



COMMEMORATIVE BOOK

A Tribute to Fifty Years of
Service and Contribution to Agriculture

**Blazing My Golden Journey
(1960 - 2010)**
Through The Seed Route

by
H.F. Chin

THE SILK ROUTE



Map



Old silk Route in Samarkand



Old silk Route of today in Tashkent

Photos by:
Dr Percy Sajise in
Museum Bukara

COMMEMORATIVE BOOK

**BLAZING MY
GOLDEN JOURNEY
(1960 – 2010)
THROUGH THE SEED ROUTE**

by
H.F. Chin

A public lecture delivered at Palm Garden Hotel IOI Resort, Putrajaya, Malaysia on 23rd March 2010. This lecture commemorates the Golden Anniversary of five decades of service in the area of Seed Science and Technology. In particular teaching at the College of Agriculture Malaya, now Universiti Putra Malaysia and also a research fellow at Bioversity International. He was The Chairman of the Organizing Committee of the past five National Seed Symposium since 1976 till 2008 and also the founder of The National Seed Association Malaysia. This lecture is sponsored by Universiti Putra Malaysia Faculty of Agriculture, The National Seed Association Malaysia and Bioversity International.

BLAZING MY
GOLDEN JOURNEY
(1960 – 2010)
THROUGH THE SEED ROUTE

by

Chin Hoong Fong JSM
Hon. D. Agric. Sc. FASc. FMSA
B. Agric. Sc., M. Agric. Sc. Ph.D (Melb.)

Professor Emeritus
Department of Crop Science
Faculty of Agriculture
Universiti Putra Malaysia
Serdang, Selangor, Malaysia


Honorary Research Fellow
Bioversity International
Asia, Pacific and Oceania
PO Box 236, UPM Post Office
Serdang, 43400
Selangor, Malaysia

Dedications

**In Memory of My Late Wife
Annie Sim Hooi Guat**

**To me a remarkable woman, loving wife
Diligent gardener, excellent cook
efficient homemaker and professionally
an analytical chemist at (RRIM) and food
technologist (MARDI)
all these in one – who gave me continuous
support and encouragement
as well as assistance
throughout my working career**

Contents

-  6 Foreword
-  7 Message
-  9 About the Speaker
-  11 Introduction
-  13 Seeds of Reminiscence
Photo Gallery: Faces, Places & Phases of my career
-  25 Seeds the Source of Life
-  29 Seeds Their Mysteries, Secrets and Wonders
-  32 Seeds for the Future
-  37 A Tribute to Seeds
-  48 Acknowledgements

Foreword

It gives me a great pleasure to write this foreword in Professor Emeritus H.F. Chin's public lecture on "Blazing My Golden Journey (1960-2010) Through the Seed Route". I wish to congratulate the Dean of Faculty of Agriculture, President of The National Seed Association Malaysia (NSAM) and The Regional Director of Bioversity International for sponsoring and organizing this public lecture to celebrate the 50 years of Prof Chin's service for agriculture in general and seed science and technology in particular. This is indeed a very rare occasion for all of us who are former students, colleagues and friends to attend this function and to listen to Prof Chin's reminiscing through his passage down memory lane via the seed route. No doubt he will highlight the changes that have taken place over the past half a century in education at UPM and research in seed science and technology. I am sure many of you in the audience are former students of Prof Chin and will be delighted to listen to his lecture again after, 10, 20, 30, 40 or even 50 years ago when he first taught you. As usual his lecture will be well illustrated, informative and entertaining.

Our country is very well endowed with a rich heritage of mega diversity in the fauna and flora. In this lecture Prof Chin will surely highlight and stress on the importance and need for conservation of plant genetic resources. His knowledge and experience in seed science and technology will be utilized to promote the establishment of our National Seed Bank and research on recalcitrant seeds. This will ensure our national asset, the seeds will be conserved in posterity for our future generations.



Y. Bhg Prof. Datuk Dr Nik Mustapha R. Abdullah
Vice Chancellor
Universiti Putra Malaysia



Message

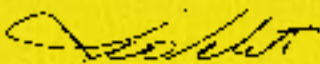
On behalf of the staff of UPM's Faculty of Agriculture, Bioversity International and the National Seed Association Malaysia (NSAM), we join Prof Chin in celebrating his Golden Anniversary of service in agriculture in UPM and Bioversity International. We are also joined by his many friends and former students in marking this very important milestone in his life. As the longest serving academic staff of UPM, he has devoted his life to the teaching and research in the field of seed science and technology particularly the study of recalcitrant seeds and the conservation of plant genetic resources.

We welcome Prof Chin's Golden Journey lecture where he will highlight his observations and experiences over the five decades at the former College of Agriculture of the University of Malaya, later Universiti Pertanian Malaysia and now Universiti Putra Malaysia. The name of this institution has changed several times, Prof Chin had witnessed the many changes in the students, staff, buildings and landscape in Serdang.

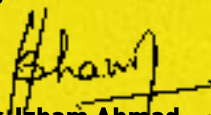
In recognition of Prof Chin's exemplary service and outstanding contribution to agriculture, education and research, in particular the Faculty of Agriculture, National Seed Association Malaysia and Bioversity International, we are extremely happy to organize and dedicate this public lecture to commemorate and celebrate his 50 years in Serdang. Still strong after 50 years, we wish him all the best and look forward to the realization of his many dreams in the near future.



Prof. Dr Mad Nasir Shamsudin
Dean, Faculty of Agriculture,
Universiti Putra Malaysia



Dr. Leocadio Sebastian
Regional Director
Bioversity International, APO



Dr. Izham Ahmad
President
National Seed Association Malaysia





About the Speaker

PROFESSOR CHIN HOONG FONG was born in 1935 in Kuala Lumpur. After World War II, he started schooling at the age of eleven at Methodist Boys' School, Kuala Lumpur and left in 1955 to complete his matriculation at University High School Melbourne. He completed his Bachelor of Agricultural Science course at University of Melbourne in 1960 and started work as lecturer in 1961 at the College of Agriculture Malaya. While working he completed his Masters of Agricultural Science and was sent under Universiti Pertanian Malaysia scholarship for his Ph.D., which he obtained in 1973. He was appointed Associate Professor in 1975 and Professor from 1981 and Emeritus Professor in 1996. Throughout his 50 years working career, he has been working only at Serdang, College of Agriculture, Universiti Pertanian Malaysia, and now Universiti Putra Malaysia.

Prof. Chin's main interest is in Seed Science and Technology and his field of research is on seed storage particularly the recalcitrant species. During his career he has been active nationally and internationally. Prof. Chin has published three books on seeds namely Agricultural and Horticultural Seeds of Malaysia, Seeds Technology in the Tropics and Recalcitrant Seed. He was Chairman of Technical Committee on Planting Materials of SIRIM and Chairman of National Seed Symposium. Internationally he was Chairman of Technical Committee

on Seed Storage of International Seed Testing Association for 9 years. As a member of the Board of Trustee of the International Board for the Plant Genetic Resources (IBPGR), then known as International Plant Genetic Resources Institute (IPGRI), now Biodiversity International. He also served in the Advisory Committee on Seed Storage. Prof. Chin sat on the committee of Svalbard International Seed Bank and recently undertook a review of IRRI Genebank.

“Prof. Chin’s main interest is in Seed Science and Technology and his field of research is on seed storage particularly the recalcitrant species”.



Besides his research in seed science he has other interest in gardening and photography. With these interest and skill he has written and edited ten books, including Malaysian Flowers in Colour, Malaysian Fruits in Colour, Malaysian Trees in Colour, Hibiscus-Queen of Tropical Flowers and Malaysian Vegetables in Colours.

For his long service and contributions, he was appointed Emeritus Professor at UPM, and Foundation Fellow of the Academy of Science by Minister of Science, Technology and Environment. He was awarded an Honorary degree of Doctor of Agricultural Science by University of Melbourne and appointed Honorary Fellow of International Plant Genetic Resources Institute at Serdang. The Malaysian Scientific Association recognized his contribution by making him a Fellow of MSA.

The beginning of the new Millennium marks an auspicious decade of anniversaries and awards for Prof. Chin. In 2003, the 150th Anniversary of University of Melbourne was celebrated with pomp and ceremony in Melbourne. A contingent of over 30 alumni members flew to Melbourne to join the celebration. A grand Gala dinner was held and graced by the Governor General of Australia. A special convocation was held for nine honorary doctorates, this was one of the highlights of the 150th Anniversary celebration. Then on 2005, Prof. Chin celebrated his 50th Anniversary of his first landing on Australian soil, tracing back the route taken 5 decades ago (1955 - 2005). He was able to meet up with his former classmates, lecturers, professors and was invited for afternoon tea with three former chancellors at the University House. An interesting programme was planned as guest of the University and enjoyed a pleasant journey down Memory Lane. As founding President of the Alumni of Kuala Lumpur branch, in 2008 he celebrated with his fellow Alumni members at the 20th Anniversary Gala Dinner graced by the Vice Chancellor and 20 university officials attended with 200 local members of the KL branch, during which he was awarded a certificate for Meritorious Service to the University. For his contribution in Seed Science and Technology he was given a special award by the Asian & Pacific Seed Association, presented by the Minister of Agriculture YB Tan Sri Muhyiddin Yassin at the Asian Seed Congress 2006 held in Hilton KL.



Introduction

THE WORLD FAMOUS SILK ROUTE across the Asian continent from Eastern China to Europe stretching 7,000 miles of treacherous roads. This route started mainly as a lucrative silk trade, later included spices, slaves and satin during the Han Dynasty 3,000 years ago. Many of you are familiar or heard of the Silk Route and may even have travelled on this route as part of your overseas tour. But I bet you have not heard of the Seed Route, which took me 50 years of travelling around the world through the five continents not for trade but in search of the seeds of knowledge. That's why I have chosen the title of my talk "Blazing My Golden Journey (1960 -2010) Through the Seed Route". I wish to share with you my experiences by giving you a glimpse of the highlights of my career in teaching and research in agriculture in general and seed science and technology in particular. So now fasten your seat belt and join me for a flight round the world in an hour, to see the beauty and wonders of seeds. I hope to keep you all enthralled with my golden journey through the seed route, interspersed with jokes and amusing anecdotes of incidents that happened in my life.

"Working fifty years in one place is indeed a long time, and to dedicate and devote the entire working life in an institution is indeed uncommon nowadays".

Working fifty years in one place is indeed a long time, and to dedicate and devote the entire working life in an institution is indeed uncommon nowadays. Furthermore obtaining four agricultural degrees from the same university, the University of Melbourne is doubly rare. In spite of being attached to and studied in one university, I managed to travel widely to attend courses, workshops, conferences and to conduct courses and present papers and deliver keynote addresses all over



the world. The experiences gained, lessons learnt and exposures to fellow man have greatly enriched my life.

In my lecture, I will lead you through memory lane of five decades. This lane is not always lined with a bed of roses, at times, it is winding, steep, narrow, slippery and through dark tunnels, luckily at the end of the tunnel there is light. I would like to share with you some of the memorable experiences throughout my career in teaching and research by comparing the past with the present, it is best seen in the changes and tradition of UPM as illustrated in the landscapes, buildings, the students and staff.

Searching, sharing and saving are the keys in my life. Searching to me stands for the quest for knowledge which is a life long process. Even now I am learning to narrow the generation gap i.e. in information technology and to keep up to date. Research forms another component of learning, seed science and technology in particular conservation of plant genetic resources through seed storage. Sharing is to sow seeds of knowledge dispersing and disseminating by imparting knowledge and skill to others. As I strongly believe sharing ones knowledge is a way of achieving immortality. This is done through teaching and training thousands of students over the past fifty years. The books I have written and papers published are distributed locally and abroad. Saving refers to the conservation of plant genetic resources via seed storage. Throughout my long career I have developed various methods of seed storage and cryopreservation of plant genetic resources. These rich resources that we have conserved can and have to be utilized for the betterment of mankind. I have vision and dreams of miracle seeds to feed the world's future generations and make them a reality. Finally, I like to pay a tribute to man and seeds the capsule of life with my poems on SEEDS.



Seeds of Reminiscence

FLIPPING THROUGH THOUSANDS OF PAST PHOTOS in my albums having a glimpse back in time will sparkle unforgettable fond memories in my 50 years career. These memories are both bitter and sweet, fortunately they are mainly sweet ones to cherish. Even a bitter experience in a car accident in Brasilia in May 17th 1993 when I had 13 lined fractures in my ribs and a fractured collarbone, a painful but lucky incidence. In the hospital, strangers from Malaysia visited and brought me food. Even the Malaysian Ambassador to Brazil invited me to stay in his residence for me to recuperate for a fortnight before I flew home. Members of staff of CENARGEN and their families came to the airport to bid farewell. All these touched me deeply and remained clearly in my minds eye, till today a few of them still keep in touch.

Fifty years is indeed a long time but to me the nostalgic past of dreams, laughter and tears pass by me as quickly as a wink. In 2005 when I went on my Golden Anniversary back to Melbourne, I walked the path in the parks where I walked a few times a day for my lectures, I felt as if I had been there just yesterday as the trees that lined the path looked the same. But now if I think of fifty years ahead in the future, it feels and sounds such a long journey in life, even five years will be a long wait. Let me share with you my experience and joy in my 50 years down memory lane, with just a glimpse of my working life (1960 -2010) and with some preliminary episodes of my school and university in Kuala Lumpur and Melbourne.

“Fifty years is indeed a long time but to me the nostalgic past of dreams, laughter and tears pass by me as quickly as a wink”.

In the final year of the Bachelor of Agricultural Science course, I started working during the vacations and immediately after my final exams,



working as an experimental officer in the Land Research Division of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Canberra, Australia. Subsequently after my graduation and return to Malaysia was appointed as a pupil agronomist at the Federal Experimental Station in Serdang in July 1961 but actually worked as a lecturer at the College of Agriculture Malaya in Serdang.

Just after World War II in 1946, I was one of the over-aged boys admitted to the Methodist Boys School in Kuala Lumpur, I entered school at the age of eleven and began learning A, B, C and the alphabets compared to boys of the same age nowadays they are well competent with computers. We have to catch up with the lost years through double and triple promotions and by early fifties Form Six classes and coeducation were introduced. The educational visits organized by the school science societies to the College of Agriculture Serdang and the Federal Experimental Station was my early exposure to agriculture. Together with my interest in plants and gardening and being a member of the school science society further stimulated my interest in agriculture and aspiration to be a plant scientist. After form five at school,,that I planned to further my study in agricultural science at the University of Melbourne, my mother thought I was crazy asking whether I intend to grow apples in Malaysia when I returned after graduation.

In July 1955, the journey to further my education began with a train ride to Singapore, where I boarded a cargo boat bound for Fremantle Australia. Leaving home for the first time is indeed another memorable moment in my life. I was fortunate that two of my school mates joined me in this torturous voyage which lasted eight long days. Life is full of new experiences and this one is unforgettable, eight days and nights on board a boat sailing the rough oceans in the middle of winter and eating strange smelly food for the first time is indeed a real test of endurance. Even my classmate a big size body builder succumb to sea sickness on board, he vomited for days. Riding through mountainous waves was real frightening, one moment you were on top of the wave, the next the ship was below the wave, the sound of the pounding waves and water lashing on deck made me shiver. We were so happy when



the boat docked at Fermantle, like sailors we could not even walk straight, to board the transcontinental train across Australia to our destination. Melbourne which took another 3 days and nights. Finally we reached our destination Spencer street station in Melbourne to be met by a few other classmates who flew there earlier. It was indeed a happy reunion, shivering in the middle of winter but met with a warm welcome by our friends. It took us two weeks to get to Melbourne, now students fly by the thousands in jumbo jet 747 in comfort just a night sleep away in seven hours. Looking back, I still treasure the hardships and memorable experiences encountered which I now can relate to our young generations, pointing out to them how lucky they are nowadays. I attended matriculation or form six class at University High School, Melbourne followed by the four year course in Bachelor of Agricultural Science in the University of Melbourne and returned home in early 1961.

After graduation on my return back home I applied for jobs and was offered one with an estate and the other from the Department of Agriculture, the latter was chosen. I reported for duty on 1st July 1961 at the Federal Experiment Station in Serdang, to my surprise I was told that I was to be located at the college of Agriculture, Serdang. There I was greeted by a young Scotsman Mr. Iain Martin the principal who was one of the last few colonial agricultural officers with the Department of Agriculture, placed in the education branch like me. I expressed my surprise and shock saying teaching was not my chosen career. But he assured me that I would come to like teaching and not to worry about my educational background in temperate agriculture dealing with fruits like apples and pears, crop such as wheat and barley. He reminded me that one starts learning after graduation.

I was given the opportunity to teach a few subjects in plant sciences, at that time trained agricultural graduates were very scarce, just a few lecturers. I was thrust into teaching botany of fruits like durian and rambutan and crops such as rice and rubber. Here I was a young fresh graduate having to face a class of 23 mature students about my age, this was a frightening moment of my life. Thank God the late Mr Chew Hong Jung the former Deputy Director of Agriculture and principal of

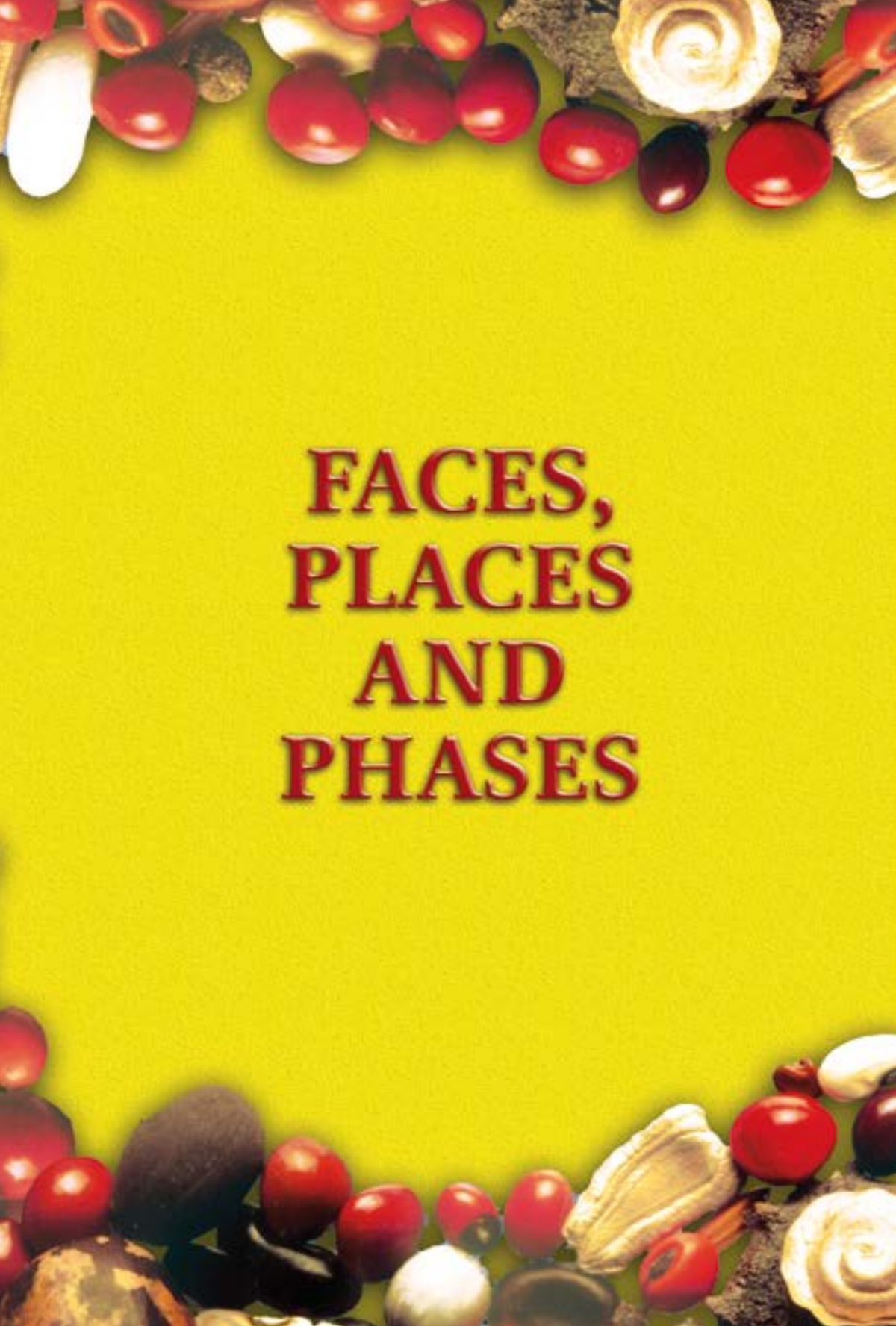


the College of Agriculture passed me his lecture notes which saved my day.

It was fortunate, besides teaching I had the opportunity to do fieldwork. In fact every morning at 6.30 am the lecturer had to supervise student's field work everyday before breakfast and lectures. Practical field work in the college farm became the hallmark of graduates from Serdang. From then on teaching became a ritual together with field work and research have changed my ambition to be an agricultural scientist and put me into the academic arena, with a combination of teaching and research. Later I slowly began to be interested in teaching as a profession because it gave me the opportunity to mix and know students and staff members. Through this I am able to impart both knowledge and skill to others. The feeling of helping and sharing at the same time enjoying my work, contribute to personal satisfaction and progress in the academic field. This definitely will not make me a millionaire, but I can pass on my love for plants to others.

In the early part of my academic life at the College of Agriculture, teaching was the main emphasis in the early 60's and research is optional. At the beginning, as a plant enthusiast I was keen on different aspects of crop production and ornamental plants. It is not until 1964 when I was sent to New Zealand to attend a seed workshop for a month that I have been attracted to seed science and technology from then onward there was no turning back, my research was focused on seeds at the beginning in general on production, protection and storage. The secrets and wonders of seeds intrigued me especially their viability and longevity, seeds can remain viable for centuries and I need to know how and why seeds can survive for such long periods. This led to the field specialization in seed storage with particular reference to physiology. Subsequently, on my own initiative I underwent a partime course for my master's degree in agricultural science on the storage of some tropical seeds. In 1970, I was offered a scholarship to do a Ph.D degree entirely focused on seed storage for over three decades, concentrating on one topic and not changing my research from time to time even though other more lucrative research projects were offered. This dedication and full concentration allowed my work to be known in the field of seed science and technology.





**FACES,
PLACES
AND
PHASES**

Faces, Places and Phases
Sowing the Seeds (1950)



*Methodist Boys' School (MBS)
Science Exhibition Primitive
hydroponics*



*Visit to College of Agriculture
Serdang, Members of Science
Society (MBS)*



*University High School Melbourne
In full uniform*



Faces, Places and Phases
Seeds Germinating (1960)

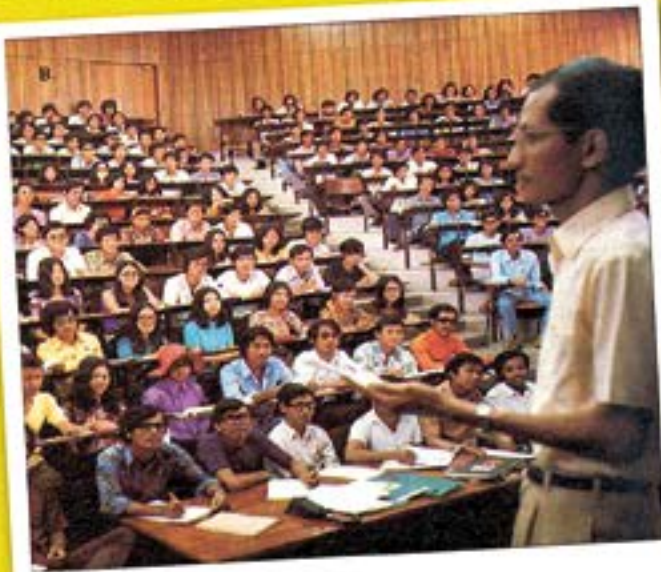


*Dookie University Farm;
Milking Time*

*Final year class of
B. Agric. Sc. Course*



Faces, Places and Phases
Seeds Growing (1970)



Giving a lecture at UPM



First Batch of B.Agric.Sc. Graduates of UPM



Faces, Places and Phases
Flowering, Fruiting and Seeding (1980)



*Organizing conferences
Dr Marimuthu, Deputy Minister of Agriculture*



Books Published



Faces, Places and Phases
Seeds Maturing (1990)



Faces, Places and Phases
Golden Harvest (2000)



*University of Melbourne 150th Anniversary 1853-2003
Honorary Doctorates (Left to right):
H. T. Chin (Hon. Doc. Agri. Sc.), Dato Mustapa Mohamed (Hon.
Doc. of Commerce), Chancellor Ms Fay Marles, Dato' Seri Mohd.
Tajol Rosli (Hon. Doc. of Law)*



*APSA Special Award from
YB Tan Sri Muhyiddin Yassin*



*With former Chancellor and
Professor Nancy Millis*





Seeds – The Source of Life

TO THE COMMONLY ASKED QUESTION “What is a seed?” the definitions given are as variable as seeds themselves. Each definition is actually dependant on the interpretation of the beholders be they farmers, poets, philosophers, scientists or the layman on the street. In the broadest sense, a farmer defines seeds as anything he uses for planting a crop, to the extent of even including the vegetative parts like the buds and cuttings which are not actually the true seeds.. To a botanist, he interprets a true seed as the fertilized, ripened ovule, which is basically made up of the embryo, or miniature plant, the endosperm and the cotyledons storing the food reserves – all of which are protected by the seed coat or testa. The latest in a book on seeds, it is summed up as the time capsules of life.

The basic parts of most seeds are very similar but one will be amazed at the great diversity in shape, size, texture, colour and weight. Even within the same family of beans (Leguminosae), there is great variation in the appearance and design of intricate patterns, colour and texture of the seed coat, which often go unnoticed or admired.

Very interestingly, statistics have revealed a great range of seed weight in the order of a millionth fold from 0.005 to 5kg as seen in the microscopic orchid seed and the gigantic Double Coconut (*Lodoicea maldivica*).

A single plant can produce as many as a million seeds and in some species, the longevity of seed ranges from a few days to hundreds or even thousands of years. These are some of the wonders of nature which one seldom or never ponders over in one’s lifetime. The physiology and longevity of many seeds still remain a secret. There remains many physiological, biological, genetical and ecological mysteries yet to be elucidated.

It is equally fascinating to observe how nature has designed seeds perfectly for various functions like their dispersal and survival. Seeds



“There are also many in-built survival mechanisms that enable seeds to adapt to new environments or survive the vagaries of the weathers”.

for wind dispersal are equipped with feathery or wing like structures that enable them to be carried far away. Such structures help them to avoid competition among themselves. Seeds like the coconut are provided with a thick layer of fibrous husk to help them float in time and distance as they are dispersed by the water.

Man and animals too help to disperse seeds. Many delicious fruits that man and animals eat have seeds encased in them. These seeds are

often dispersed wherever the consumer takes the fruit and eats them. Some have special structures in the form of numerous appendages like hairs, hooks or needles for attaching themselves to man and animals. There are also many in-built survival mechanisms that enable seeds to adapt to new environments or survive the vagaries of the weathers.

Seeds – the source of life is so important that the United Nations has designated 1961 as the World Seed Year. The importance of seeds is spelt out clearly in the four words “all food is seed”. The world’s population is ever increasing and food production must keep abreast to meet the demand. To counter the threat of hunger in this overpopulated world the development of newer and better seeds of all crops must be given top priority. Today’s modern technology used in the creation of miracle rice, genetically engineered and artificial seeds are promising examples of our scientists’ contributions towards the increased production of food for the ever increasing population.

In the field of horticulture, selection and breeding have given rise to many improved cultivars i.e. distinct cultivated varieties. Through conventional breeding techniques, mutation and genetic engineering, the dream of creating a black tulip, blue rose or fluorescent orchids can be achieved. Hybrid seeds are equally significant. In general, these



better quality seeds have revolutionized agriculture and horticulture by increasing the yield and diversity of crops for our food and garden. A good knowledge of seed science and technology will not only benefit the scientists but also the farmers, gardeners and the laymen.

A farmer or gardener learns from practical experience, through persistently hard ways of success and failures. Nowadays practical guidelines are readily available to make gardening more friendly. There is great truth in the saying “care with the seeds, joy with the harvest,” for if one takes proper care of the crop seeds from the time they are harvested till the storage and planting, one is most likely to get a good quality crop of high yield. A famous quotation says “As you sow, so shall you reap”. Literally, in farming terms it means that what one reaps or harvest is totally dependant on ones input. If a farmer sows good quality seeds in his field or garden, with proper care he should be able to get higher yield at harvest time.. In fact “a good quality seed does not cost, it pays”. Use of high quality seeds costs more but the net profit far outweighs the cost.

The use of high quality seeds is both agronomically and economically sound. The returns from such seeds far outweigh the savings from the use of cheaper and lower quality seeds.

In nature, seeds are designed and endowed with characteristics for survival, dispersal and regeneration of species. We cannot depend on nature alone for today’s needs. Giving nature a helping hand is a very significant role man can play to enhance crop production, increase yield and improve quality food to feed mankind.

“In fact “a good quality seed does not cost, it pays”. Use of high quality seeds costs more but the net profit far outweighs the cost”.

Most people buy seeds of flowers or specially bred vegetables from reputable garden centers. These centers provide high quality hybrid seeds that are pure and true to type. One can be



sure that the seeds are properly processed, packed and stored, tested and certified before sale.

Just a few words of advice in the sowing of seeds. Usually small seeds are seldom sown directly in the field. Very fine seeds are mixed with sand and sown in prepared seed boxes or shaded seedbeds in the nursery. They have to be watered with a fine spray watering can or a fine sprinkler. When seedlings are a few centimeters tall, they can be transplanted either into polybags or in the field where protective shades are used to shield them from the strong sun and rain.

Nowadays a lot of vegetables and ornamental plants are grown in glass houses or under plastic shades. Home gardeners have to ensure that newly planted seedlings are initially protected from the direct sun or rain. Once established, the protective shade can be removed. However, care must be taken to water them regularly and properly. With proper care and management, healthy and productive plants will grace your farm or garden. Always remember the quotation “care with the seeds, joy with the harvest” and “as you sow, so shall you reap”. The slogan “good seed does not cost, it pays” is always true.



Seeds : Their Mysteries, Secrets And Wonders

SEEDS ARE OMNIPOTENT, where there are animals, men and plants, there are seeds. They are also ubiquitous found in the atmosphere, land and sea. Seeds exist under extreme conditions in the desert, arctic and antarctic condition or in the tropical rainforests. We encounter seeds everywhere, handle them, grow them from microscopic orchid seeds to huge coconuts, yet we can not understand their behaviour and physiology, there are still more mysteries to be uncovered and learnt for the betterment of mankind. Especially the longevity of some seeds exceeding hundreds of years is also beyond that we ever imagined of living things.

The secrets and wonders of plant life are deeply embedded in the tiny structure of the seed. Even in this era of interplanetary travel, man has not yet been successful in unravelling some of the secrets that lie within a seed. Galbraith refers to the seed as “This is the awesome vessel of power, wherein all mystery is enfolded”.

A large number of presumed long lifespans of seeds can be cited. The age of the seeds has been estimated by such comparisons as with objects of known age, surroundings, geological events and carbon-14 dating. Turner (1933) pointed out the weakness of conclusions based on such observations “When the longevity of buried seeds is estimated entirely from circumstances in which they are found, there is the possibility of error. But dated seed collection in Paris Museum such as *Cassia multijuga* were found by Becquerel (1934) to be able to germinate after 158 years. Shen-Miller (2002) reported that the age of Lotus seeds in buried lakebed were 1040 + 210 years of age as determined by carbon dating; this was further confirmed by Wester (1973). There is little

“The secrets and wonders of plant life are deeply embedded in the tiny structure of the seed”.



“History has revealed the ability of seeds to survive for hundreds of years under natural conditions of being buried in soil or in tombs. Under the controlled environment of temperature, relative humidity and seed moisture content, the life span of some crop seeds such as rice can easily be in the region of 70 years”.

doubt that these seeds are very old, but their age has not been established to the satisfaction of the biologists. In contrast, the recalcitrant seeds (Roberts 1973) have a very short life span from a few days to a few months. These seeds cannot tolerate dehydration and low temperature of below freezing. A typical example is the rubber seed (*Hevea brasiliensis*) which perish with exposure to chilling temperature and dehydration to 15 per cent moisture content (Chin *et. al*, 1981).

Prolonging life is always of interest to all. History

has revealed the ability of seeds to survive for hundreds of years under natural conditions of being buried in soil or in tombs. Under the controlled environment of temperature, relative humidity and seed moisture content, the life span of some crop seeds such as rice can easily be in the region of 70 years. Man hopes to store seed indefinitely. Attempts in the field of cryogenic storage *i.e.* storing seeds in liquid nitrogen, at temperature of -196°C , have shown that seeds in such state of suspended animation, on thawing can be germinated. Research in this method of storage has been only initiated in recent years. Success or failure will be known only in centuries to come.

The life span and longevity of some seeds are astounding from hundreds to thousands of years as reported in lotus seeds. These are some of the wonders of nature which one seldom or never ponders in one's lifetime. The secrets and wonders of plant life are deeply



embedded in the microscopic seeds or the huge ones like the coconut. Even today, man can travel to the moon yet he has not been successful in unravelling some of the secrets that lie within a seed. In the near future with the rapid advances in biotechnology and molecular biology man can unfold some of these mysteries and help in his own survival. An understanding of the mechanisms involved in longevity and deterioration will enable more efficient and cost effective methods of seed storage.

The seed, an embryonic plant, is well protected by the testa or seed coat. Its metabolic activities are at an extremely low rate while dormant, yet after a long period it can be re-awakened by the stimuli of a favourable environment. The orthodox way for seed to be stored is for them to be dried to very low moisture content where moisture content should be around 5 per cent the dry weight of the seed; at times even as low as one per cent. This rather abnormal ability of seeds to sustain life when all other living things, plants or animals die is unique. A very important and basic question which always escapes our notice and curiosity is, how can the embryo or other parts of a seed, unlike all other parts of the plant, withstand desiccation and avoid death? Even today, no answer is available yet to solve one of the mysteries in seeds.



Seeds For The Future

IT IS IMPOSSIBLE TO PREDICT THE FUTURE, but one must plan and be brave enough to dream of the impossible and strive towards it. The future looks bleak with the impending population explosion; with hunger and famines at our doorsteps. It is frightening to think of the future. Will there be enough food for everybody? Will our genetic resources be lost forever? Our salvation lies partly with the seeds. Time is running out. There must be world wide efforts to produce and use high quality seeds to try to get super-productive plants. At the same time man must collect the world's germplasm within the next few decades. It will be our best insurance against the spectre of world hunger and real disaster.

Miracle plants and seeds have been produced in the last two decades in wheat and rice. We look forward to miracle species in other food crops. These must not only be high yielding but also high in seed quality and nutrition. For example, many in the third world suffer from chronic protein malnutrition which can be overcome by consuming food with very high protein, legumes or cereals specially bred to meet the nutritional needs of rapidly expanding world.

As I have mentioned earlier, man is presently too dependent on the four major cereals – wheat, rice, maize and sorghum. A dangerous situation would arise if a new virulent disease appears and we do not have the means to cope with it in time. The ability to cope with such an epidemic depends largely on the built-in genetic resources of plants that breeders have at their disposal for cross-breeding. By selection breeding, resistance to diseases and pests can be bred into a species. Similarly, plants have been bred for tolerance to drought, high salt, low soil nitrogen and extreme temperature. Highly complex investigations on the amino acid composition, its protein and alkaloid content, its salts, starches and enzymes have to be conducted. It is from this biochemical profile of a plant, together with its performance record, that the plant breeder is able to judge whether its germplasm is what he needs to develop a new plant with genetic capability that



thus far exist only in his mind. Nowadays in germplasm collection, all such details are computerized and one can at short notice pick up a desirable line for crossing. With great advances in modern technology, gene manipulation has been practiced and in the very near future it will play a major role in plant breeding. Given these advanced technology we can look forward with confidence to a perfect seed in which one can incorporate all the desirable characteristics required for the super-productive plant.

A perfect seed alone is insufficient. The environment must also be favorable for it to germinate and grow. The green revolution will not be successful unless miracle seeds can be supplied with sufficient water and fertilizers for crop establishment. With rapid advancements in agricultural engineering we can explore the possibilities of using germinated seeds with specially prepared seed covering materials designed to provide an optimal environment for the seeds. These seeds need to be protected from pests and disease, be provided with water for initial seedling development, perhaps in the form of a gel which will remain with the seed and may also contain nutrients for the seedling. Selective herbicides may also be introduced in the seed which will inhibit weeds but will not affect the crop plant. We may be setting our targets too high by incorporating all the above in the seeds.

In addition to the establishment of gene banks to conserve genetic resources, there should also be a concerted effort to explore what remains of virgin jungles on the earth. The search for yet undiscovered wild species which can be domesticated and become future crop plants must begin before it is too late. Such exploration will not only lead to the discovery of new species but the collection from wild species will widen the genetic base as in the case of rubber in Malaysia whose base has depended on a very narrow spectrum of genes inherited from the 22 seedlings from Brazil via

“A perfect seed alone is insufficient. The environment must also be favorable for it to germinate and grow”.



Kew Gardens a constant vigil is kept on the dangerous disease known as South American leaf blight which can wipe out the whole industry within a short period. With this in mind an expedition from Malaysia went in the Amazon forest in 1981 to collect wild species of rubber which will be used to widen the genetic base tree in Malaysia. The crosses made between the wild species and the cultivated clones may render some degree of resistance to such diseases. The small amount of resistant plants are diminishing rapidly and may be lost forever to plant breeders. By collecting and placing all plant productions in appropriate storage or gardens they will be available to plant breeders indefinitely. One of these plant introductions may save the whole industry, and the benefits to be gained from such an introduction would more than compensate for the construction of a store or seed bank and the cost of maintaining one for many years.

Legumes are well known for their ability to fix atmospheric nitrogen by the Rhizobium bacteria in the root nodules. The Rhizobium species must be of the right strain for efficient symbiosis to fix nitrogen. At present leguminous seeds are often inoculated with Rhizobium cultures as Rhizobium compost. The contribution of legumes is vital for the maintenance of soil fertility over long periods. A leguminous crop can add up to the 500 kg of nitrogen to the soil per hectare per year (National Academy of Sciences 1977). In the United States, legumes contribute about 2.4 million tons of nitrogen a year, nearly one-fourth the amount of fertilizer nitrogen manufactured in the same period. In the current decade the energy crisis has resulted in a five fold increase in price of fertilizer which badly hit the developing countries. It is under these conditions that legumes and biological nitrogen fixation take on new and great importance although nitrogen fixation is peculiar to the legumes, and other crop species such as cereals are lacking in this symbiotic nitrogen fixation by Rhizobium bacteria. Other microorganisms such as mycorrhiza are found to be beneficial to the well being of plants. Lately some grasses have been found to possess a certain degree of ability to fixed nitrogen. In future, by gene manipulation or the discovery of microorganisms with the nitrogen fixation capacity, all types of seeds legumes as well as cereal



may be inoculated with such organisms so that farmers need not apply costly fertilizers.

Yearly all over the world both in advance developed and developing countries millions of dollars are lost in post harvest losses caused by insects and other microorganisms. In future seeds could be protected against all pests while they are in the field and while they are in storage, the losses could be saved to feed more people. Seeds may be treated that pests will not attack them and yet be edible as food. On the other hand seeds for planting can be treated for invigoration, tolerance to adverse conditions of stress and growth with the minimal amount of nutrients. These characteristics, if included in the high yielding miracle seed, would be ideal. It is envisaged that seeds in the future will come as pellets or capsules within which all the necessities for growth and protection against hazards are present for super-productive growth and yield.

Nowadays, through genetic engineering and traditional selection and crop breeding for example in cotton seeds which are more insect resistant and herbicide tolerant varieties will be made available to farmers by mid 1990's. Several reports on successful encapsulated somatic embryo from a range of commercially important species have indicated the possibility of using the artificial seeds for propagation. It has been successfully applied to crop plants such as carrot (Kitto and Janick, 1985), pine (Gupta and Durzan, 1987) and barley (Datta and Potrykus, 1989). The artificial seed coating also has the potential to hold and deliver beneficial materials such as hormones, retardants, nutrients and pesticides for precise placement (Redenbaugh et. al, 1987).

It is amazing what we can do to the seeds and what the seeds can do for us. We hope that the future will enable us to produce a 'ideal miracle seed' which will satisfy all our requirements. Such needs will have long life, germinate and grow rapidly to produce high yielding quality products with the minimum input of fertilizers, pesticides, water and labour.



References

CHIN, H.F. & HOR Y.L (1981) A decade of seed technology education in Malaysia. *Seed Science and Technology*. 9: 489-494.

DATTA, S.K. & POTRYKUS, I. (1989) . Artificial seeds in barley: encapsulation of microspore – derived embryo. *Theor. Appl. Genet.* 77: 820-824.

GAILBRAITH, G.S. (1961). On a seed , *American Year Book on Seeds*.

GUPTA ,.P. & DURZAN, D. (1987). Biotechnology of somatic polyembryo genesis and potential regeneration in loblolly pine. *Biotechnology* 5 : 147.

KITTO, S. L. & JANICK, J. (1985). Production of synthetic seeds by encapsulating asexual embryos of carrot. *J.Am. Soc.Hort.. Sci.* 110:227-282.

REDENBAUGH, K., VISS,P., SLADE,D. & FUJI, J. (1987). Scale – up : Artificial Seeds. *Plant Tissue and cell Culture*. Allan R. Liss Inc. p473-493.

ROBERTS ,E.H. (1973). Predicting the storage life of seeds. *Seed Science and Technology*. 1 :499- 514.

SHEN –MILLER, J. (2002). Sacred lotus the long-living fruits of China Antique. *Seed Science Research* 12: 131-143.

TURNER,J.H. (1933). The viability of seeds. *Kew Royal Gardens Bulletin Miscellaneous Information* 6: 257-269.

WESTER, H.V. (1973). Further evidence of age of ancient viable lotus seeds from Pulantien deposit, Manchuria. *Hort, Science* 8: 371-377.



A TRIBUTE TO SEEDS

On a Seed

This was the goal of the leaf and the root
For this did the blossom burn its hour
This little grain is the ultimate fruit
This is the awesome vessel of power

For this is the source of the root and the bud...
World onto world onto world remoulded
This is the seed compact of Gold
Wherein all mystery is enfolded

George S. Galbraith



37



A Vigorous Seed

I am just an ordinary seed
And of no special breed
But nurtured till full maturity
In storage I am put under security

In size or weight I am normally above average
I may be younger or older in age
One look at me you cannot tell
For I shine especially when things are not well

Under adverse conditions I can survive
While others normally may not thrive
Through soil, crust and rock I penetrate
This is nature's way to perpetuate

My potentiality can be tested
Very often not being appreciated
Like a shield to a soldier
I ensure yield to the farmer

My virtue must be tested
In every certificate it must be listed
Users of seeds then can cheer
At last here comes vigour

H.F. Chin





40

Amazing My Golden Journey (1960-2010)
Through The Seed Route

Seeds: The Source of Life

Natures aim in life is to multiply, disperse, adapt to survive
Millions are dispersed even to distant land I can thrive
Buried in soil dormant I may lie for years
My longevity as seeds farmers jeer or cheer

As a seed I live, for days, months or years
Depending on my origin, the environment and what I fear
Moisture in me and surrounding temperature are the key factors
They determine my viability, longevity and vigor as a propagator

Seeds of all shapes, sizes, colour and texture, nature display
Diversity of behaviour, in the same multifarious ways
Low moisture and temperature in Harrington rule,
orthodox seeds obey
But recalcitrant seeds in contrast will perish rapidly in
great dismay

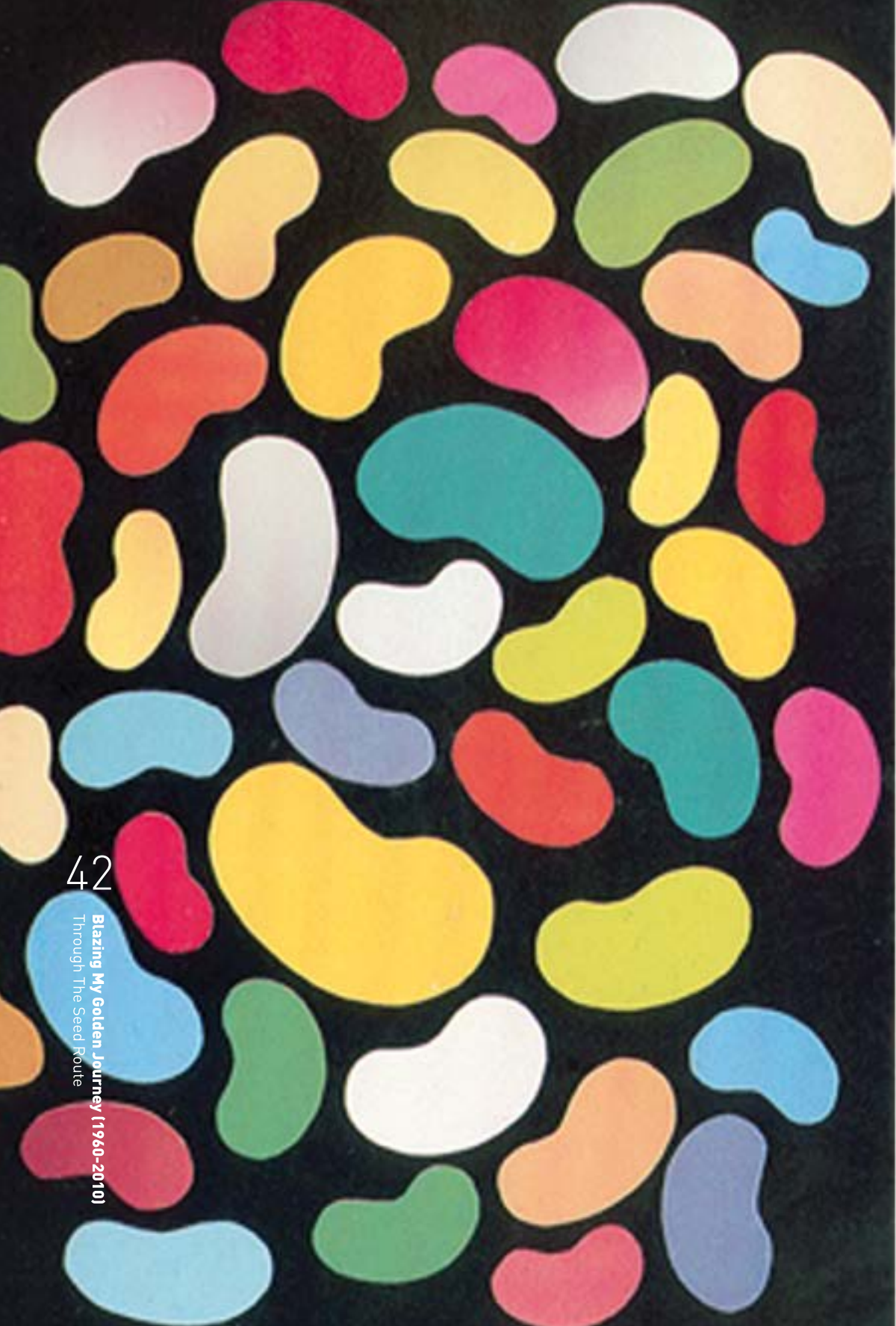
Favourable environment can prolong storage life
This is achieved, only with some strive
The world's plant resources, as germplasm must be conserved
Future generations can then enjoy, what man has preserved

Before storage I undergo various tests
Cleaned, at times dressed with chemicals to fight the pest
Presently freezer and cold rooms, orthodox seeds prefer
In future cryogenic storage may reveal better things to offer

As precious seeds I am to be perpetuated
In genebanks, seeds are carefully guarded and regenerated
These will be the source, for man's own future needs
Advances in cryogenics may be the answer to the Everlasting Seed

H. F. Chin





42

Blazing My Golden Journey (1960-2010)
Through The Seed Route

Seeds For The Future

Seeds - the progenitors of plant life
Man on earth depends on them to survive
Priceless, they are worth more than jewels and gold
Today, conservation for the future must be stressed and told

Men and nature as partners coexist side by side
Tons of seeds are produced and some are kept aside
Safely stored in genebanks or stores big and small
These genetic resources are free to everyone's call

In storage, orthodox seeds lie dormant, cold and dry
The recalcitrant species detest and will surely die
Seed longevity remains still a mystery
In banks and stores they are kept under tight security

Seeds in banks guide and determine our future
Should practise what we learnt from nature
From seed science, alternatives are in the offer
Cryogenic storage may yet be the answer

In storage, some seeds may have deteriorated
Their potential value must be tested and evaluated
ISTA rules we must all follow to ensure uniformity
This is to certify their longevity and quality

Seeds in many styles will come in modern time
Taped, invigorated and artificial ones are in line
Buried seeds are ways to survive in nature
Tomorrow's seed bank run by robots safeguard our future

H. F. Chin





44

Blazing My Golden Journey (1960-2010)
Through The Seed Route

Seeds of Friendship

Seeds of friendship worth more than gold
Sown in the hearts of young and old
Appreciated and properly stored they survive
In fertile or even poor soil they thrive

The world over these seeds we sow
Over land and sea they may go
With phone and email we will not be apart
Such true friendship remain in our hearts

Strong bonds of friendships will withstand stress
Though trials and endurance put us to test
But the fruits of joy and sorrow we nurture and share
Bring happiness and satisfaction beyond compare

Through good and learn years, friends by our side will stand
Active, able and strong a helping hand they will lend
In twilight years, fragile and senile, we cannot fend
Only true friends remain till the end

H.F. Chin





46

Blazing My Golden Journey (1960-2010)
Through The Seed Route

SEEDS of Love: The Heartseed

My existence as a seed in the tropics very few know
The heartseed as seeds of Love,when sown can rapidly grow
Each seed is naturally designed with a big white heart
Against the black background my purity and dignity stand bright.

As a herbaceous climber,fences I climb with tendrils
The minute greenish white flowers have no frills
I am borne in a fruit like a three sided balloon pendent
On ripening the fruit dehisces and the seed dispersal is
independent.

In Latin *Cardiospermum halicacabum*,
commonly known as Heartseed
Seeds of friendship,knowledge and love very important indeed
Abundantly sown seeds of Love easily take roots
Love radiating light, the needy and neglected will bend toward
it like shoots

People will scramble,creep or climb for the love of mine
Armed with true love,based on trust,you will be fine
Everyone needs love of all types,even for animals and
plants to survive
Especially love showering on family,friends,pets,
husband or wife.

The long journey in life,begins with love at
home,school,work and play
Seeds of love sown over time and place,
like a heart shape shield we display
They germinate and grow even in poor soil,
drought or adverse conditions
So,sow your Seeds of Love freely for peace,
health and happiness in all nations.

H.F.Chin





Acknowledgements

I am indeed very glad and honoured to have Datuk Noh Omar, Minister of Agriculture and Agro-based Industries, Prof. Datuk Dr. Nik Mustapha R. Abdullah, Vice Chancellor, Universiti Putra Malaysia and Prof. Dr. Mad Nasir Samsudin, Dean Faculty of Agriculture and staff of Universiti Putra Malaysia gracing this auspicious occasion.

Special thanks to Dr. Izham Ahmad, President of National Seed Association Malaysia (NSAM) and Dr. Leo Sebastian, The regional Director, APO of Bioversity International for co-sponsoring this 50th Anniversary celebration.

I wish also to thank the following people for their assistance in organizing this 50th Anniversary event and publication of this commemorative book.

Assoc. Prof. Dr. Uma Rani Sinniah

Dr Anita Anthonysamy

Ms. Suryanti Bustam

Mr. Albert Chan

Mr. Yap Sin

Palm Garden Hotel IOI Resort

Members of NSAM

Autograph

The background of the page is a vibrant yellow color, adorned with a repeating pattern of white floral and vine motifs. The design features stylized flowers with multiple petals, interspersed with delicate, swirling vines and clusters of small, pointed leaves. The overall aesthetic is elegant and decorative, typical of a vintage-style book cover or endpaper.