



THE BASICS OF HUMAN CIVILIZATION
**FOOD, AGRICULTURE
AND HUMANITY**
VOLUME - III : AGRICULTURE

Compiled by
Prem Nath



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Dr. Prem Nath Agricultural Science Foundation

The Basics of Human Civilization Food, Agriculture and Humanity

Volume-III: Agriculture

Compiled by
Dr. Prem Nath

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**Dr. Prem Nath Agricultural
Science Foundation (PNASF),
Bangalore, India**

**The Basics of Human Civilization
Food, Agriculture and Humanity
Volume-III: Agriculture**

**Dr. Prem Nath Agricultural Science Foundation (PNASF),
Bangalore - 560 094, India**

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FOREWORD

Since my birth, my journey of seventy five years of life, I have been associated with plants. Though I was an urban boy during my childhood, I knew plants and sometimes grew flowers in the large garden of my parents where I lived. When I grew I joined the Bihar Agricultural College, Sabour, from where I got my Bachelor's degree in Agriculture and further studied at the Kansas State University, USA, for post-graduate degrees. All along I remained associated with agriculture and horticulture.

My professional life in agriculture started during late 1962 when I started teaching and understanding research in horticulture and spent most of my time with the students and experiment stations at universities and institutions in India for more than a decade. This was my initial stage of professional training when I understood more about education and research and problems of both farmers and students. I discovered agriculture as a vast domain of biological sciences with its practical applications by the majority of population, *i.e.*, farmers mostly illiterate but intelligent inhabiting in rural areas. And these people, *i.e.*, farmers were kind hearted and produced food for both rural and urban people without any prejudices. But they faced tremendous difficulties with regard to technological know-how and its applications, availability of inputs and credits, post-harvest handling and marketing.

With half a century of my professional services and experiences abroad with the international organizations and interaction with countries of different regions, my observations in agriculture broadened and thoughts matured enabling me to understand both national and international problems, develop strategies and implement programmes and projects to mitigate problems faced by farmers and consumers by assisting the policy makers and development agencies. Some problems or issues were common to both developed and developing countries, some were common to developing countries and some were specific to nation. But by and large, most of the issues in production were faced by farmers, handling and marketing were faced by the traders and processing and consumption were faced by consumers.

At every stage both public and private sectors were necessarily involved in producing, distributing, marketing and consumption. In the end, if we examine closely, agriculture, food and human beings even though being dealt independently, are closely knit with unbreakable bondage among each other.

The P.N. Agricultural Science Foundation (PNASF) with the mission to promote agricultural education, research and development has taken up the mandate and the lead to disseminate the emerging agricultural knowledge among public and private sectors, farmers and consumers, professors and students, and people of both developing and developed countries. The PNASF and team firmly believe and propagate that Food, Agriculture and Humanity are the basics of human civilization

and it needs to be viewed that way by each and all in order to get our adequate food and survive.

On the whole, the attempts will be made to give adequate treatment to the three Basics of Human Civilization, namely, Food, Agriculture and Humanity, in 5 volumes, namely I) Present Scenario, II) Food, III) Agriculture, IV) Humanity and V) Expectations.

Volume-II of this series of publication covered widely on Food and this volume-III will highlight the emerging issues of Agriculture.

The present volume-III has the contribution of 28 articles by 37 authors/co-authors invited nation and world-wide, to each of whom the PNASF is very grateful as they have gladly agreed to our request to extend voluntary contribution in the interest of the subject we are dealing with. The authors have drawn their own views based on their own findings and referred other authors, and the views of scientists, professionals and other specialists. The chapters in this volume include Introduction, Agriculture in Human Life, Contribution of Agricultural Technology, Improving Agriculture, Recent Developments, Urban and Peri-urban Agriculture, Women and Agriculture and Challenges and Opportunities.

We are highly grateful to the Technical Team and the Editorial Board consisting of Dr. C.P.A. Iyer, Dr. O.P. Dutta, Dr. K.R.M. Swamy, Dr. B.S. Prabhakar and Mr. P.B. Gaddagimath who made unfailing efforts to prepare and edit the book. All of this was not possible without the heavy support of the secretarial team led by Mrs. Vanita V. and Mrs. Divya C. who worked hard at the details of this publication.

We cannot forget the due contribution of our Senior Scientific Councillors and other Professors and Scientists who have kindly participated in brain storming sessions and have reviewed and provided their valuable comments on each paper received. Those senior scientists are Dr. S. Bisalaiah, Dr. R. Dwarakinath, Dr. G. K. Veeresh, Dr. M. Mahadevappa, Dr. P.G. Chengappa, Prof. R.S. Deshpande, Dr. C.P.A. Iyer, Dr. Elumalai Kannan, Dr. K.G. Ahuja, USA and Dr. Sundari Velayudhan, USA and PNASF extends grateful thanks to them.

On behalf of the PNASF, I extend my thanks to Scientific Publishers, Jodhpur, who readily agreed to make this joint publication in this beautiful form and presentation. Lastly, on behalf of the Board of Trustees, I express my gratitude to PNASF Senior Scientific Councillors, Technical Advisory Committee members and those individuals whose names are not mentioned, for their moral support and valuable contribution in the preparation of this book.



September 30, 2013

Prem Nath
Chairman, PNASF

T.B. JAYACHANDRA
Minister for Law, Justice and
Human Rights, Parliamentary
Affairs & Legislation, Animal
Husbandry and
Tumkur District In-charge
No: LAN/HAH/2013



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30-9-2013.

Message:



I am happy to know that the P.N. Agricultural Science Foundation is bringing out "The Basic of Human Civilization-Food, Agriculture and Humanity, Volume-III: AGRICULTURE"- a book for educating the public on Agriculture and its relation to humanity and food. It is learnt that the book is aimed to benefit the policymakers, universities, development officers, farmers and all other stake holders. It is interesting to know that the FOUNDATION has already published two books on related subject earlier. I wish the present publication find a success in its publication as well as bringing rich information to the dignitaries aimed at and the general public as well.


(T.B. Jayachandra)

To,

Dr. Prem Nath,
Chairman, PNSAF,
Bangalore.

M.V. RAJASHEKARAN

FORMER, UNION MINISTER OF STATE
FOR PLANNING
GOVERNMENT OF INDIA
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October 13, 2013

MESSAGE



Agriculture is the primary source of food, income and important livelihood for many poor in the developing countries. Poor dietary quality and related deficiencies of vitamins and minerals, can be addressed through effective promotional and educational strategies. Efforts aimed at improving smallholder participation, decreasing transaction costs of marketing and improving access to technologies and productive assets, can also be translated into improvements in the nutritional status. Smallholder farmers can directly contribute to improve family feeding by producing nutrient-dense foods.

As population grow and pressures on natural resources and eco-system services increase, the farmers are being asked to produce more food to meet the demand. The production needs to be increased and at the same time, resources are becoming more scarce and natural disasters are more frequent. Climate change is creating risks for agriculture and affecting growing conditions. Worldwide this issue is being debated, discussed on various platforms by various organisations like the Food and Agriculture organisation, the World Health Organisation of the United Nations and various other national organisations, NGOs and private sectors. The International Conference on Nutrition in 1992, The World Food Summit in 1996 and in July 2002 have made various recommendations and have initiated action plans in this direction of combating malnutrition.

A wealth of information and recommendations are contained in this timely initiative by PNASF. The upcoming book "The Basics of Human Civilization - Food, Agriculture and Humanity: Volume - III Agriculture" contains papers written by leading authorities in the field of Food and Agriculture, will be useful in our joint effort to all concerned with providing every child, woman and man, an opportunity for a productive and healthy life.

Not only India, both the Developing and Developed countries all over the world, can derive inspiration from one of the outstanding International Horticulturist and Agriculturist Dr. Prem Nath. The present publication brought out by Dr. Prem Nath, is again a great asset to his visionary leadership. I send my warm greetings to Dr. Prem Nath for his leadership and to the lead authors and the Editors for their valuable contributions for the benefit of humankind.


(M.V. RAJASHEKARAN)

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MESSAGE

Vegetable and fruit crops are at the heart of agricultural enterprises aiming to generate higher incomes for producers and provide more nutritious, healthy diets for the general public. Although a significant proportion of the world's efforts are focused on improving staple crops to ensure sufficient calories to stave off hunger, enhancing the production and increasing the consumption of vegetables and fruit are equally critical to the health and well-being of billions across the globe.

Food security as defined by the Food and Agricultural Organization of the United Nations is achieved when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active, healthy life. This definition is an overarching framework for our vision to improve the livelihoods of the world's population, particularly through agriculture. This book, *The Basics of Human Civilization - Food, Agriculture and Humanity: Volume-III: Agriculture* provides guidance to move through the framework towards the proposed Sustainable Development Goals.

AVRDC - The World Vegetable Centre Strives to design and use technologies and innovations to develop production packages to produce traditional and global vegetables that are high yielding and nutritious, without contamination from chemicals or human-pathogenic microorganisms. The Center breeds vegetable lines resistant to biotic stresses, and adapted to or tolerant of abiotic stresses, to minimize production costs for smallholder farmers and maximize harvests. Ensuring year round availability of vegetables requires off-season production and diversification of production. Because of the highly perishable nature of vegetables, good postharvest management is essential to minimize physical losses and maintain nutritional value, as well as to maximize profits. Efficient vegetable value chains, and ensuring access to markets, are both very important and can help improve the quality of life for rural and urban populations throughout the world. Finally, agriculture cannot stand alone; it must go hand-in-hand with good health, clean water and good sanitation, better education and improved policies.

Jacqueline d'A Hughes
Deputy Director General – Research
AVRDC – The World Vegetable Center



AME Foundation

Dr. R. Dwarakinath
Chairman

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Message



One of our major concerns today is ensuring subsistence of the vast global population. This humanity, now put at 7.2 billion is estimated to be around 10.5 billion by 2050. Thinking professionals, policy makers and development administrators are searching for ways of ensuring food and nutritional security for this population. Surprisingly, with all the remarkable progress man has made with science and technology, no alternative means of human subsistence have been found so far. As such, agricultural development remains a critical need for the future also.

Globalization initiatives in India, after the green revolution, have made the agricultural situation very complex. Factors like shrinking land-man ratio, competing demand for land and water, ecological degradations, degenerating farming practices, general education devoid of farming matters, distorted parity prices and alienated farm youth are affecting farming. Farmer is no more the master of his farming. Policy goes by text book strategies, ignoring the ground realities. More disturbingly, the simple extension system, of the green revolution glory, has met a silent death. But, with all these negative factors, agricultural development must happen.

Agricultural development is very much unlike building a road or a reservoir. Here, farmer comes into the picture, with his central role. He cannot be overlooked. He has his own mind and capabilities. Moreover, all farmers are not similar in their development behavior. They differ vastly in their social traits, resource endowment and mindset. Innovators are a small group, while early adopters and slow adopters are large in number. But, development must take all of them forward, adopting different extension approaches. Bulk of them are in dry farming, and are resource poor and risk shy. Now, it is they who have to be mainstreamed into the development process. But, here is a big gap in the agricultural development planning today.

Pervasive agricultural development is a two-stage process. First, there must be conducive development conditions like demand, technology, remunerative prices and market facilities that make up the **necessary conditions** for development. Some small number of frontline farmers will readily avail them. But for the large segment of middle level farmers some hand holding is necessary. Capacity building, not merely technology delivery, is required here. Creating these enabling processes will be **sufficient conditions**. Today, policy focus is just on the first aspect. But, agricultural development in India today requires attention to both of them.

It is indeed a commendable effort on the part of PNASF to create scope for deliberation on this strategic issue of human welfare.

R. Dwarakinath

Bangalore.
26 September 2013



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18, September 2013



Message

Deprivation from balanced and nutritious food is a "national shame" - Mahatma Gandhi said, Sixty five per cent of women and children in India are anaemic leading to stunted growth and 50% of world's anaemics are in India - a factor for low rating in the galaxy of nations. Availability, access and absorption of food are the three end points of wellness triangle-each supplements the other leading to realization of United Nations Millennium Development Goal (MDG)- reducing population below poverty level by half by 2015. Availability of food is a function of productivity and in fact productivity of vegetables and fruits in India are one of the lowest in the world. Effects of

climate change are getting visible by early flowering in temperate fruits and vegetables leading to lower yields. Access to food is a function of purchasing power resulting from higher wages and non-farm avenues of employment. Area under cropping is getting reduced, irrigation water depleted and farm labour becoming costly. Protected cultivation of horticultural crops is gaining attention where yield per unit of space is quite high. Unscientific overuse of pesticides is leaving poisonous residues on edible fruits and vegetables. Organic horticulture making use of Good Agricultural Practices (GAP) is gaining attention and in fact labeled organic fruits and vegetables are receiving premium prices. In 1947 when India became independent, 85% of population was producer-farmers which has now reduced to 45% and expected to fall further due to migration to urban and periurban areas and horticulture getting mechanized and value addition is becoming mantras in food markets. Absorption of food was a matter of concern due to poor drinking water, unhygienic way of cooking-smoke cholas-. With availability of LPG, cooking has become housewife friendly. Nutrition education has become an essential component of primary and secondary education. Advances in medical sciences especially development of nutraceuticals and wholistic medicine have pushed up life span of Indians. The life span of a Keralite (73 years) is comparable to people in Netherland. Dr. Prem Nath Agricultural Science Foundation, Bangalore, the pioneering think tank in International Horticulture Research, Education and Extension organizes international conferences attended by science leaders from all over the world. The present book "The basics of Human Civilization - Food, Agriculture and Humanity Vol. III - Agriculture" is a treatise from such deliberations. Seven major areas are dealt in detail; Recent developments, Urban and peri-urban agriculture, challenges and opportunities and an introduction by Dr. Prem Nath. I congratulate the Foundation for the ever remembering academic service to academics. I also congratulate Scientific Publishers (India). Jodhpur for the excellent printing.


(K V Peter)



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Prof. P.G. Chengappa
National Professor, ICAR and Former Vice Chancellor,
UAS, Bangalore

Bangalore
01 October 2013

Message



I am delighted to know that Dr. P.N. Agricultural Science Foundation (PNASF), Bangalore is bringing out a publication entitled "**The Basic of Human Civilization - Food, Agriculture and Humanity: Volume - III: AGRICULTURE**". It is great effort and a good addition to existing literature wherein contributions of leading scientists on the emerging issues in agriculture are compiled.

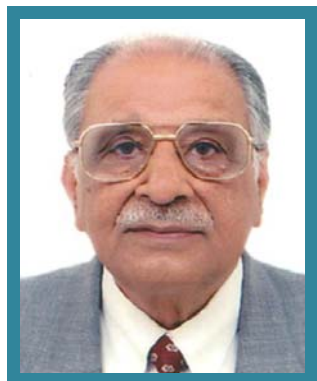
During last two decades the Indian agriculture is facing many challenges that *inter alia* mainly relate to slow growth of productivity, efficiency, equity and sustainability. The biggest challenge is to reverse the sharp decline in growth rate of agriculture sector experienced after mid 1990s though signs of recovery are witnessed during the last two years. These challenges have arisen due to many changes taking place in the global food and agricultural system which warrant adjusting to the changing demands of the market, reduce cost of production and become more competitive, while at the same time meet the increasing demands of consumers for more specific products and ways of producing them. Agriculture continues to be a promise of plenty but adequate policy support and strategic investments along with innovations, institutions and preparing the farmers to changing paradigm is necessary to achieve accelerated growth. There is a need to move towards Green Agriculture: conservation farming with the help of integrated pest management, integrated nutrient supply and integrated natural resource management for a sustained growth. Also, from Farming to Agribusiness: improving the supply chain, linking farmers to markets, reap the benefit of value addition etc.

The envisaged publication will be quite useful for students, teachers, researchers and practitioners involved in teaching, research, extension and developmental activities.

I wish great success to PNASF in bringing out the volume.

(P.G.CHENGAPPA)

About the Architect of the Book



Dr. Prem Nath obtained his PhD. Degree in Horticulture from the Kansas State University, Manhattan, USA during 1962. Since then, Dr. Nath has been serving in different national and international institutions, in different capacities and in different countries in food and agriculture sector for 50 years.

As *Professor and Senior Scientist*, he served at Indian Agricultural Research Institute, New Delhi; University of Udaipur, Rajasthan; Indian Institute of Horticultural Research, Hessarghatta, Karnataka and at Nigerian Institute of Horticulture Research, Ibadan, Nigeria during the period 1962-79.

As *FAO Research Team Leader* he served at Nigerian Institute for Horticultural Research, Nigeria; National Centre for Horticultural Research and Development Centre, Saudi Arabia; and National Agricultural Research Authority, Yemen Arab Republic during the years 1979-90.

During 1990-94, Dr. Nath served as *FAO Regional Team Leader* for Asia and Pacific, Middle East, North Africa and Europe Services, Agricultural Operations Division, FAO, Rome.

Dr. Prem Nath served as the *Special Adviser for Food Security* to Director General, FAO, Rome (1994-96). He had a *diplomatic position* as FAO Resident Representative, Myanmar during 1996-98.

As *International Senior Executive*, Dr. Prem Nath retired as the FAO Assistant Director General and Regional Representative at the FAO Regional Office for Asia and the Pacific, Bangkok, Thailand by the end of 1999.

Since 2000, Dr. Nath continues to serve as the Chairman of the Dr. P.N. Agricultural Science Foundation (PNASF), Bangalore. During November, 2002, Dr. Nath was nominated as Convener of the Vegetable Science International Network (VEGINET) by the General Assembly of the International Conference on Vegetables (ICV-2002) and during November, 2009 he was nominated as Chairperson of VEGINET by the International Conference on Horticulture (ICH-2009).

With the mission to promote agricultural education, research and development with focus on food and nutrition security, the PNASF was launched during the beginning of the new millennium (2000), and has made significant achievements under the Chairmanship of Dr. Prem Nath. He organized successfully two international conferences (International Conference on Vegetables ICV-2002; International Conference on Horticulture ICH-2009), FAO International Workshop on Urban and Peri-urban Agriculture for Asian countries (UPA-2005); SEAVEG/DOA/AVRDC/AARNET/VEGINET/HSSI Regional Symposium on High Value Vegetable in Southeast Asia (SEAVEG-2012) in Chiang-Mai, Thailand; FAO/PNASF Regional Workshop on Strengthening Urban and Peri-urban Agriculture towards Resilient Food system in Asia (UPAFSA-2013) at Bangkok, Thailand; and ISEC/PNSAF Seminar on Development Trends in Urban and Peri-urban Agriculture, August 2013, Bangalore. He also assisted other national and international institutions to organize symposia on Horticulture/Agriculture and actively participated in it.

During his research career, Dr. Nath developed a number of vegetable varieties which were widely adapted by growers and as professor he guided number of M. Sc. and PhD. students.

During his career, Dr. Nath led/assisted in establishing a number of research institutions in horticulture and agriculture in India, Nigeria, Saudi Arabia and Yemen Arab Republic. He developed and guided a number of national, regional and inter-regional field projects on food and agriculture to its success in different countries.

Dr. Nath is the author/co-author/editor of number of books, hundreds of research and technical papers, and thousand of research and technical reports. The books are Vegetables for the Tropical Region (ICAR), Germplasm Resources and Genetic Improvement of Vegetable Crops in the Tropics (NIHORT, Nigeria), Food Security and Vegetables-A Global Perspective (PNASF), Vegetable Crops-Improvement and Production (PNASF), Foods and Nutrition (PNASF, Studium Press) and Horticulture and Livelihood Security (PNASF and Scientific Publishers) and The Basics of Human Civilization-Food, Agriculture and Humanity-Volume-I-Present Scenario (PNASF and New India Publishing Agency).

The Basics of Human Civilization-Food, Agriculture and Humanity, is the brain-child of Dr. Prem Nath who laid out its blue-print in 5 volumes, and he is the author of number of papers in this volume.

About the Technical and Editorial Team

Dr. C.P.A. Iyer



Dr. C.P.A. Iyer obtained M.Sc and Ph.D. degrees in Horticulture from the Post Graduate School, I.A.R.I., New Delhi and did his post doctoral research at the Institute of Horticultural Plant Breeding, Wageningen, the Netherlands, in 1965-65.

Dr. Iyer served as Geneticist (Fruits) at the Indian Institute of Horticultural Research, Bangalore, in 1968 and later became the Head of the Division of Fruit Crops at the same Institute. He was the All India Project Coordinator for fruits and coordinated research project on fruits on an all India basis. Subsequently he was appointed Director, Central Institute of Horticulture, Lucknow, India.

Dr. Iyer was the International Horticulturist of FAO in a Mango Project of UNDP/FAO in Bangladesh. Subsequently, he was a FAO Consultant for many projects in Nigeria, Myanmar and Bangladesh.

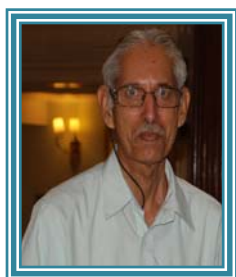
Dr. Iyer has traveled extensively world wide; has visited most of the important Horticultural Institutions in United States, the Netherlands; U.K., Germany, Belgium, France, Israel, Australia, Philippines and Thailand; was a Visiting Scientist at the University of Hawaii, Honolulu, USA.

Evolved many hybrid varieties in mango, guava and papaya. Dr. Iyer was invited by the CSIRO, Australia to take up the prestigious McMaster Fellowship to organize the Australian National Mango Breeding Project which he successfully carried out in 1994. Dr. Iyer has published more than 200 papers in scientific journals; has guided many students for their M. Sc and Ph.D. degrees. He is in the Board of Examiners in many Universities in India and abroad.

Dr. Iyer was a Keynote speaker and Chairman of many sessions during International Mango Symposium held in India, Australia, Israel and Brazil.

Dr. Iyer continues to take active part now in international consultancy, writing books, giving lectures and attending symposia.

Dr. O.P. Dutta



Dr. O.P. Dutta obtained his Ph.D degree in Horticulture from the University of Agricultural Sciences, Bangalore during 1981.

He is having thirty three years of research experience in breeding tropical vegetables for high yield, nutritional qualities and resistance to multiple stresses, twenty five years of experience in hybrid seed production, breeder seed production and production of tropical vegetables and sixteen years of experience in Research Management as Head, Division of Vegetable Crops at IIHR, Bangalore; planned, organized and monitored the activities of 8

Research Laboratories having 18 projects and 17 scientists in the Division of Vegetable Crops at IIHR, Bangalore.

During the past 33 years of service at IIHR, Bangalore, he has developed 22 improved varieties of tropical vegetables countering biotic and abiotic stress losses, battling malnutrition and low productivity. At Namdhari Seeds Pvt. Ltd., Bangalore he has developed commercially viable 54 varieties in tropical vegetables such as tomato (4) hot pepper (3) watermelon (20) melon (10) gourds (6) and beans (11) gaining 70% market share at the national level. The varieties developed by him and his colleagues are still popular in India and abroad. Dr. Dutta made significant achievements in developing a number of vegetable varieties, which are of high nutritive value, resistant to pest and diseases and heat tolerant varieties. He has guided researches on tropical vegetables for a number of M.Sc and Ph.D students.

He has established a sound vegetable seed production system in Bangladesh under the FAO Vegetable Seed Project (GCP/BGD/025 and 028/DEN) jointly funded by DANIDA and Belgium Government 1996-1999. He has provided technical guidance pertaining to vegetable production, vegetable seed production, vegetable breeding to SAARC countries, under SAVERNET programme.

Presently, Dr. Dutta is the Director, R & D division of M/s Namdhari Seeds Pvt. Limited, Bangalore involved in research and development activities pertaining to tropical vegetable improvement program has taken a momentum to move beyond its immediate vicinity to be of greater service to the South East Asia under the umbrella of SAVERNET /VEGINET program which includes SAARC countries as well as through FAO and UNDP collaborative and consultancy activities in China, DPR Korea, Thailand, Pakistan, Nepal and Bangladesh.

Dr. K.R.M Swamy



Dr. K.R.M. Swamy obtained his Master's degree in Agriculture with specialization in Horticulture, from GB Pant University of Agriculture and Technology, Pantnagar, in 1972 and Ph.D in Horticulture from University of Agricultural Sciences, Bangalore, in 1984. He was engaged in breeding of Cucurbitaceous crops at IIHR, Bangalore, from 1974 to 1986; in improvement and propagation of cashew, at Central Plantation Crops Research Institute, Regional Station, Vittal, Dakshina Kannada and National Research Centre for Cashew (NRCC), Puttur, Dakshina Kannada, from 1986 to 2003; and in improvement of Cucurbitaceous crops and okra, at IIHR, Bangalore, from 2003 to 2007. He worked in various capacities starting from Senior Research Assistant (Vegetable Breeding), Scientist-S (Hort.), Scientist-S1(Hort.), Senior Scientist (Hort.), Principal Scientist (Hort.), Principal Scientist & Head, Division of Vegetable Crops. Dr. Swamy retired as Principal Scientist (Horticulture) and Head, Division of Vegetable Crops, Indian Institute of Horticultural Research (IIHR), Bangalore.

He has contributed in the development and release of vegetable and cashew varieties. He has established the National Cashew Field Gene Bank; standardized the “Softwood Grafting Technique” for cashew and recommended for commercial multiplication of cashew varieties; established cashew nurseries at Kemminje Campus and Shantigodu Campus, of NRCC under the Revolving Fund Schemes sponsored by AP Cess Funds of ICAR, New Delhi and Directorate of Cocoa and Cashew Development, Kochi, respectively; and produced and distributed over 10 lakh grafts of different cashew varieties to farmers and development agencies. He has over 130 publications to his credit, which include research papers, book chapters/books, seminars/ symposia papers, popular articles, technical bulletins, extension folders and technical manuals. He has guided a student for her Ph.D (Horticulture) thesis work. He has monitored Vegetables Breeder seeds Project and DUS Test Project at IIHR, Bangalore.

Dr. B. S. Prabhakar



Dr. B. Prabhakar obtained Ph.D. in Agronomy, from I.I.T. Kharagpur 1978. He served as Agronomist, Indian Institute of Horticultural Research (IIHR) ICAR, Bangalore, 1978-2008; Scientist, Directorate of Oilseeds Research, Hyderabad, 1977-78; Research Assistant, AICRP Oilseeds, APAU, Hyderabad, 1970-71; Research Fellow, Rockefeller Foundation, AICRIP, Hyderabad, 1969-70; Principal Investigator, AP Cess Fund/ICAR Project on Technology Assessment and Refinement through Institute-Village linkage programme, 1995-1999; Principal Investigator, NATP/ICAR, Project on Technology Assessment and Refinement in Eastern

Dry Zone of Karnataka, 1999-2000; Principal Investigator, NATP/ICAR Project on Protected cultivation of vegetables and flowers in plains and hills, 2000-2004.

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