

National Symposium
on
**Quality Protein Maize for Human Nutritional Security and
Development of Poultry Sector in India**
and
Presentation of
The Third Dr. M.S. Swaminathan Award
for
Leadership in Agriculture

PROCEEDINGS & HIGHLIGHTS

May 3, 2008
NASC Complex, Pusa,
New Delhi -110 012



**Trust for Advancement of Agricultural Sciences (TAAS)
and Directorate of Maize Research (DMR)**
Pusa Campus, New Delhi-110 012, India



TRUST FOR ADVANCEMENT OF AGRICULTURAL SCIENCES (TAAS)

GOAL

An accelerated movement for harnessing agricultural sciences for the welfare of the people.

MISSION

To promote growth and advancement of agriculture through scientific interactions and partnerships.

OBJECTIVES

- Sponsoring seminars and special lectures on emerging issues and new developments in agricultural sciences in different regions of India.
- Promoting local lecture tours and visits to institutions within the country of the eminent scientists from international organizations abroad and of the academicians of foreign agricultural academies visiting India.
- Facilitating partnership with non-resident Indian agricultural scientists visiting India on sabbatical or short leave.
- Instituting awards for outstanding contributions to Indian agriculture by scientists of Indian origin abroad.
- Arranging special lectures of eminent agricultural scientists in various schools in different parts of the country.
- Providing support to agricultural scientists for participation in conferences/seminars, in India and abroad, for oral presentation of their research work.
- To act as think tank on key policy issues relating to agricultural research and development (ARD).

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National Symposium

on

Quality Protein Maize for Human Nutritional Security and Development of Poultry Sector in India

A National Symposium was organized jointly by TAAS and the Directorate of Maize Research, ICAR on “Quality Protein Maize for Human Nutritional Security and Development of Poultry Sector in India,” on 3 May, 2008 at NASC Complex, Pusa, New Delhi, in which 150 delegates participated. The program is given in Annexure-I and the list of participants in Annexure-II.

INAUGURAL SESSION:

The inaugural session of the Symposium was Chaired by Dr. M.S. Swaminathan, Chairman, MS Swaminathan Research Foundation and Co-chaired by Dr. Mangala Rai, Secretary DARE and Director General, ICAR.

Dr. R.S. Paroda, Chairman, TAAS welcomed the delegates. He stated that the Symposium was a timely step towards utilization of potential of maize, including the quality protein maize (QPM) for food and nutritional security. The first Indian Science Congress of this millennium, held at IARI and the Vision 2020 document released by the Prime Minister had laid stress on the need for achieving food, nutrition and environment security. Dr. Paroda further emphasized the need to create public awareness regarding importance of QPM not only for human nutrition but also for poultry and allied sectors as feed and fodder crop having great future in India.



Dr. R. S. Paroda welcoming the delegates

Dr. Mangala Rai, Secretary DARE and DG, ICAR in his opening remarks, mentioned that 2007-08 was an eventful year especially because of record maize production of 18.54 million tonnes. In USA, where single cross maize hybrids were first introduced, almost five decades ago, a consistent increase in yield has been observed. In India, maize production has doubled in last one decade. This had been the



Dr. Mangala Rai addressing the audience

result of a total technology package comprising use of single cross hybrids coupled with advanced crop management techniques. He further attributed the rise in prices of maize to its use for biofuel in USA. On the contrary, in India, it would be better to use biomass rather than grain for bio-fuel production, whereas we should continue using grain for human and poultry consumption. He further stated that our fertilizer policy should include an aggressive approach for the use of balanced fertilizers, while also addressing the deficiency of micronutrients which seemed to have occurred due to over-exploitation of soil and water resources. There are at least eight micro and secondary nutrients, which need to be supplemented, viz., Zinc, manganese, sulphur, molybdenum, boron, iron etc. This could best be done by developing and distributing fortified fertilizers containing a balanced mix of these deficient elements rather than the traditional Urea or DAP or potassic fertilizers alone. When soil is deficient in these minerals, the grain is also deficient and creates nutritional imbalance which is not good for the consumers.

Dr. MS Swaminathan, in his inaugural address, stressed that maize was a highly potential cereal crop in in India. He attributed the quantum jump in production from 15.1 million tonnes in



Dr. M.S. Swaminathan delivering Inaugural Speech

2006-07 to 19.31 million tonnes in 2007-08 mainly to use of a number of 'single cross hybrids', bulk of them from the public sector. According to him, the Indian scientists have brought about a mini-revolution in maize by developing good single cross hybrids, which are not only superior in yield but are also nutritionally rich, known as “Quality Protein Maize” or simply QPM. He specified that the high performance of QPM single cross hybrids warranted maize to be included in the National Food Security Mission, which currently covers only wheat, rice and pulses. The growth rate of maize in the country over the last one decade was an example to emulate for other major food crops. He concluded saying that we need to exploit the full potential of maize in India.

Dr. Sain Dass, Project Director, Maize gave the vote of thanks. He appreciated the research contribution of Dr. S.K. Vasal in the field of QPM. Dr. Sain Dass expressed his gratitude to Dr. Swaminathan, Dr. R.S. Paroda, Dr. Mangala Rai, Dr. P.L.Gautam, Prof. V.L. Chopra, Dr. S. Nagarajan, Dr. C.D. Mayee, Dr. A.K. Singh, Dr. S.A. Patil, Dr. Mruthyunjaya, Dr. J.S.P. Yadav and several Directors of ICAR Institutes, VCs of SAUs, representatives from the Ministry of Agriculture, USAID and many private organizations, especially, seed, poultry and maize industrial sectors for their active participation in the symposium.

Session-I: Enhancing Productivity of Quality Protein Maize

Dr. S. K. Vasal, former distinguished scientist, CIMMYT made a presentation on global efforts for improving quality protein maize (QPM). He said that improving nutritional quality of agricultural crops was indeed a noble goal. Such goals, in general, are difficult and the success stories are relatively few. Sharing his experience of QPM development, he stated that achieving good results required long term investments, patience, deep commitment and utmost perseverance in pursuing the set objectives.

Dr. Vasal emphasized that QPM was a great scientific breakthrough and a real success story for which maize scientists should feel proud of. Past four years have witnessed lots of QPM excitement. Maize program in India had been involved in QPM research ever since the discovery of high lysine maize mutants. Initial emphasis was on soft opaques that led to the release of Shakti, Ratna and Protina in 1971. He further highlighted that marker assisted selection had also been deployed to convert some normal lines to QPM and a QPM version of Vivek 9 had also been developed. Also the Home Science group had been active in developing a number of value added products from QPM. Also various avenues were being explored for successful seed production of QPM hybrids.

Dr. Vasal cautioned that in order to take full advantage of QPM technology, much greater emphasis was needed to incorporate important traits which did not receive attention in the past. He suggested following points for future consideration:

- there is a definite need for more diverse QPM germplasm at inbred level, especially in early maturity category.
- specific QPM donors for various diseases and abiotic stresses are to be documented.
- better understanding of modifying gene complex and regions where modifying alleles are present.
- generating information to establish as to how the modification is affected at the biochemical and molecular level. There is already indication that modified o2 kernels contain increased amounts of gamma-zein protein.
- research on genetic isolation mechanisms to prevent contamination of QPM by normal pollen should be pursued.
- a strong resource inbred base germplasm should be built by deploying more than one strategy, including inbreeding in basic QPM populations, F₂ pedigree populations and in some instances backcross populations and in limited cases converting normal to QPM.
- well equipped biochemical laboratories should be established to provide rapid and reliable analyses.
- practical strategies should be worked out to speed up conversion process alongwith good recovery of kernel modification.
- breeding procedures and strategies need to be deployed to form hybrid-oriented populations for inbred extraction in homozygous genetic backgrounds.
- more research on storage grain pests is needed as it relates to kernel hardness and ability to withstand insect pressure.
- use of biotechnological tools to facilitate hybrid development should be taken up more aggressively.
- conscious efforts are needed to identify more testers as part of on-going QPM research activities.
- more training programs are needed to attract talented researchers to carry out QPM research.
- properly designed nutritional and feeding trials should be conducted for both human development and poultry production.
- research on value addition in processed food and traditional preparations would help in achieving nutritional security

Dr. N.N. Singh, Vice Chancellor, Birsa Agricultural University, Ranchi presented the strategies for increasing production of quality protein maize in India. Dr. Singh highlighted that wide gap existed between potential and actual yields of maize at the farm level. These were associated with several factors including genotypes, biotic and abiotic stresses and management related aspects.

He further stressed that low productivity was the result of its cultivation mainly in Kharif season coupled with low input use, non-adoption of modern techniques, pre-dominance of short duration local varieties and above all the uncertainty of weather conditions, due to which maize was still considered a high risk crop.

Dr. Singh further emphasized that in view of these constraints, QPM could play an important role in meeting the food and nutritional requirements of the poor people in India. He stressed upon popularization of high yielding QPM hybrids. Besides, he suggested that non-conventional areas and seasons should be explored for both QPM cultivation and seed production. QPM village concept should be encouraged, and to ensure profitability, fair marketing and pricing of QPM produce need to be ensured.

Dr. Dev Raj Arya, Manager, Regulatory Affairs, Monsanto India Limited, made a presentation on, “The Role of Private Sector in Ensuring Availability of Quality Maize Hybrid Seed in India”. According to Dr. Arya, despite availability of 200 hybrids in the country and its 5th rank in terms of area, the productivity was dismally low, contributing only 2.8% to world maize production. Seed being the most crucial input in enhancing maize productivity, he considered quality seed production to be a major challenge, Dr. Arya elaborated the need for a strong team work, hi-tech post-harvest technologies for quality management etc. He further stated that private sector was playing an important role in identifying potential markets for quality seed supply, transfer of new technologies, for imparting training and education to farmers, maintaining purity of germplasm and encouraging public-private partnerships.

He also stressed the need for government support in undertaking community based production to avoid isolations, promoting hi-tech agri based industries such as subsidized drier units; support for adoption of biotechnology products including GMOs, devising and providing uniform standards and strict implementation, agricultural loans to seed producers.

Dr. S.V. Rama Rao of the Project Directorate on Poultry, made a presentation on, “The Role of Maize in Poultry Sector in India”. He highlighted that poultry growth was very fast in the country during the period 2002-2007. It showed an increase of 44, 68, 46, 87 % in broiler, layer, broiler breeder and layer breeder production, respectively. This has resulted in increased demand for poultry feed. Both high energy (55-65 %) and protein (20.35 %) requirements in the feed make it rather very expensive. Maize as feed is a preferred choice for energy due to high ME and

better digestibility and palatability (3.5 % fat and 72 % NEE). Dr. Rao further emphasized that quality protein maize, being rich in lysine and tryptophan, is still a better source of poultry feed. According to him, the systematic research on QPM as poultry feed was needed.

Session-II: Panel discussion on Prospects of Maize Production for Nutritional Security

This Session was chaired by Dr. MS Swaminathan and co-chaired by Dr. BR Barwale, Chairman, MAHYCO.

Dr. Rajiv Tandon, Divisional Chief, Maternal, Child and Urban Health, USAID delivered the key note lecture on “Roadmap Towards Nutritional Security in India”. He expressed his concern about the problem of mal-nutrition in India and suggested that for addressing this problem, current approaches needed refinement and for that we need new ideas, increased collaboration and better implementation strategies. Highlighting the USAID initiative on National Nutrition Conclave for a nutrition secure India, he mentioned that they have brought out some key recommendations in the Chennai declaration, which need to be pursued.

Dr. Tandon stressed upon the need for a coalition for Sustainable Nutritional Security in India with a mission to advocate policy and program decisions that would improve nutritional security. This coalition should include policy makers, bureaucrats, technical representatives, CSOs, Academia, Corporate Sector, Media, and Bilateral and Multilateral agencies.

Dr. Tandon informed that the task force on comprehensive nutritional strategy for children under two years of age was set up to strengthen existing policies, programs and systems at all levels.

Dr. B.R. Barwale, Chairman, MAHYCO emphasized the enormous potential offered by the maize hybrids in meeting the challenges of both food and nutritional security. He also mentioned that public-private partnership can play an important role. He assured that Mahyco will do its best to promote QPM hybrid seed production so that maize productivity is enhanced in our country. According to him, maize offers great potential both for internal consumption as well as export in the region. We need to harness this opportunity in our national interest.

Dr. P.L. Gautam, DDG (CS) spoke as a panelist about the potential of maize crop. In India, maize has registered highest growth rate in terms of area, production and productivity. Also maize is mostly a rainfed crop and grown under resource poor conditions. It has the potential to serve as one of the important sources of food and nutritional security. He appreciated the contributions of Dr. Vasal for improving QPM and wanted to have greater thrust on their seed production.

Dr. S.A. Patil, Director, IARI referred to the successful examples of UAS Dharwad and IARI in the areas of seed production and commercialization of indigenous technologies through public-private partnership. According to him, public-private partnership was essential for faster dissemination of QPM hybrids in India.

Dr. M. Ramasami of Rasi Seeds spoke on “Prospects of Maize Production for Nutritional Security Globally”. He stated that nearly 200 million children, younger than five years, were undernourished for protein, which was a major national challenge. In this context, maize could play an important role worldwide. According to him, endowed with high content of carbohydrates, fats, proteins, some of the important vitamins and minerals, maize had acquired a reputation of being poor man's nutritious food. Dr. Ramasami highlighted the following issues confronting the seed Industry: development of QPM donor stocks and QPM germplasm that would adapt to the varying production environments both in the tropical and sub-tropical areas, and sharing them freely with the private sector for rapid exploitation.

- developing QPM hybrids with desirable quality parameters, such as marked yield advantage compared to the best performing private / public sector maize hybrids currently available in the field, so as to have better acceptability among the farmers.
- promoting studies on “Nutritional Genomics” which has the potential to further enhance the nutritional value of QPM through elucidation and effective manipulation of molecular mechanisms and bio-chemical pathways controlling the kernel quality.
- exploring the possibilities of bringing more area under irrigation, since, we are getting on an average 2 tonnes per hectare productivity, whereas the productivity in rainfed areas is only 0.7 to 0.8 tons/ha.
- developing innovative weed management strategy in maize, since, crop losses due to weeds is estimated to be higher.
- familiarizing farmers with improved maize technologies through effective farmer-scientist extension linkages (both public and private sector).

Dr. Sain Dass, Project Director, Directorate of Maize Research stated that it was an established fact that among cereals, maize had the highest yield potential. According to Dr. N.E. Borlaug, the last three decades saw the revolution in rice and wheat, whereas the next few decades would be known as the era of maize.

He stated that the recent rise in productivity of maize was the result of single cross hybrid cultivation in India. According to him, the investment on hybrid research during last decade had contributed more than Rs.100 billion to the agricultural GDP.

Discovery of opaque-2 (o2) and floury-2 (F2) mutant opened enormous possibilities of improvement in protein quality of maize. This eventually led to the development of quality protein maize (QPM). For this pioneering work Dr. Vasal and his co-worker were awarded the World Food Prize in the year 2000.

Dr. Sain Dass further stated that it was desirable to replace the existing composites and even some of hybrids with new QPM hybrids. As regards the agronomic adaptability of QPM hybrids across a range of agro-climatic conditions in India is concerned, it has amply been demonstrated that QPM is at par in the terms of cultivation, grain yield potential, tolerance to biotic and abiotic stresses with other maize hybrids under cultivation. Special mention was made of good work done on single cross QPM hybrids at HAU, RAU, and VPKAS, Almora.

Dr. Usha Singh, Human Nutrition Specialist at Rajendra Agricultural University, Pusa, Bihar made a presentation on “Quality Protein Maize Products towards Sustainable Development of Bihar”. Highlighting the changing food consumption pattern in Bihar, she mentioned that there were no processing plants except small animal feed industry due to which majority of maize produced in the state was being sent to other states for processing and value addition. Highlighting maize processing, she mentioned that it was usually processed by three major processes viz. dry milling, wet milling and alkali processing and the end products varied considerably and served as raw material for manufacture of processed food. In this direction, she explained the steps involved in processing of maize and explained the role played by RUA in the development of nutritious food products from QPM which were of low cost, targeted mainly to serve the poor people.

She further informed that M/s Katyayani Makka Udyog, Khagaria had already started production of some of QPM products like roasted flour, dalia, suji, sattu, atta, besan, vermicelli and sewian on a large scale. This firm has provided facilities to the farmers to purchase inputs needed for production of QPM maize in Khagaria district and assured the procurement of their produce (QPM) at an incentive price.

Dr. Asha Kwatra, Professor, Human Nutrition, Haryana Agricultural University, Hisar shared her views on “Value Addition of QPM and Baby Corn for Nutritional Security”. She emphasized that value addition of QPM and baby corn would help in creating quality products. Dr Kwatra added that people consuming QPM were healthier and at lower risk of malnutrition disorders such as Marasmus and Kwashiorkor. Besides this, all products prepared from QPM were organoleptically acceptable; QPM products were at par with those from normal maize and had the shelf-life of 3 months.

Dr. M.D. Gupta, of Sehgal Foundation apprised about the activities of the Foundation related to maize research and development in India. He stated that the major emphasis was on the

development of early maturing, stress tolerant germplasm of QPM. The large scale hybrid seed production (11 metric tonnes) and the distribution of HQPM1 in 2005 for demonstration on farmers' fields in 2005 helped in generating both employment and farm income, besides adding value to the product quality. According to Dr. Gupta, multiplication of QPM germplasm from CIMMYT, DMR, Kasetsart University, Bangkok, Department of Agriculture, Thailand and North Carolina State University had been undertaken, beside capacity building by the Sehgal Foundation.

Recommendations:

The discussions were mainly focused on the vast opportunities offered by QPM hybrids in promoting nutritional security to human beings as well as the poultry industry. The following important recommendations had emerged:

1. Maize should be included in the National Food Security Mission, in addition to the existing thrust on wheat, rice and pulses. It is because of the potential of maize not only in meeting the food and nutritional security, but also the influence it will have on the growth of allied sectors viz. poultry and livestock production.
2. There is an urgent need to bring about 80 - 90% area under single cross hybrids, which at present is rather low. Since QPM hybrids are basically bred by the public sector institutions, and the public seed agencies are unable to meet the demand for seeds of these hybrids, a Public-Private Partnership model needs to be promoted to achieve the desired area coverage.
3. Maize crop has a wide range of adaptability, beside great potential for adaptation to climatic change. In addition, maize has also demonstrated a very high growth rate (about 4.5% p.a.) during the last one decade. With emerging problems of water scarcity, rising temperature etc., maize seemed to have good potential both for vertical and horizontal expansion. There is need to have diversification of rice-rice and rice-wheat cropping systems in the peninsular and eastern India, respectively.
4. Currently, utilization of maize as food crop is only 25%, whereas its use for animal and poultry feed is almost 60%. Hence, increasing area under QPM could lead to improved human nutrition and availability of low-cost high quality feed for which internal demand is increasing at much faster pace. This would demand use of variable maize products and change in the food habit through popularization of various maize recipes. Also, QPM could be a cheaper source of protein for the children and can thus be used effectively as mid-day meal for which Bihar State has already taken good lead. It also has relevance for inclusion in the Rural Employment Guarantee Scheme.

5. Maize has also demonstrated its adaptation ability in areas where the rabi temperatures rise suddenly rather than gradually, as being the case in the eastern states including West Bengal. 'Single cross hybrids' of maize can play a significant role in these areas.
6. Utilizing maize as nutritious animal feed would demand faster growth of bio-and -organic fertilizers like poultry droppings. This will help in improving the health status of our soils.
7. Poultry sector has enormous growth potential (about 15% p.a.) as compared to the present level of 11 - 12%. Poultry industry would raise further the demand for QPM. Besides, maize has tremendous export potential in the region, especially South East Asia.
8. Maize being the best quality feed for poultry, it is necessary to provide incentives to those farmers who produce QPM. Government could consider giving a premium price to the QPM growers so as to accelerate its production in the country. In this context, State Department of Agriculture, Govt. of West Bengal has already taken major initiatives for seed production of the QPM hybrids through public-private partnership.
9. The fast growth of maize wet as well as dry processing industry demands that it is included in the 'identified' schedule crops of the food processing industry. This would ensure stable prices for maize processed products in the market and would benefit both the producers and consumers.
10. More thrust is needed now both on research and development of QPM maize, for which additional resources need to be allocated as a matter of priority.



A view of the participants

Dr. M.S. Swaminathan Award for Leadership in Agriculture

The Trust for Advancement of Agricultural Sciences (TAAS) has instituted an Award in honour of our renowned agricultural scientist, Dr. M.S. Swaminathan, whose pioneering contributions to Indian Agriculture enabled us to achieve Green Revolution in late 1960s, leading to food self-sufficiency and enormous boost to our national pride.



Dr. R.S. Paroda giving introductory remarks.

The Award consists of a citation scroll and a golden memento and is given annually to a distinguished scientist for providing outstanding leadership in agriculture, as demonstrated by his/her significant contributions towards overall agricultural growth in the developing world.

First Award

The First Award was presented to Dr. Norman E Borlaug, by the Hon'ble President of India, Dr. A.P.J. Abdul Kalam on March 15, 2005 at Vigyan Bhawan, New Delhi. Dr. Borlaug is a world renowned leader in agriculture, whose contributions have changed the face of agriculture in the developing world. He is the only agricultural scientist who was awarded the Nobel Peace Prize in 1970 for his services to humankind. The Highlights of the First Award Ceremony are available on TAAS website (www.taas.in).

Second Award

The Second Awardee was another distinguished agricultural scientist, Dr. Gurdev S. Khush, an eminent rice-breeder and the World Food Laureate. The Award was presented to him by the Hon'ble Prime Minister Dr. Manmohan Singh on October 9, 2006 at Vigyan Bhawan, New Delhi, during the Inaugural Session of the International Rice Congress attended by over 1300 delegates from all over the world. Rice varieties evolved by Dr. Khush today occupy maximum area in Asia

and have resulted in increased rice production. Dr. Khush is currently the Adjunct Professor at the University of California, Davis, USA. The Highlights of the Second Award Ceremony are available on TAAS website (www.taas.in).

Third Award

The Third Award was presented by Prof. M.G. K. Menon to Dr. Surinder Kumar Vasal, a leading scientist who worked at CIMMYT in the field of breeding maize for improved nutritional quality, on 3rd May, 2008. He is also a recipient of the World Food Prize for the year 2000.



Dr. M.G.K. Menon presenting the award to Dr. S. K. Vasal

The lifelong work on QPM by Dr. Vasal has shifted the direction of maize breeding and evoked tremendous interest in the private sector because of the vast potentialities offered by QPM in the development of protein rich food products for human nutrition and as feed and fodder for poultry and livestock sector.

On this occasion, Dr. R.S. Paroda, Chairman, TAAS welcomed the guests and dignitaries including Mrs. and Dr. M.S. Swaminathan, Dr. Mangala Rai, Dr. Joseph Hulse, Dr. B.R. Barwale and many others in an impressive audience of around 150 persons. Dr. Vasal in his response spoke about his work and its relevance to Indian maize program. Prof. Menon delivered the Chairman's address and lauded the work of Indian agricultural scientists in making our country food self-sufficient.

The Award ceremony comprised reading of the citation, followed by presentation of the Award Trophy and the citation scroll.



Dr. S.K. Vasal addressing the audience



TRUST FOR ADVANCEMENT OF AGRICULTURAL SCIENCES
(TAAS)
IARI, New Delhi

DR. M.S. SWAMINATHAN AWARD

for

LEADERSHIP IN AGRICULTURE

Presented to

Dr. Surinder K. Vasal

Citation

Dr. Surinder K. Vasal is an accomplished Plant Breeder and Genetiist whose on maize led to the development of high quality protein maize (QPM). He, alongwith his colleague, Dr. Evangelina Villegas shared the 2000 World Food Prize for their valuable contributions.

Dr. Vasal was born in 1938 in Amritsar, India. He took Ph.D, in Genetics and Plant Breeding from the Indian Agricultural Research Institute, New Delhi. Dr. Vasal began his career as a researcher in the Department of Agriculture. Himachal Pradesh and later worked as Maize Breeder at the Himachal Agriculture College.

In 1967, Dr. Vasal took up an assignment with the Rockefeller Foundation in Thailand to conduct research on maize in close collaboration with the National Corn and Sorghum Research Center of Kasetsart University. From there, he moved to the International Maize and Wheat Improvement Center (CIMMYT), Mexico in 1970 and supervised the high lysine maize program. He also held positions of Germplasm Coordinator, Head of Maize Research and Coordinator of Asian Regional Maize Programme. Dr. Vasal was honored to be the first distinguished scientist at CIMMYT.

With the development of Quality Protein Maize, the amino acid content in the diets of several millions has improved since 1990s. Quality Protein Maize Germplasm, developed by Dr. Vasal, is now being used worldwide for developing QPM cultivars. Dr. Vasal has developed important concepts and methodologies and released a large number of promising inbred lined for use by the maize researchers worldwide.

In 1967, Dr. Vasal took up a new role, leading CIMMYTs Asian Regional Maize Program in Thailand. He strengthened regional hybrid research activities and coordinated the Tropical Asian Maize Network (TAMNET) He specifically played an important role in human resource development by training hundreds of young scientists from the developing countries.

Dr. Vasal is a member of the American Society of Agronomy, the Crop Science Society of America (whose Presidential Award he won in 2000), and India's National Academy of Agricultural Sciences. He has received the 1996 International Service in Crop Science Award and the 1999 International Agronomy Award, in addition to accolades from the Governments/Institutions in Honduras, Peru, Panama, India, Vietnam, Bangladesh and a few other countries. He is also the recipient of Chinese Friendship Awards of 2001.

The Trust for Advancement of Agricultural Sciences takes pride in honouring Dr. Vasal with the Third Dr. M.S. Swaminathan Award for Leadership in Agriculture on this day the 3rd May, 2008

TRUSTEES OF TAAS
Avenue II, IARI,
New Delhi-110012

Program

Annexure- I

- 09:30-10:00 : Registration**
Inaugural Session
Chairman : Dr. M. S. Swaminathan,
Chairman, M.S. Swaminathan Research Foundation
Co-Chairman: Dr. Mangala Rai, Secretary DARE & Director General, ICAR
- 10:00-10:10 : Welcome Address** - Dr. R.S. Paroda
10:10-10:20 : Opening Remarks - Dr. Mangala Rai
10:20-10:50 : Inaugural Address - Dr. M. S. Swaminathan
10:50-11:00 : Vote of Thanks - Dr. Sain Dass
11:00-11:30 : Coffee/Tea Break
- 11:30-13:30 : Session on Enhancing Productivity of Quality Protein Maize**
Chairman: Dr. P. L. Gautam, DDG (CS), ICAR
Co-Chairman: Dr. S. A. Patil, Director, IARI
- 11:30-12:00 : Global Efforts on Improving Quality Protein Maize - Dr. S. K. Vasal**
12:00-12:20 : Strategy for Increasing Production of Quality Maize in India - Dr. N. N. Singh
12:20-12:40 : Role of Private Sector in Producing Quality Maize Hybrid Seeds -
Dr. Dev Raj Arya
- 12:40-13:00 : Role of Maize in the Poultry production - Dr.S.V. Rama Rao**
13:00-13:30 : General Discussion and Concluding Remarks- Dr. P.L. Gautam/ Dr. S.A. Patil
13:30-14:30 : Lunch
- 14:30-16:30 : Panel discussion on "Prospects of Maize Production for Nutritional Security"**
Chairman: Dr. M. S. Swaminathan,
Chairman, M. S. Swaminathan Research Foundation
Co-Chairman: Dr. B.R. Barwale, Chairman, MAHYCO
Key Note Lecture on "Roadmap Towards Nutritional Security in India"
Dr. Rajiv Tandon, Divisional Chief, Maternal, Child & Urban Health, USAID
Panelists : Dr. B.R. Barwale, Dr. P.L. Gautam, Dr. Ramasami, Dr. S.A. Patil,
Dr. M.D. Gupta, Dr. Sain Dass, Dr. Asha Kwatra, Dr Usha Singh,
Dr. S.K. Singh (5-7 min. each)
General Discussion and Concluding Remarks - Dr. M.S. Swaminathan/
Dr. B.R. Barwale
- 16:30-17:00 : Coffee/Tea Break**
- 17:00-18:30 : Dr. M. S. Swaminathan Award Function**
Chief Guest: Prof. M.G. K. Menon
Guest of Honor: Dr. M.S. Swaminathan
Awardee: Dr. S.K. Vasal
- 19:00 : Reception Dinner**

List of Participants

Annexure II

Dr. M. S. Swaminathan

Chairman, MS Swaminathan Research Foundation, Chennai (TN)

Dr. Mangala Rai

Secretary DARE & Director General, ICAR, Krishi Bhawan, New Delhi

Dr. S. K. Vasal

Former Distinguished Maize Scientist, CIMMYT, Mexico

Dr. P. L. Gautam

DDG (CS), ICAR, Krishi Bhawan, New Delhi

Dr. S. A. Patil

Director, IARI, Pusa New Delhi-12

Dr. J. S. Samra

Chairman, National Rainfed Area Authority, NASC Complex, Pusa New Delhi-12

Dr. Mrithyunjaya

National Director, NAIP, KAB-II, Pusa New Delhi-12

Dr. Sant S Virmani

President Virmani Consulting Int'l, 4425, Partney Court Plano, Tx, USA

Dr. K. S. Rana

Principal Scientist, Division of Agronomy, IARI, Pusa New Delhi-12

Dr. Dayanand

Ex-Principal Scientist (Agronomy), Directorate of Maize Research, IARI Campus, New Delhi-12

Dr. V. L. Chopra

Member, Planning Commission, Govt. of India, Yojana Bhawan, New Delhi

Dr. R. S. Paroda

Chairman, Trust for Advancement of Agricultural Sciences (TAAS), Pusa New Delhi-12

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Acronyms

DARE	Department of Agricultural Research and Education
ICAR	Indian Council of Agricultural Research
QPM	Quality Protein Maize
IARI	Indian Agricultural Research Institute
DG	Director General
DAP	Diammonium phosphate
CIMMYT	International Centre for Maize Breeding, Mexico
SAU	State Agricultural University
VC	Vice Chancellor
USAID	United States Agency for International Development
O2	Opaque-2
NEE	Net Energy Equivalent
ME	Metabolizable Energy
MAHYCO	Maharashtra Hybrid Seed Company
CSOs	Chief Scientific Officers
DDG (CS)	Deputy Director General (Crop Science)
UAS	University of Agricultural Sciences (Dharwad)
RAU	Rajendra Agricultural University
DMR	Directorate of Maize Research
TAAS	Trust for Advancement of Agricultural Sciences



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1. Regulatory Measures for Utilizing Biotechnological Developments in Different Countries - First Foundation Day Lecture, delivered by Dr. Manju Sharma, Secretary, Department of Biotechnology, Government of India, October 17, 2003.
2. Enabling Regulatory Mechanisms for Release of Transgenic Crops - Brainstorming Session, October 18, 2003.
3. Challenges in Developing Nutritionally Enhanced Stress Tolerant Germplasm- Special Lecture, delivered by Dr. S.K. Vasal, Distinguished Scientist, CIMMYT, Mexico, January 15, 2004.
4. Role of Science and Society Towards Plant Genetic Resources Management -Emerging Issues - Brainstorming Session, January 7 - 8, 2005, Highlights and Recommendations.
5. Role of Information Communication Technology in Taking Scientific Knowledge/Technologies to the End Users - National Workshop, January 10 - 11, 2005, Recommendations.
6. Public-Private Partnership in Agricultural Biotechnology - Second Foundation Day Lecture, delivered by Dr. Gurdev S. Khush, Adjunct Professor, University of California, Davis, USA, October 17, 2005.
7. First Dr. M.S. Swaminathan Award for Leadership in Agriculture, March 15, 2005 - Highlights.
8. Farmer-Led Innovations for Increased Productivity, Value Addition and Income Generation - Brainstorming Session, October 17, 2005 - Highlights & Recommendations.
9. Strategy for Increasing Productivity Growth Rate in Agriculture" - Strategy Paper by Dr. R.S. Paroda, August, 2006.
10. The Second Dr. M.S. Swaminathan Award for Leadership in Agriculture, October 9, 2006 - A brief report.
11. Farmer-Led Innovations Towards Plant Variety Improvement, Conservation and Protecting Farmers' Rights", November 12 - 13, 2006, National Dialogue Highlights & Recommendations.
12. Brainstorming Session on "Models of Public-Private Partnership in Agricultural Biotechnology ", April 7, 2007 - Highlights & Recommendations.
13. Symposium on "Farmer-Led Innovations for Sustainable Agriculture", December 14-15, 2007 - BAU, Ranchi Proceedings.



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