Fifteenth

T. A. PAI MEMORIAL LECTURE

Fostering New Symbiotic Social Contract for a Hunger-Free India

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Fostering New Symbiotic Social Contract for a Hunger-Free India

I. Sri T. A. Pai and a Hunger-Free India

It is a privilege to have been invited to deliver a lecture in honour of the late Sri T. A. Pai, one of the greatest Indians of this century. Sri T. A. Pai was an achiever in whatever field he chose to work on, whether it was business, industry, public administration or philanthropy. He had a clear vision of goals and could articulate with great clarity the methods of achieving them. He took pleasure in perfection and he felt joy in giving. He was a strong advocate of a new social contract between business and industry and resource poor rural and urban families. Above all, he was convinced that hunger was unnecessary and could be eliminated from the country, if we have the requisite blend of political will, professional skill and people's participation.

Prior to our independence, Gandhiji speaking at Noakhali stressed that "to the hungry, God is bread". He felt that the first and foremost duty of independent India is to ensure that this God resides in every hut and house of the country. This was also the desire of the late Sri T. A. Pai. Hence, I would like to deal in this lecture on how we can achieve this goal within the next 10 years, if there is the political will to achieve it.

II. Malthus Re-visited: Children for Happiness

1998 marks the bicentenary of Thomas Malthus's essay on population. Malthus has proved to be correct with reference to his prediction of an exponential growth in population. Food production has however grown at a pace faster than expected by Malthus, thanks to rapid advances in technology supported by appropriate public policies. It would be useful to revisit Malthus and examine where we stand today.

The problem of a rapid growth in population is now mainly confined to developing countries, a term which also denotes "poverty-stricken" countries. For example, the Japanese are concerned about the possibility of there being no Japanese left on the earth in less than two centuries, if the present rate of decline in the Japanese population continues !

The following two major issues of contemporary development have to be addressed if we are to remain within the population supporting capacity of our planet.

- Unsustainable life styles on the part of over a billion.
- Severe poverty and destitution on the part of another billion.

The economic inequity prevailing among members of the human family is growing. According to UNDP's Human Development Report of 1996, "the assets of the World's 358 billionaires exceed the combined annual incomes of countries with 45% of the World's people". Thus, as we approach a new millenium, we can be proud that skin-colour based apartheid has ended. However, it is being replaced at a fast pace by economic and technological apartheid.

A desirable pathway to achieve population stabilisation was indicated by the French Mathematician Marquis de Condorcet, who wrote in 1795, "Population growth can be limited if people have a duty towards those who are not yet born, that duty is not to give them existence but happiness". In my view such a change in mind set is fundamental to achieving population stabilisation in our country.

How can we foster a "Children for Happiness" movement? It is obvious that this involves having children by choice. Unless such a movement gains strength, the reasons why we should reduce human numbers will have no impact in the real world. Our country has now the highest annual net increase in population in the world, but there are states like Kerala where population growth is already negative (TFR of 1.7). There are other States like Uttar Pradesh where the TFR exceeds 3.5. It is now recognised that such a wide variation within the country in achieving a demographic transition to low birth and death rates is because of factors like low infant and maternal mortality rates, high female literacy, greater gender equity and effective family planning services. Gender equity, literacy and use-preferred family planning services are vital for success in achieving a balance between human numbers and the carrying capacity of our life support systems.

Enlightened public policies hold the key to creating the substrate conditions essential for both the stabilisation and gradual reduction of population. China is well known for its determined public policies in the area of population stabilisation. Some of China's approaches are not easily replicable elsewhere. But everywhere we can launch a movement for eliminating hunger and deprivation and promoting the birth of children by choice and for happiness. In this context, I would like to deal with the question of population and food supply in some detail.

Thomas Malthus in his essay *The Principle of Population as it Affects the Future Improvement of Society* published in 1798, warned that "the period when the number of men surpass their means of subsistence has long since arrived". Two centuries ago when Malthus wrote his essay, the global population was less than a billion. Now the population exceeds 6 billion.

In spite of a 6-fold increase in human population since 1798, there is enough food on the market today for all who have the requisite purchasing power. The average life span of human beings has gone up considerably all over the world. While the death rates are dropping rapidly, birth rates have not shown a commensurate decline in many developing countries. Consequently, the human population will increase by a billion during the next 11 - 12 years. In addition to population increase, the following factors raise the question, "Will Malthusian predictions come true in the early part of the coming millennium ?"

- Diminishing per capita arable land and irrigation water availability.
- Expanding demand for food, particularly animal products, as a result of higher purchasing power and increased consumption by those currently undernourished.
- Stagnation in marine fish production since 1990.
- Increasing environmental damage and distinct possibilities of adverse changes in climate and sea level.
- Fatigue of green revolution due to technology stagnation, leading to a decline in the per person world grain production from 415 kg in 1985 to 360 kg in 1996.

The above situation has led experts like Dr. Lester Brown of the World Watch Institute to predict that China and India may have to import over 240 and 50 million tonnes respectively of foodgrains by the year 2030. The entire world trade in foodgrains now is about 200 million tonnes. Under conditions where trade is free and not fair, the price of wheat and other foodgrains will go up steeply in the international market, if China and India go for large food imports. Also, there is no way that the industrialised countries can produce the amount of grain that Lester Brown fears that China and India may have to import by 2030, since further intensification of agriculture in such countries will be environmentally disastrous.

Ashish Bose (1996) has recently summarised the present demographic scenario in India. The desired demographic transition to low birth and low death rates is yet to take place in most parts of the country, excepting in the States of Kerala, Tamil Nadu, Goa and Mizoram. Based on consideration of population, illiteracy, percentage of malnourished children and per capita income, Mahbub ul Haq (1997) has developed a measure of human deprivation. He concludes, "the overall extent of human deprivation is simply colossal in the SAARC region. The deprivation of human capabilities far exceeds the deprivation of income alone and affects over 500 million people in South Asia". Of this 500 million children, women and men, nearly 50% are in India.

TABLE 1

Human Deprivation Characteristics of the SAARC Region (India, Pakistan, Bangladesh, Nepal, Sri Lanka, Bhutan and Maldives)

- Most illiterate region: 48% adult illiteracy
- Most malnourished region: 50% children are underweight
- Least gender-sensitive region: Gender Equality Measure of 0.235
- Highest human deprivation: Human deprivation affects over 500 million people

Source: Haq, 1997

Inter-state variation in India in human and social development indicators [Table 2(a) and 2(b)] sheds light on the pathways we should adopt for achieving a balance between human population and the supporting capacity of the ecosystem. A Government of India Committee for drafting a national population policy statement for the consideration of Parliament recommended a paradigm shift in our population stabilisation strategy, with a view to achieving a Total Fertility Rate (TFR) of 2.1 by the year 2010 (Table 3).

TABLE 2(a)

Poverty and Literacy Profile of Major Indian States (Rural Areas)

State	Per Capita Income (Rs. per annum)	Persons below absolute Poverty Line (%)	Literacy Rate, Age 7+ (%)
Punjab	6,380	32	60
Haryana	6,368	27	55
Kerala	5,778	30	90
Maharashtra	5,525	34	58
Gujarat	5,288	39	59
Andhra Pradesh	5,046	21	50
Rajasthan	4,229	40	41
Uttar Pradesh	4,185	40	47
Himachal Pradesh	4,168	45	68
Bihar	3,691	42	44
West Bengal	3,157	51	59
Orissa	3,028	55	55
Average for Rural India	4,485	39	54

Source: NCAER, 1996 (Personal communication)

TABLE 2(b)

Disaggregated HDI for India

Indian States	HDI Value
Madhya Pradesh	0.341
Uttar Pradesh	0.343
Tamil Nadu	0.432
Kerala	0.597
West Bengal	0.452
Haryana	0.476
Maharashtra	0.513
Punjab	0.516
India (Average)	0.436

Source: Haq, 1997

TABLE 3

Paradigm shift recommended by the Swaminathan Committee (1995)

Existing	Swaminathan Committee
Strategy Target and Technology Driven	Human and Social Development Centred
Approach Think and Plan Centrally and Act Locally	Think, plan and act locally and support nationally
Awareness Generation National Slogans, Symbols and Educational Strategies	Sensitisation and self-awareness of rural and urban communities concerning the population supporting capacity of their ecosystem
Planning Tool Five Year Plan of the Department of Family Welfare, Government of India	Socio-demographic charter for the village/town prepared by the people
Delivery Services Contraceptive Services	Integrated health security including reproductive health and user-preferred family planning devices

Population stabilisation policies are a must in our country for sustainable food, health and livelihood security. If population policies go wrong, nothing else will have a chance to succeed.

III. Sustaining the Agricultural Revolution

Indian agriculture has witnessed a phenomenal growth since independence. Compared to around 50 million tonnes at the time of independence, India has attained a foodgrain production close to 200 million tonnes in 1996-97, a rise of four times. This great big achievement is a matter to celebrate during the Golden Jubilee Year of our independence, since it has occurred against the backdrop of two and one-half times rise in population during the same period (330 millions at the time of independence vs. 960 millions in 1997). Along with food, in other sectors of agriculture also, India has made great strides. For instance, our country ranks second in the world in milk, fruit and vegetable production. Despite this unparalleled achievement proving Malthus and other prophets of doom wrong, there is no room to relax. Such a concern is born out of the fact, that even with the fall in population growth rate from the current 1.8% to 1.4% by 2011 (Standing Committee on Population Projections, 1989), India's population will continue to grow by an additional 16 million people each year. Just to nurture this population alone (leaving aside seed and feed needs), our farmers will have to produce additional 3.2 million tonnes food each year (1 ton food is assumed to feed 5 Indians for one year). This is a formidable challenge.

The remarkable progress in food production narrated above has primarily been fueled just by two crops i.e. rice and wheat, and that too in irrigated areas. In fact, for every 100 tonnes rise in food production, 91 tonnes were contributed by rice and wheat, the remainder 9 tonnes came through a host of coarse cereals *(jowar, maize, bajra, ragi)* and pulses *(channa, urid, moong, mash and moth).* Because coarse cereals and pulses are predominantly (about 90%) cultivated without irrigation, the vast majority of rainfed areas did not witness the kind of growth seen in the irrigated areas.

Since independence, the area under irrigation has increased from 21 M ha to 50 M ha. However, even by the year 2013, when the full irrigation potential is likely to have developed (National Commission on Agriculture, 1976), 50% of the arable land will continue to remain unirrigated (or rainfed). Therefore, keeping in view the limits on stretching the irrigated area beyond a certain point, rainfed agriculture would have to be looked upon to meet the rising demand for food created

by the growing population. We should strive to achieve at least 2 tonnes foodgrain productivity per hectare from rainfed areas (and 4 tonnes per hectare from irrigated areas). Current foodgrain productivity of rainfed crops stands at less than 1 ton per hectare. Achieving this target is possible through a proper mix of technological interventions leading to the improved rain water harvesting and use of declining land-man ratio.

The immense pressure on India's natural resources can be gauged from the following facts: India has 16% of the world's population, and owns 15% of the world's livestock. Against this, India possess merely 2% of the world's geographical area, 1% of rainwater, 1% of forest area and 0.5 % of the pasture lands. The resultant overstraining of land resources beyond their supporting capactiy by disproportionate number of human beings and animals is at the root of shrinking holding size, rising degradation and diminishing farming efficiency. Consequently, the rainfed areas are marked by marginal and fragile environments, low and uncertain productivity, high concentration of poverty, unemployment, large scale male migration and unsustainable development. Male migration to urban areas is also leading to an increasing faminisation of agriculture. The obvious question is "Can we meet the new challenges by improving the productivity, profitability, stability and sustainability of rainfed farming systems?" The answer is yes, provided we initiate the following steps:

- Restoration of ecological balance in the degraded and fragile rainfed areas through eco-regional agricultural technology missions.
- Promotion of natural resource management and productivity objectives through diversified farming systems to enhance the income levels of farmers and village communities on an ecologically and socially sustainable basis.

IV. Revolution in Rainfed Farming

At present out of 142 M ha (million hectares) net cultivated area, around 35% (50 M ha) is served with irrigation. The remainder 65% area (92 M ha) is rainfed. Rainfed areas produce 44% food, support 40% human and around 60% livestock population. The current dominance of millets (90%), pulses (89%), oilseeds (76%) and cotton (67%) in rainfed areas is likely to stay in the future also.

Rainfed areas are complex, diverse and risk prone. Productivity of rainfed crops is generally low and unstable. Furthermore, as in most countries of the world - India being no exception - increases in productivity attributable to technological change have been more rapid

in irrigated than in rainfed areas. Nevertheless, rainfed areas offer many opportunities for development. With that background, Central and State Governments have been initiating projects from time to time to elevate and stabilise crop yield in rainfed areas. Historically, attention to develop rainfed agriculture dates back to the year 1880, when the First Famine Commission was appointed by the then British Government. A significant programme on dryland agriculture research was, however, set up more than 50 years later. It was in 1933 - 35, the then Imperial Council of Agriculture Research (now the Indian Council of Agricultural Research or ICAR) sponsored a Dry Farming Scheme at 5 centres viz., Sholapur, Bijapur, Raichur, Hagari and Rohtak. The setting up of a Soil and Water Conservation Research and Training Institute at Dehradun in 1954 was, perhaps, the first initiatve made in the independent India to focus on problems of soil and water conservation. Since then a number of research and development initiatives have been launched from time to time to stabilize and raise the productivity of dryland crops combined with sustainable natural resource (land, rainwater) management. A chronicle of research and development related programmes are summarized in Table 4.

Apart from the Government of India support, several projects were initiated with external funding. In the 1960s, a dry farming project had been started at Anantapur district in Andhra Pradesh with support from the Government of France. The All India Co-ordinated Research Project for Dryland Agriculture got extensive support from CIDA (Canadian International Development Agency) through bilateral collaboration between the Governments of India and Canada signed in 1970. Almost coinciding with that event, the International Crops Research Institute for the Semi-arid Tropics (ICRISAT) was founded at Hyderabad in 1972. A number of watershed projects, starting with Indo-British Project at Indore in the early 1980s, received external funding from agencies like the United Kingdom, World Bank, European Economic Commission (EEC), Government of Denmark (DANIDA), Germany (FRG) etc.

To sum up, 60 years of research and development efforts by the National Research Institutes and Development Departments with support from International Agencies have led to the evolution of useful techniques and information on agronomic practices, appropriate choice of crops and their varieties and cropping systems. With time, greater area coverage under high yielding varieties receiving relatively more amount of fertilizers have contributed to rise in productivity of rainfed crops. No doubt, the rate in growth of productivity continues to lag behind that observed in irrigated areas. More importantly the yield gap between

TABLE 4

History of Dryland Research and Development in India

Year	Research and Development Programme
1880	First Famine Commission
1923	Dry Farming Research on a Small Plot at Manjari, near Pune
1928	Report of the Royal Commission on Agriculture
1933 – 35	Dry Farming Scheme at 5 Centres
1954	Soil and Water Conservation Research Institute at Dehradun with 8 Soil Conservation Centres
1959	Central Arid Zone Research Institute
1956 – 61	Several Dry Farming Projects
1962	Indian Grasslands and Fodder Research Institute at Jhansi
1970	All India Co-ordinated Research Project for Dryland Agriculture (AICRPDA) at 23 Centres
1972	Establishment of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) at Hyderabad
1973	Rural Works Programme of 1970 renamed as Drought Prone Area Programme
1976	Operational Research Projects to Validate Technologies in Farmer's Fields
1977	Desert Development Programme
1983	Model Watersheds at 47 Sites
1985	Central Research Institute for Dryland Agriculture (CRIDA) at Hyderabad
1988	National Research Centre for Agroforestry at Jhansi
1990	National Research Centre for Arid Horticulture at Bikaner
1990	National Watershed Development Project for Rainfed Agriculture (NWDPRA)
1991	Several Watershed Projects with support from World Bank, DANIDA, EEC, FRG, ODA etc.
1993	Ministry of Rural Development Programme on Watershed Development in DPAP districts of the country

the research stations and farmers' fields continues to be very wide. Yields of rainfed crops obtained by farmers do not reach even 50% mark of that obtained by research stations. Existence of this gap despite 70 years of research and development efforts has brought the following lessons to the fore:

- The research farm programmes have mostly been scientist oriented and not farmer or client centred. These were perceived, planned, implemented, supervised and evaluated by scientists. The transfer of results followed a top-down approach. In this "take it or leave it approach", the farmer was at best a passive participant. Scientific findings which became the so called 'technologies' were born from small plots and short-term research and were invariably not associated with cost-benefit studies.
- Acceptance of introduced technologies was largely co-terminus with the period of financial support. The moment financial support was withdrawn, farmers reverted to their traditional practices or adopted only some selected components of technologies. Rarely, a total package constituting an integrated technology was adopted.
- Acceptance of certain components of technologies did lead to a moderate increase in productivity, but emphasis on employment generation was lacking. Consequently, male out migration in search of jobs continues to be a serious problem. In a majority of the instances the introduced technologies did not suit the women who primarily manage the fields in the absence of menfolk. This glaring neglect of gender issues has seriously affected the success of rainfed projects.
- The absence of a farming system perspective ignoring the rural energy or fuel needs for households and forage needs for farmers' animal support system affected the sustainability of the programmes and long-term acceptance.
- Watershed programmes, whether funded from internal or external resources, were labelled as government programmes, with minimal involvement and empowerment of farmers in planning and implementation. Despite the fact a watershed is owned by many farm families, soil and water conservation approaches did not emphasize community approach and group action on sharing water resources.

V. Panchayat Centred Eco-development Mission for Rainfed Agriculture

Rainfed agriculture to be productive, should be based on watershed as the unit of development. Watershed is not a technology but a concept

which integrates conservation, management and budgeting of rainwater through simple but discrete hydrological units. Simultaneously, a watershed supports a holistic framework which means a combined application of technologies on soil and water conservation with improved crop varieties, farming systems and agronomic management, taking into account both arable and non-farm land.

Although low gains in a majority of the watershed programmes continue to be a matter of concern, success of watersheds like RaleGaon Sidhi (Maharashtra) and Sukkomajri (near Chandigarh) has attracted nationwide attention. Future development of rainfed agriculture can draw some valuable lessons from these success stories. It was the total development of the ecosystem in a mission mode format that formed the hallmark of success. Water resource development through efficient rainwater management, harvesting and equity in sharing formed the nucleus of watershed development. With water availability assured, farmers get motivated to accept more profitable, sustainable and innovative farming systems. Water availability has also catalyzed the adoption and spread of value-added arable technologies in the entire area of the watershed, such as horticulture. A major reason for the success of projects executed by several non-governmental agencies is the co-operative effort generated among the members of the Watershed Community.

Integrating the watershed development programme with the village development plan to be executed by the Panchayat will be an effective method of ensuring peoples' participation and the sustainable and equitable use of water. In village where there are several watersheds, an integrated master plan for watershed management could be developed.

Tailoring cropping systems to suit different rainfall cum soil zones:

a) High rainfall areas (Mean annual rainfall > 1000 mm); Soybean will be a suitable crop. Specific efforts should be instituted to realise the full potential of the crop in high rainfall, black soil region. Apart from marketing network and ensuring necessary inputs, the emphasis of the mission should be to achieve two crops a year through selective mechanization and drainage of low lying areas.

b) Medium rainfall regions (means annual rainfall: 750 – 1000 mm): Cotton could be given high emphasis in this region. Depending upon considering soil and length of the growing season a suitable intercrop could be introduced to increase overall profitability of the system.

c) Low rainfall regions (mean annual rainfall < 750 mm); pulse crops will be ideal. Farmers should be allowed to process the pulse into **dal.**

Thus a lead crop could be identified for each major rainfall cum soil zone. In every case, the Panchayat-led Watershed Management system should have the following goals:

- Conservation of water.
- Sustainable and efficient use.
- Equitable sharing of benefits.
- Value-addition to water by cultivating high value but low water requiring crops.

Such a Panchayat-centred Eco-development Mission in rainfed areas will help to trigger rapid agricultural progress in such areas to bridge the gap between potential and active yields.

VI. Sustainable Food Security

At a Meeting of Science Academies held at MSSRF in July 1996 in preparation for the Rome Food Summit convened by FAO in November 1996, it was agreed that National Food Security Systems should ensure:

- that every individual has the *Physical, Economic, Social and Environmental access* to a balanced diet that includes the necessary macro-and micro-nutrients, safe drinking water, sanitation, environmental hygiene, primary health care and education so as to lead a healthy and productive life;
- that food originates from efficient and *environmentally benign production technologies* that conserve and enhance the natural resource base of crops, animal husbandry, forestry, inland and marine fisheries.

Immediately after World War II, food security was considered only in physical terms (i.e., production and availability). In the seventies it became clear that economic access to food is equally important. In the eighties, it became clear that food security has to be considered at the level of the **individual** and **not merely** of the **household,** since within a household women and girl children often tend to be more under-and malnourished. In the nineties, it is becoming evident that environmental hygiene and safe drinking water as well as the intake of the needed micronutrients are becoming important. Poor environmental sanitation and unclean drinking water affect adversely the biological absorption and retention of food. Thus, today we have to view food security from the viewpoints of physical, social, economic and environmental access.

According to FAO, we may need by 2020 an annual production of atleast 3000 million tonnes of foodgrains, 200 million tonnes of aquatic foods, in addition to large quantities of fruits and vegetables to provide

balanced diets for over eight billion human beings. In addition, large quantities of fuelwood, fodder, fibre and other agricultural commodities will be needed. Such additional production has to be achieved under conditions of shrinking per capita arable land and irrigation water resources and expanding biotic and abiotic stresses. We have to produce more food and other farm commodities per units of land, water, energy, labour and capital, but we have to do it differently in order to avoid long term ecological harm.

Food and health security systems in the past depended upon a wide range of crops [See Lost Crops of the Incas (1989) and Lost Crops of Africa (1996)]. This helped to provide both balanced diets and insurance against total crop failures. Also, crops suited to different agro-ecological conditions could be cultivated, thereby avoiding monoculture with the same crop over large areas.

With the "advancement" of civilization and "modernisation" of agriculture, the crop-mix in the food security basket started shrinking. Today, about 22 crops dominate the global food scenario and trade (Fig. 1). Wheat, maize, rice and potatoes have become the most widely grown food crops. Not only has there been a drastic reduction in the crop-mix of the food basket, but there has also been a steep decline in the genetic diversity of the crops grown (Fig. 2). Soils are getting depleted of micronutrients due to intensive cultivation. Hidden hunger, caused by micronutrient deficiencies, is consequently getting more widespread.

Enlarging crop and varietal diversity in the food basket will confer multiple benefits such as the following:

- Contribution to overcoming micro-nutrient deficiencies and promotion of balanced diets.
- Insurance against total crop failures.
- Matching crops to specific agro-ecological conditions.
- Revitalisation of *in situ* on-farm conservation of agro-biodiversity and thereby opportunities for new genetic combinations.
- Preventing nutritious crops from becoming "lost crops".

a. **Nomenclature**

Many of the neglected and under-utilised crops have highly desirable nutritional profiles (Fig. 3). However, in trade as well as in FAO terminology, the following pre-fixes are attached to many of these nutritious and life-saving (because of their ability to withstand drought and relatively unfavourable growing conditions) crops.

- **Coarse** Grain (implying that such millets are fit only for animal feed).

- **Minor** Crops (not important in commercial terms)
- **Minor** Millets (small seeds)
- **Famine** Foods (coming to rescue only under conditions of famine)
- **Feed** Grains (suitable only for animals)

It is time we review the nomenclature and crop diversification strategies in the interests of both global and national nutritional and ecological security.

The publications of the US National Academy of Sciences on "Lost Crops" give valuable information on the nutritional merits of many grain crops like *Chenopodium quinoa, Amaranthus Candatus, Digitaria* sp, *Paspalum* sp, *Setaria* sp as well as tuber crops like *Lepedium meyenil.* Many useful food and medicinal plants occur in forest canopies. Institutions belonging to CGIAR have over 600,000 accessions of genetic strains of food crops. There is need to analyse them systematically for their nutrient content. Wide variability occurs at the intra-specific level in crops such as rice, maize and wheat in micronutrient content, particularly with reference to iron.

b. **Strategies for Enlarging the Crop Mix in Food Security Systems**

There is need for a 7-point **National Nutrition Security** strategy comprising the following components:

- Revitalisation of the pre-market traditions of cultivating and consuming a wide range of cereals, millets, grain legumes, oilseeds, vegetables, fruits and tuber crops both by education and creation of markets for such nutritious food crops.
- Promotion of the development, manufacture and sale of processed and semi-processed foods based on a mixture of nutritious crops, so as to help overcome micro-nutrient deficiencies.
- Including neglected and "minor" crops in food security reserves and in public distribution systems, so as to provide an economic stake in the cultivation of a wide range of food crops.
- Redesignating "coarse cereals" as "nutritious cereals" in order to alter the image of such micro-nutrient rich crops in public perception.
- Promoting the *in situ* and *ex situ* conservation of a wide range of food crops, so as to prevent them from becoming "lost crops".
- Promoting breeding efforts designed to increase the micro-nutrient content of crops like rice, wheat and maize.
- Promoting mixed cropping and multiple cropping sequences which provide space in the cropping system for underutilised but nutritionally desirable crops.

Such steps will also help in matching crop choice and agronomic

practices with specific agro-ecological conditions, such as arid and semi-arid areas.

Crop Planning for Nutrition Security will need appropriate steps in the following areas:

- Government policies in relation to pricing, foodgrain reserves and public distribution system.
- Market opportunities and incentives.
- Education and public awareness.
- Nutrition focused research in the areas of screening varieties for the content of micro-nutrients, plant breeding and food processing technology.
- Mass media support for spreading messages relating to nutrition security.
- Changes in nomenclature in order to alter prevailing mindsets which place undue emphasis on a few staple crops in human diet.

c. Agro-ecological Planning and Local Level Grain Banks

The growing trend towards agro-ecological land use planning in agriculture provides an excellent opportunity for enlarging the crop-mix in food baskets. Local level **Grain Banks** comprising millets, grain legumes and minor crops could be promoted. This will be an important step in building sustainable national nutrition security systems. Such local level Grain Banks will help both to provide producer-oriented marketing opportunities and to prevent distress sales and/or panic purchase.

d. Towards a Hunger-free India

Gandhiji considered the elimination of hunger the foremost duty of independent India. His receipe for achieving freedom from hunger involves attention to the following:

- Livelihood opportunities to enable every individual to purchase food.
- Clean drinking water and environmental hygiene.
- Women's status and education.
- Self-reliance, starting at the level of a village.

The steps taken by Central and State Governments during the last 50 years have given us both the necessary experience and expertise and the essential infrastructure to launch an integrated programme for the elimination of endemic and silent hunger. This will be the most appropriate way of commemorating the 50th anniversary of our independence.

Entitlements of the Poor

According to several estimates, the number of persons below the poverty line may be nearly 400 million. However, the number of women, men and children going to bed hungry is much less. It is only the **ultra poor** who suffer from chronic hunger.

Gram Sabhas in some parts of Tamil Nadu have estimated that the **ultra poor** suffering from under-and mal-nutrition will be of the order of 12 to 15 percent of the population. With some variations, the percentage of the ultra poor among those below the poverty line may be about 15 percent i.e. about 60 million persons. The criteria used by Gram Sabhas to identify the ultra poor: are lack of productive assets like land or livestock, living in huts with no access to clean drinking water and sanitation, are illiterate and depend for their livelihood upon unskilled daily paid work.

Government projects for helping the ultra poor include:

- Land reform and security of tenure.
- Employment generation and guarantee.
- Targeted public distribution system.
- Nutritious Noon Meal for children and old and infirm persons.
- Asset building like animal husbandry and new skills.
- Micro-credit for micro-enterprises.
- Special programmes for women and children like DWACRA and ICDS.

Unfortunately, studies reveal that the ultra poor have invariably been by-passed by such programmes. **Including the excluded is therefore the most urgent task.** For this purpose, information empowerment becomes vital. **A Household Entitlements Card** should be issued to every woman and man belonging to the ultra poor category. In such cards, the entitlements (i.e. Central and State Government programmes available to help them to end their hunger) should be disaggregated according to age and gender.

Coalition of the Concerned

It will be appropriate if during this year all concerned with the gradual social disintegration now taking place as a result of extreme economic disparities and discriminations, would join together to work for a hunger-free India. In such efforts, the following ground rules should be kept in view for planning and implementing an action plan:

- Work towards creating an "enabling environment" for a healthy and productive life for all.
- Foster self-reliance and self-help.

- Pay particular attention to the empowerment of women and to the needs of children, introducing a "gender code" in development programmes.
- Empower and actively involve Gram Sabhas and grassroots democratic institutions in the design and implementation of programmes designed to achieve a sustainable end to hunger.

Voluntary organisations could help the nation to move towards the goal of achieving freedom from hunger through the following steps:

- Foster the formation of broad-based networks and coalitions of the concerned, including development administrators, women's organisations, corporate-sector, mass media and grassroots democratic institutions for both advocacy and action.
- Undertake capacity building, such as training and information empowerment, including organisation of seminars for policy makers.
- Serve as a conduit to take the benefits of governmental and non-governmental programmes to the ultra poor, who have generally been by-passed by such projects; and
- Provide the missing links in ongoing programmes related to the elimination of hunger.

Seven Point Action Plan

During 1996, a detailed study was initiated in seven districts of Tamil Nadu on methods of achieving an end to poverty-induced hunger. The study was carried out by seven institutions in the State, with financial support from the State Social Welfare Department. Detailed consultations were held with Panchayati Raj leaders and local communities. This exercise **led to the formulation of the following 7-Point Action Plan for achieving a sustainable end to endemic and silent hunger:**

1. Identification of the ultra poor by the village/urban communities.
2. Information empowerment through a Household Entitlement Card containing information on the Government programmes available to the family differentiated according to gender and age.
3. Eliminating protein-calorie undernutrition through improving the delivery of the public distribution system.
4. Eliminating silent hunger arising from micro-nutrient deficiencies through the identification of the missing elements in the diet and ensuring their intake through the most feasible methods.
5. Improving the biological absorption and retention of food through the provision of safe drinking water and improved environmental hygiene.

6. Improving the purchasing power of the ultra poor through economically viable micro-enterprises supported by micro-credit.
7. Ensuring that the special programmes intended for women and children reach the unreached, particularly those relating to work opportunities, reproductive health, breast feeding and reduction of infant mortality rate.

Today, administrators may find excuses for not taking up such an integrated programme, since it involves the introduction of a horizontal dimension in numerous vertically structured programmes. Achieving convergence and synergy among programmes is not the strength of administration. However, there is no political, social, economic or technological excuse for not initiating a concerted drive to achieve Gandhiji's vision of an India where every individual can earn his or her daily bread and children are not denied their childhood.

VII. Fostering New Symbiotic Social Contracts

The economic difficulties currently being experienced by S. E. Asian countries serve as grim reminders of the fate of countries which borrow heavily and use the borrowed money to erect mansions and promote consumerism. Countries which overvalue land and buildings and undervalue human beings will suffer economically, socially and politically. **Public policies in our country, including investment priorities must concentrate on creating opportunities for a healthy and productive life for all.** To achieve this, we need a coalition of the concerned. In such a coalition, the private sector and the civil society must play a dominant part.

The social contract between the private sector and resource poor rural families can take many forms such as the following:

- **Contract Farming rather than Corporate Farming:** This will involve firm buy-back arrangements of crops and commodities produced for a company.
- **Wasteland Development:** This is an urgent task. Upgrading degraded land requires technology and capital. Industry-farmer linkages can help enterprises requiring wood as raw material.
- **Water Harvesting and Pulses and Oilseeds Villages:** In dry farming areas, industry-farmer partnerships will help to promote scientific water harvesting and the use of conserved water for producing high value - low water requiring crops like pulses.
- **Urban Green Belt Movement:** A green-belt movement can be fostered by industry linking the rural producer and the urban consumer in a symbiotic manner.

- **Seed Villages:** With the spread of hybrid strains even in self-pollinated crops like rice, there are many opportunities for business-farm families collaboration in seed production.
- **Horticulture and Animal Husbandry:** Industry-producer linkages will be of particular value in perishable commodities since these need capital and management intensive facilities at the post-harvest stage, such as cold storages and refrigerated transportation.
- **Agri-business Enterprises:** The success of the Small Farmer Agri-business Programme designed by MSSRF at the instance of the Government of India needs for its success the active participation of industry.
- **Decentralised Production Supported by Key Centralised Services:** There is need for such arrangements in the production and marketing of a wide range of processed foods, horticultural and animal products and goods produced in micro-enterprises. The **All-Women Biotechnology Park** being established at Chennai by the Government of Tamil Nadu with support from the Department of Biotechnology, Government of India, is an example.
- **Manufacture of Farm Implements:** This is another area where large industries can foster small scale manufacturing units in villages.

Such mutually beneficial industry-resource poor families linkages will help to strengthen the livelihood security of the economically under privileged sections of the Society and thereby help to achieve economic access to food. Fostering such partnerships will be the best tribute we can pay to the life and work of Sri T. A. Pai.

References :

Bose A (1996), India's Population Policy: Changing Paradigm. Dehli: B. R. Publishing, 415 pp.

Brown L. (1995), Who will Feed China? Wake-up Call for a Small Planet, New York: W W Norton, 163 pp.

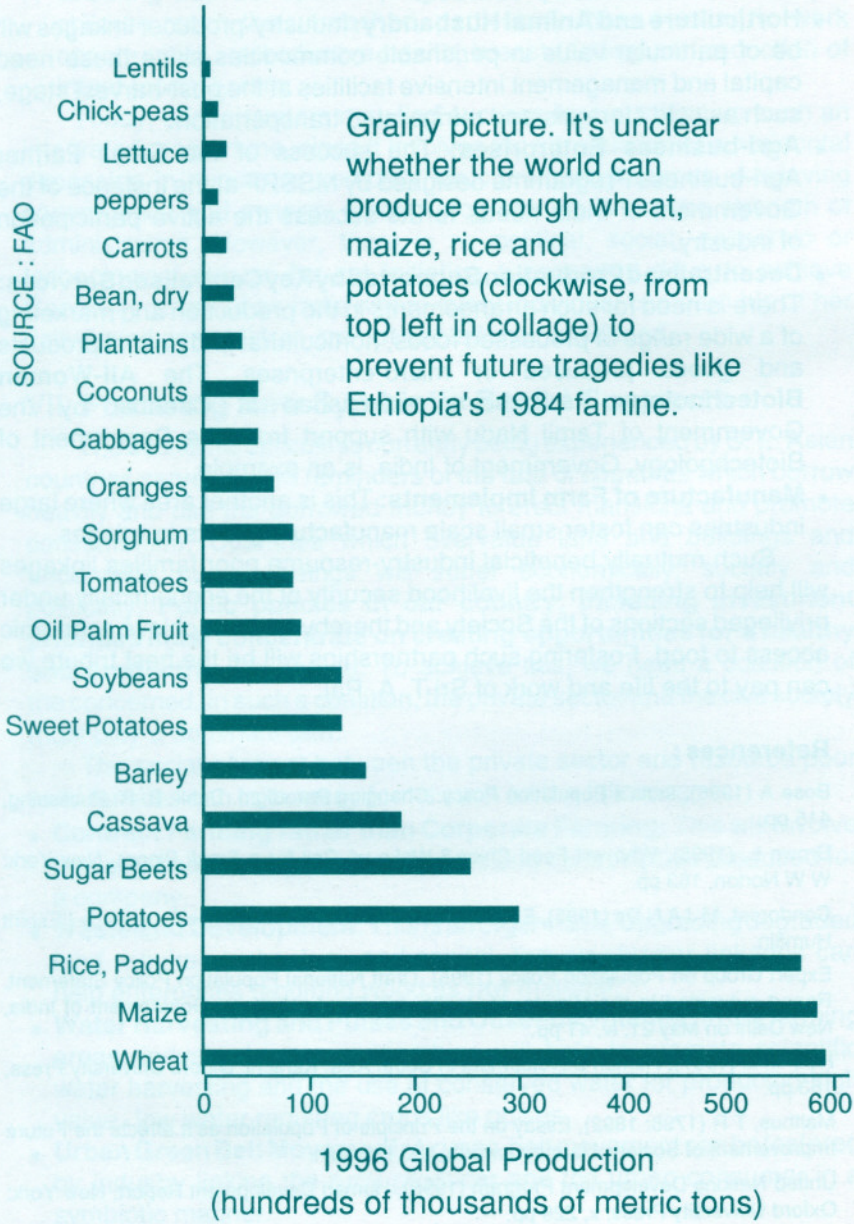
Condorcet, M J A N De (1995), Esquisse dun Tableau Historique des Progres de l'Espirit Humain.

Expert Group on Population Policy (1995), Draft National Population Policy Statement, Report submitted to the Ministry of Health and Family Welfare, Government of India, New Delhi on May 21, iv, 41 pp.

Haq. M ui (1997), Human Development in South Asia. Karachi: Oxford University Press, 153 pp.

Malthus, T R (1798: 1892), Essay on the Principle of Population as it affects the Future Improvement of Society, Harmondsworth, UK: Penguin.

United Nations Development Program (1996), Human Development Report, New York: Oxford University Press, x, 229 pp.



Grainy picture. It's unclear whether the world can produce enough wheat, maize, rice and potatoes (clockwise, from top left in collage) to prevent future tragedies like Ethiopia's 1984 famine.

Fig. 1

America's lost diversity

(Rob Edwards 1996)

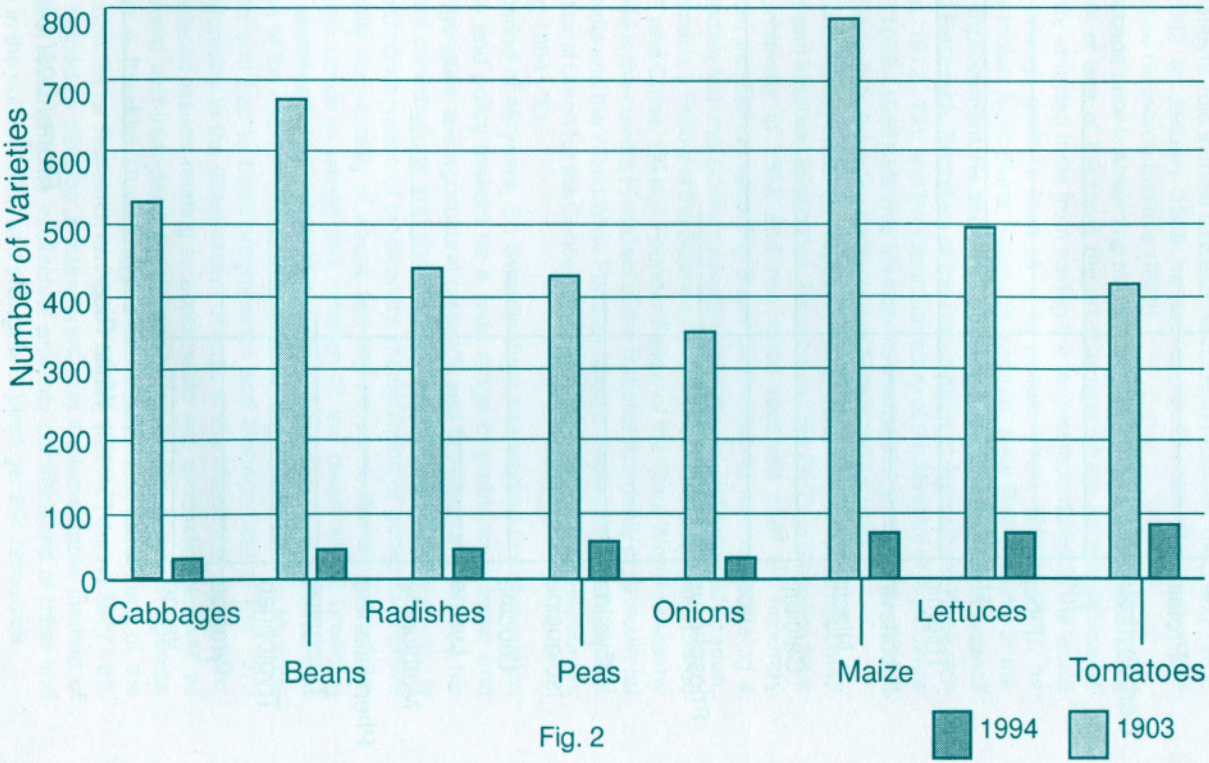
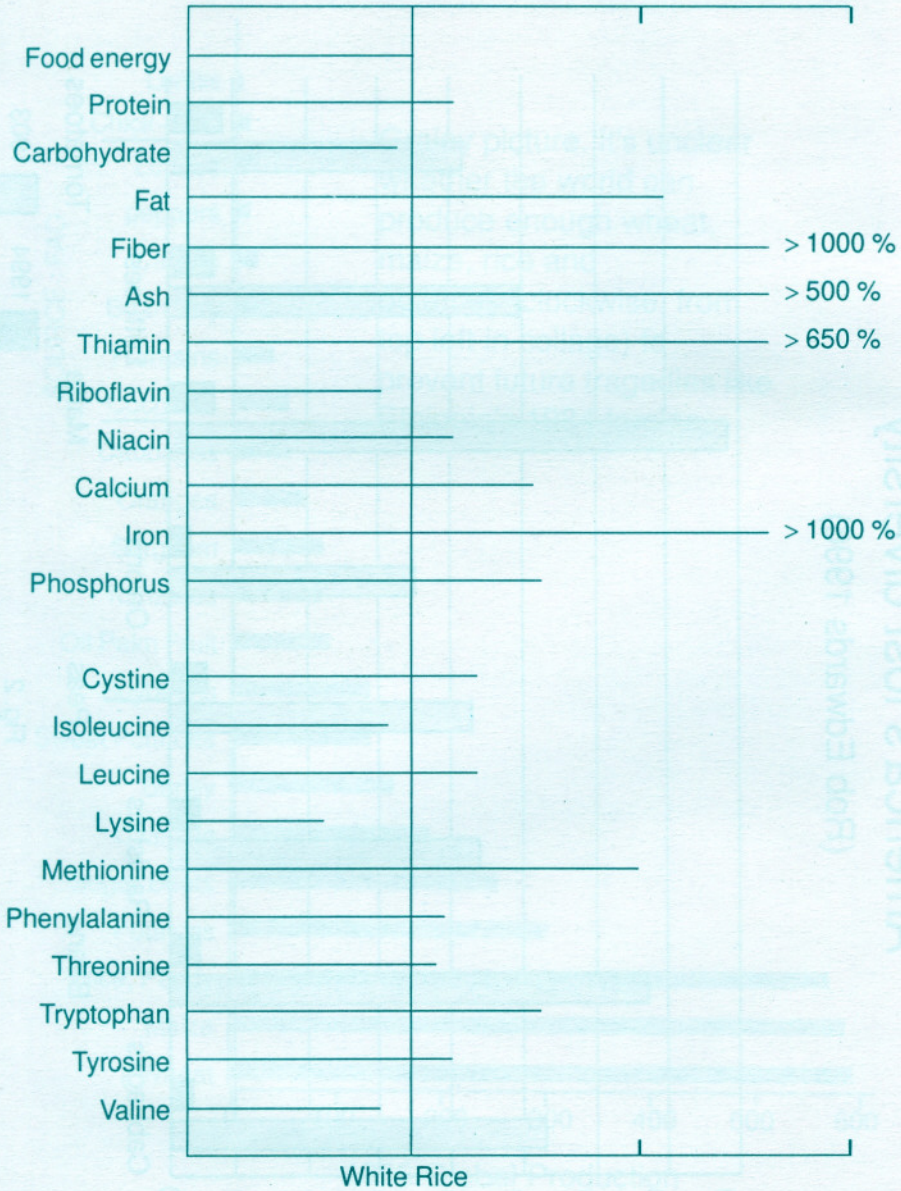


Fig. 2

Comparative Quality of Digitaria Exiles and Rice



From : Lost Crops of Africa

Fig. 3

Prof. M. S. Swaminathan

UNESCO Chair in Ecotechnology, Chennai

Dr. M. S. Swaminathan is one of the world's leading Agricultural Scientists. He played a catalytic role in India's Green Revolution between 1960 and 1982. From April 1982 to January 1988 he served as Director General of the International Rice Research Institute (IRRI).

For the decade prior to assuming his post with IRRI, Dr. Swaminathan was at the forefront of one of the most remarkable agricultural accomplishments in recent history – moving India from having the largest food deficit in the world to producing enough grain to feed all of its people. From 1954 to 1972, he worked at the Indian Agricultural Research Institute, New Delhi, mainly in the field of wheat improvement. He served as Director General of the Indian Council of Agricultural Research; Secretary of the Department of Agricultural Research and Education (1972 – 79); and Principal Secretary of the Ministry of Agriculture and Irrigation (1979 – 1980). He was Member In-charge of Agriculture and Rural Development in India's Planning Commission from 1980 to 1982.

Born in Tamil Nadu, India, on August 7, 1925, Swaminathan was educated at Travancore and Madras Universities. He received his Ph.D. in Genetics from Cambridge University in 1952 and has since received over 34 honorary doctorates from institutions spanning three continents. In addition to being a Fellow of the Indian National Science Academy and the Royal Society of London, Dr. Swaminathan is a Fellow of the Science Academies of Sweden, Italy, United States, USSR and China. He is a Founder Fellow of the Third World Academy of Sciences. He is the current President of the National Academy of Agricultural Sciences of India and the World Wide Fund for Nature – India. He was President of the International Union for the Conservation of Nature and Natural Resources (IUCN) during 1984 – 90.

Over a period of 45 years, Dr. Swaminathan has worked in collaboration with scientists and policy makers on a wide range of problems in basic and applied plant genetics and agricultural research and development. Among his more important contributions are: conservation of plant genetic resources, *in situ* and *ex situ* conservation of biodiversity, manipulation of genes to improve the yield, quality and stability of wheat, rice and potatoes; identification of the barriers to high yields in wheat and initiation of the dwarf wheat breeding programme; identification of cytotoxic agents in irradiated food material and demonstration of the indirect effects of radiations, organisation of the National Demonstration and Lab to Land programmes and Management of the 1979 drought as Secretary to the Government of India in the Ministry of Agriculture. At IRRI, he placed issues relating to sustainable rice production as well as intra-generational and inter-generational equity top on the research agenda. He served as a Founder-Trustee and later Chairman of the Board of the International Council for Research on Agro-Forestry (ICRAF) during 1977 – 82. Recently he helped to develop a transparent and implementable method of recognising and rewarding the intellectual property contributions of tribal and rural families in the conservation and selection of plant genetic resources.

He served as Chairman of the U.N. Advisory Committee on Science and Technology for Development during 1981 – 84 and was Independent Chairman of the FAO Council during 1981 – 85. In 1982, he organised a Society for the Promotion of Wasteland Development (SPWD) as a professional non-governmental organisation committed to the ecological restoration of degraded land in different parts of India. He was Founder Chairman of SPWD from 1982 to 1985. He served as Chairman of the Advisory Panel on Food Security, Agriculture, Forestry and Environment to the World Commission on Environment and Development (WCED). The report of his panel was published in March 1987 by Zed Books Ltd., under the title "Food 2000: Global Policies for Sustainable Agriculture".

He has published over 200 papers in international journals and several books, including "Building a National Food Security System" (Indian Environmental Society, 1981) and "Science and Integrated Rural Development" (Concept Publishing Company, New Delhi, 1982). Along with Prof. S. K. Sinha, he edited a book on "Global Aspects of Food Production" (Tycooly, 1987). He has chaired several national and international committees of experts, including the Indian Expert Group on Programmes for the Alleviation of Poverty, Eradication of Leprosy and Blindness, the Eco-development of Himalayas and Western Ghats and the preparation of a Draft National Population Policy.

Among his many distinguished awards are the Ramon Magsaysay Award for Community Leadership (1971), the first award for serving the cause of women in development (1985), Padma Shri (1967), Padma Bhushan (1972) and Padma Vibhushan (1989) awards by the President of India. In 1986, he received the Albert Einstein World Award on Science. On 6 October, 1987, he became the first laureate of the World Food Prize, regarded widely as the equivalent of a Nobel Prize in Agriculture.

Dr. Swaminathan is currently heading in an honorary capacity, a Research Centre at Chennai for sustainable agricultural and rural development based on the integration of traditional and frontier technologies. The Centre was set up with the funds associated with the World Food Prize, Tyler Prize and Honda Prize. The major aim of the Research Centre is the promotion of a job-led economic growth strategy in villages rooted in the principles of ecology and gender equity. UNESCO designated Dr. Swaminathan in 1996 as UNESCO-Cousteau Professor in Ecotechnology for Asia.

On the occasion of his receiving the first World Food Prize at the Smithsonian Institution, Washington, in October, 1987, Mr. Javier Perez de Cuellar, Secretary General of the United Nations wrote, *"Dr. Swaminathan is a living legend. His contributions to Agricultural Science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction".*