POLICY PAPER 55

Fighting Child Malnutrition



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NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI

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Preface

India has the dubious distinction of having the highest burden of malnutrition in the world – higher than Sub-Saharan Africa. Nearly 50 per cent of our children are underweight and stunted and 70 per cent suffer from serious nutritional deficiencies. The very high incidence of child undernutrition in India is both an ethical and economic imperative. Evidences show that avoidable undernutrition among young children reduces the effectiveness of investments in education and economic development. Overcoming early childhood undernutrition requires investing in targeted nutrition interventions for immediate impacts, as well as investing in packages of interventions that address the immediate and underlying determinants of undernutrition. Moreover, the benefit-cost ratio for nutrition interventions ranges from 5 to 200, much more than other interventions.

Notwithstanding the moral responsibility of liberating our children from the entrenched deprivation, the nation is constitutionally obliged to "regard the raising of the nutrition and the standard of living of its people and the improvement of public health as its primary duties" (Art. 147). Towards this objective, several initiatives such as the National Nutrition Policy, National Nutrition Plan of Action, National Nutrition Mission and Coalition for Sustainable Nutrition Security have been mooted with varying successes. But, the fact remains that over 40 per cent of world's malnourished children are our own children. Hon'ble Prime Minister. Dr Manmohan Singh, while releasing the HUNGaMA (Hunger and Malnutrition) Report on January 10, 2012, had observed that the problem of malnutrition in the country is a matter of national shame. Appreciating the seriousness of the problem, the National Academy of Agricultural Sciences, in collaboration with the Nutrition Society of India and the National Institute of Nutrition organized a Brainstorming Session on 'Fighting Child Malnutrition' on 13th November 2011 at NIN, Hyderabad to suggest policy options and actions to meet the challenges. It is hoped that the various stakeholders, including the policy makers, will seriously consider the policy options and ensure effective implementation of the recommendations.

The Academy is grateful to Dr V. Prakash, Convener and Prof. Mahtab S. Bamji and Dr. Madhavan Nair, Co-Conveners for successfully convening the Session and to all the distinguished participants for their active participation. Most grateful thanks are due to Prof. Mahtab S. Bamji for her proactive support and guidance in finalizing this document. We are indebted to Dr B. Sesikeran, Director, NIN both for his intellectual input and logistic support.

Finally, let us be reminded that "**the hungry child cannot wait**". We must act now and act with responsibility and accountability.

Relingth

(R.B. Singh) President, NAAS

Fighting Child Malnutrition

1. PRESENT SCENARIO AND MAJOR ISSUES

Magnitude of the Problem of Malnutrition

Child malnutrition is the consequence of complex set of circumstances in which the end result is an adverse effect on the health of the weakest and most vulnerable *viz.* children. After 65 years of Independence, India has the dubious distinction of having the highest burden of malnutrition in the world – higher than Sub-Saharan Africa. Thus almost 50% of preschool children are underweight and stunted^{1, 2} and 30% of adults are undernourished as judged by BMI². Almost 70% of women, children and adolescent girls suffer from iron deficiency anaemia³. Deficiencies of other micronutrients like vitamin A, riboflavin, folic acid and iodine are rampant. More recent studies suggest deficiencies of zinc, vitamin B₁₂ and vitamin D as well. Hon'ble Prime Minister Dr Manmohan Singh while releasing the HUNGaMA Survey Report on 10th January 2012 stated that the problem of malnutrition is a matter of shame.

Developmental Indicators – India's Ranking

India's ranking in Human Development Index (HDI) 2011, which assesses the state of human development based on several factors including life expectancy, adult literacy and school enrolment at primary, secondary and tertiary levels is 134/187⁴. India's Global Hunger Index (GHI) 2011, which combines three equally weighted indicators: 1) the proportion of the undernourished as a percentage of the population; 2) the prevalence of underweight children under the age of five; and 3) the mortality rate of children under the age of five is 23.7 against the score of 14.6 for the world as a whole. In GHI ranking, India is the 15th hungriest nation out of 81 developing and transition countries that were ranked⁵. India's ranking in Gender Gap Index (GGI) 2011 is 113/135 countries⁶. Ranking in different components of GGI are: economic participation, 131; educational attainment, 121; health and survival, 134 and political empowerment, 19. But for the better ranking in political empowerment, thanks to women's participation in *'Panchayati raj'*, India's rank in GGI would have been lower. This sad situation exists, despite impressive economic, scientific and industrial progresses.

For every frank case of nutritional deficiency, there are dozens of others who suffer from subclinical malnutrition as judged by milder signs and symptoms,

THE PROBLEM OF MALNUTRITION – A NATIONAL SHAME

The Prime Minister, Dr Manmohan Singh, on January 10, 2012, while releasing the HUNGaMA (Hunger and Malnutrition) Report prepared jointly by Nandi Foundation, the Citizen's Alliance and other partners observed that the surveyors in preparing the Report had reached more than 73,000 households in 112 districts across 9 States and had measured the nutrition status of more than one lakh children and had heard the voices of 74,000 mothers. The Prime Minister reiterated that "the health of our economy and society lies in the health of our children" (particularly referring to health of those below the age of six years) and underpinned that "We cannot hope for a healthy future for our country with a large number of malnourished children. The problem of malnutrition is a matter of national shame. Despite impressive growth in our GDP, the level of undernutrition in the country is unacceptably high. We have also not succeeded in reducing this rate fast enough." Emphasizing the need for clearly understanding malnutrition, the PM observed that despite a 20% decline in malnourishment in the last 7 years, it is a matter of great concern that 42% of our children are still underweight, an unacceptably high occurrence.

The Prime Minister emphasized that "though the ICDS continues to be our most important tool to fight malnutrition, we can no longer rely solely on it. We need to focus on districts where malnutrition levels are high and where conditions causing malnutrition prevail. Policy makers and programme implementers need to clearly understand many linkages - between education and health, between sanitation and hygiene, between drinking water and nutrition - and then shape their responses accordingly. These sectors can no longer work in isolation of each other." He referred to the following four functions of the National Council on India's Nutrition Challenges: "To launch a strengthened and restructured ICDS; to start a multi-sectoral programme for 200 high-burden districts; to initiate a nationwide communication campaign against malnutrition; and to bring nutrition focus to key programmes of agricultural development, research and development in agriculture, the Public Distribution System, the mid-day meals programme, drinking water, sanitation, health and the latest on the horizon is the Food Security Bill etc." The Prime Minister assured that the ministries concerned are taking necessary action to implement these four decisions, and hoped that all stakeholders would effectively work together to bring malnutrition below unacceptable levels.

biochemical indicators, dietary deficits and functional deficits poor mental and physical performance, immunity etc. The cumulative burden of marginal malnutrition on medical expenses and productivity is substantial. Obviously, India has got its developmental priorities wrong and banked upon the clichéd trickle-down theory, that assumes that social development will automatically occur if there is economic growth. Most countries of South Asia, besides China and Sri Lanka have performed much better. India has also failed to progress in the Millennium Development Goals related to reducing hunger (MDG-1) and child mortality (MDG-4).

The question is: where has India gone wrong?

The Problems of Low Birth Weight (LBW) Babies and Gender Bias

Almost a third of babies in India are born with LBW (<2.5 Kg)¹. They have higher fat to muscle ratio and they begin their life with a handicap. Maternal malnutrition is the major cause of LBW. Maternal age, prematurity, lack of antenatal care, infections and heavy physical work during pregnancy all contribute. High incidence of LBW points the finger at neglect of females from birth. A healthy girl child grows up as healthy adolescent girl and a healthy woman, physically and mentally prepared to take on the burden of child bearing. Several other indicators like high maternal mortality, higher incidence of micronutrient deficiencies in women than in men, low weight gain during pregnancy and perhaps the most important; the low sex ratio, particularly juvenile sex ratio, all point to gender bias and neglect of females in India. Over the past decade, juvenile sex ratio has declined from 927 girls for 1000 boys to 914, even though overall sex ratio has improved marginally from 933 to 9407. This shows that girl babies are eliminated. Female foeticide cannot be attributed to poverty, since juvenile sex ratio is the lowest in relatively affluent States like Punjab, Haryana and Delhi. There is a strong cultural bias against females in India and unless social engineering is done to remove this bias, the problem of malnutrition in children will persist.

Babies born with LBW have higher morbidity and mortality. Their growth rate is slower (stunting); they have lower physical and mental performance, and there is an adverse outcome of future pregnancy in the daughters. LBW babies have greater susceptibility to the adult-onset, lifestyle associated, chronic, non-communicable diseases (NCD) like obesity, hypertension, diabetes, cardiovascular diseases and some types of cancers. This observation referred to as foetal origins of adult diseases was first made by the British doctor Barcus and has received independent support from India⁸. It is of considerable significance for a country

like India which is in developmental transition. India is already showing increasing trends for these diseases. In fact, India is the diabetic capital of the world and there is a growing incidence of CVD at young age. Thus, maternal malnutrition leading to intrauterine malnutrition and growth retardation in foetus predisposes to both communicable as well as non-communicable diseases in the progeny. A window of opportunity for rehabilitation exists in the first year of life. Therefore, if a beginning has to be made to fight child malnutrition, it should be with female health and nutrition, beginning with girl child. Recently, NCDs (heart disease, diabetes *and* cancer) have caught up the attention of UN, since three out of every five deaths are caused by these diseases. The issue was discussed at a high level meeting held on September 19-20, 2011⁹. However, the emphasis was on preventive measures in adults like smoking, diet, exercise etc. Important as these are, the fact that unlike in the developed countries, in developing countries like India, intrauterine malnutrition and consequent low birth weight may be the genesis of these diseases is often overlooked.

Nutrition Security Goes Beyond Food Security

Nutrition security implies 'physical, economic and social access to age and physiological status – appropriate balanced diet, clean drinking water, safe environment and primary health care'. Thus nutrition security goes beyond food security. All of these have to receive attention in a synchronised way, even though the responsibilities may lie with different ministries and departments. While all the components are important, this write-up will focus on food security, where agriculture has to play an important role. Adequate stocks of cereals at national level do not ensure household and individual food security to ensure a balanced diet for which there has to be Awareness at all levels and Access at Affordable cost to cereals and millets, legumes, vegetables & fruits and foods of livestock origin. The fourth A – Absorption has to be ensured with access to safe drinking water and environment. Table 1 gives an estimate of number and percentage of undernourished in India since the base year 1990-92^{13,14}.

Indian Diets

Country-wide surveys done by the National Nutrition Monitoring Bureau (NNMB) since early 1970s, reveal the following: 1) Indian diets are qualitatively deficient in micronutrients (MN), because of low intake of MN-rich foods like vegetables, fruits, millets, pulses and animal products. 2) Within a family, diet of preschool

Year	Total Population	Undernourishment		
	(Million)	Number (Million)	Per cent	
1990-92	863	215	25	
1995-97	949	202	21	
2001-03	1050	212	20	
2005-07	1116	221	20	
2009-10	1168	238	20	

 Table 1. Number and percentage of undernourished people in India since the base

 year 1990-92

Source: Ministry of Agriculture, Gol, 2007 and FAO, 2010 10, 11

children, particularly 1-3 years old is more deficient than that of adults (Tables 2 & 3)². More than 70% of preschool children consume less than 50% RDA^{*} of iron, vitamin A and riboflavin (vitamin B_2). Dietary deficiencies of other micronutrients like calcium and folic acid are also rampant. It is thus obvious that strategies for improving access to balanced diet at affordable cost for all sections of the society are needed. Along with access to food, there has to be nutrition literacy in all sections of the society to ensure right policies and programmes, knowledge about proper feeding practices (particularly for the most vulnerable groups like infants and children), disease-free environment and safe drinking water to ensure absorption and assimilation of nutrients from food.

Food	1-3 years	Women (>18 years, sedentary)	Men (>18 years, sedentary)
Cereals & millets	20.1	5	9.2
Pulses	64.5	49	49.1
Green leafy vegetables	84.8	86	79.6
Other Vegetables	68.5	47	60.4
Roots and Tubers	49.8	35	50.4
Milk & milk products	97.3	57	90.1
Fats and Oils	96.0	57	60.8
Sugar	90.3	42	78.4

Table 2. Distribution (%) of subjects getting less than 50% Recommended Dietary Allowance $(\text{RDA})^{\text{`}}$

Source: National Nutrition Monitoring Bureau, Report, 2009²

Nutrient	1-3 Years	Women (>18 years, sedentary)	Men (>18 years, sedentary)
Energy	42.0	5.6	10.9
Protein	24.6	14.2	16.7
Calcium	79.9	46.3	40.7
Iron	73.5	85.1	73.0
Vitamin A	86.6	85.7	84.9
Thiamin	46.3	9.6	21.1
Riboflavin	84.9	72.9	80.6
Niacin	37.6	4.2	11.9
Free Folic acid	45.1	63.2	52.1
Vitamin C	77.6	46.1	45.6

Table 3. Distribution Percent of subjects getting less than 50% RDA of nutrients

Source: National Nutrition Monitoring Bureau Report 2009²

Successive surveys done by the NNMB show significant reduction in the consumption of all food groups in all the ages and consequently nutrients. This is a matter of great concern.

Food Production in India – Neglect of Pulses and Millets

Thanks to the Green Revolution, production of cereals including millets showed impressive increase from early 60s to mid-90s, without much increase in area (Table 4). However, since then, Green Revolution fatigue has set in and production of these staple grains has plateaued (Table 4). Some revival occurred in 2011. Unsustainability of the resource-intensive technologies of Green Revolution and its adverse impact on soil health and environment is being realised, the simply need

Area, Lakh Hectares	1955-56	1975-76	1995-96	2005-06	2008-09
Millets	363.42	349.62	240.86	208.48	185.70
Cereals	873.5	1037.24	987.40	992.08	1007.39
Production Lakh tons	1955-56	1975-76	1995-96	2005-06	2008-09
Millets	140.7	199.61	179.88	181.40	186.18
Cereals	695.24	1326.07	2066.96	1952.12	2199.99

Table 4. Area and production of millets and cereals – time trends¹²

for a paradigm shift towards resource-efficient evergreen Revolution using green methods of farming with lesser dependence on chemical fertilisers and pesticides and greater water use efficiency. Unfortunately, Green Revolution has bypassed millets (Table 4) and pulses¹² which are a rich source of minerals and B-complex vitamins (except vitamin B₁₀), and fibre. Pulses are also a major source of proteins in vegetarian diets. A combination of cereals/millets with pulses gives balanced protein (essential amino acids) since the deficiency of lysine in former is made good by pulses and deficiency of methionine in pulses is made up by cereals. Millets are orphan grains confined to less productive areas with water scarcity. Some improvement in the productivity of millets has however also occurred (Table 4) but there is a vast gap in achieving technology transfer from experimental farm to farmers' fields. The Food Security Mission set up in 2007 has helped to increase the production of pulses by a couple of million tonnes, but not enough to meet the need of growing population. Besides production, high cost has put pulses beyond the reach of the poor. Even the currently debated Food Security Act fails to address the issue of access to pulses, though the recommended food basket does include millets. Highly subsidised rice schemes in Andhra Pradesh and Tamil Nadu have adversely impacted production and consumption of millets. Traditionally millet-eating populations are turning to rice as the staple. This trend must reverse both for nutrition and environment security. Millets and pulses need lesser water. They are temperature and drought-tolerant and are amenable to mixed cropping along with vegetables. Thus, a millet-pulse-vegetables farm is a nutrition-packed eco-friendly cropping system.

Even though, the quantum of production of cereals is inadequate to meet the demand of the growing population, precious grains are allowed to rot due to lack of storage facility and farmers have to resort to distress sale. The crop holiday declared by some farmers in Andhra Pradesh is a case in point. The farmers suffer if they produce more and also suffer if they produce less. Since modern storage structures like silos are expensive, the traditional methods of storing food grains in a decentralised manner need to be revisited and adopted with some innovations.

Though, India is the top producer of milk and among the top two producers of horticulture products, but what is produced is insufficient to meet the needs of the population. High cost of production and market price put these protective foods out of reach for the poor. Children who need these foods are the worst hit. Even the farmers who produce these commodities, prefer to sell them, rather than use them for their homes. Inadequate storage facilities, cold chain and processing result in loss of almost 40% of produce. Improved storage facilities and value

addition need high priority. The National Horticulture Mission talks only of income and export. Improved nutrition security is not one of the stated objectives. Over the years, food preferences have tended to change and the grain share of diet has decreased. The recent expert group of ICMR has suggested downward revision of 4-8% for RDA for calories for men on account of lower physical activity. Double labelled water and heart rate monitoring methods were used for computation of total energy expenditure, extrapolated to requirement.¹³

2. STRATEGIES FOR INCREASING HOUSEHOLD FOOD SECURITY PARTICULARLY ACCESS TO MICRONUTRIENTS

Increased Production to Consumption

Since Indian diets are qualitatively more deficient in micronutrients (MN) than say proteins or fats, special efforts are needed to improve access to MN. This can be achieved through increased production and consumption of foods rich in micronutrients. This requires understanding of locally available MN-rich foods and appropriate farming strategies to produce them. Household and village-level production through homestead gardens, backyard poultry, dairy, fish ponds etc. can increase access to MN-rich foods at household level and shield against price rise of these foods in the market. India's effort at urban and per-urban agriculture (UPA) which involves production within cities and towns and surrounding areas is very weak. This can be in the form of a back-yard garden or community farming on common lands in association with neighbours. Many countries practise UPA successfully.

Nutrition education for the professionals as well as community is very essential to ensure proper strategies for production and home consumption. Some national and international studies emphasise the importance of homestead production of vegetables, fruits, pulses, millets and foods of livestock origin. In a four-nation study in Asia, Hellen Keller Institute demonstrated the positive impact of intensive home gardening with technological inputs on the frequency and variety of vegetables consumed by preschool children and reduction in the incidence of anaemia in children, though not in adult women¹⁴.

Cuba's food security strategy is a remarkable example of how a nation rose from ashes to achieve food security¹⁵. Every bit of cultivable and even non-cultivable land was commissioned for food production through appropriate S&T inputs. Urban food production was an important component. Appropriate measures to ensure affordability besides access were also put in place. Cuba invested in R&D

in organic methods of farming using microbial technologies. This is yet another area where India needs to do more since petroleum products are fast going out of reach.

Brazil's Zero Hunger project steered by President Lula da Silva is another example of how a large, overpopulated country reduced hunger and even achieved the targets of MDGs through right leadership, determination, strategies for enhancing production and ensuring social justice in distribution including the approach of Conditional Cash Transfer (CCT)¹⁶.

In a recent small study in Medak district of Andhra Pradesh, diversification from agriculture to nutritionally and environmentally promotive horticulture in a dry land area showed that homestead production of vegetables can shield the households against the adverse impact of price rise¹⁷. Despite inadequate production, the farmers sold 25-50% of the produce since "economic compulsions outweighed nutritional wisdom". Along with production, poverty-alleviation programmes are very important for achieving food security.

Biofortification

Biofortification is a seed-based approach where the germplasm is enriched with specific nutrients-protein, amino acids, fatty acids, micronutrients. It can be done by conventional breeding, marker driven molecular breeding, or genetic engineering. The first two are non-controversial since gene transfer is done within a species (cereals, pulses, vegetables etc) from a well-endowed variety to another with high productivity/location suitability. On the other hand, genetic engineering where genes are transferred using recombinant DNA technology within food crops or from non-food species to another has become controversial with regard to environment and health safety. Biofortified plants grow better. In India, the potential impact of biofortification is believed to be promising¹⁸. India is a part of the Harvest Plus Global Alliance which is a biofortification challenge programme. Some of the promising products that have emerged are: β carotene-rich sweet potato and cassava, zinc and iron-rich rice, wheat and maize. The ICAR, State Agricultural Universities and the National Institute of Nutrition are involved in this programme through the Department of Biotechnology. Golden rice rich in β carotene, high iron rice (high ferritin gene from mangroves) and protein-rich potatoes¹⁹ are examples of genetic engineering for biofortification. Indian scientists have developed many promising varieties through conventional and molecular breeding. Once proven biosafe, these technologies should be quickly transferred from lab to land and reap the benefits.

Food fortification

Food fortification is a time-tested and cost-effective strategy for preventing MN deficiency. The iodised salt programme in India is a case in point. Recently, the National Institute of Nutrition (NIN) has developed iron-fortified iodised salt (double fortified salt-DFS). Government order for its production has been notified and it should replace iodised salt²⁰. Fortification of cereals with iron needs serious consideration, since they are staple foods consumed by all sections of society. Technologies for iron-fortified wheat and ultra rice have been developed. Doubts have been raised about bio-availability of iron from wheat '*atta*' because of high phytate (inhibitor of absorption) content. The inhibitory effect of phytate may be bypassed by some chelating complex like Na-Fe-EDTA and or enzyme phytase. The higher cost of this salt may be off-set by better bioavailability and hence lesser dose of fortification.

Studies to ascertain the bioavailability of MN from fortified cereals need to be conducted. Recently, a Chennai-based firm has put in market iron-fortified red gram dal. In many countries, cereal products are fortified with folic acid to prevent neural tube defects. Addition of vitamin B_{12} along with folic acid needs to be considered to reduce serum homocysteine levels – an independent risk factor for cardiovascular diseases.

For food fortification, the food item selected should reach the poor who are most malnourished. Fortification of high-end foods and beverages may have market but high cost keeps them out of reach for those who need them the most. Some of the common questions to be addressed for food fortification are: commodities to be fortified, nutrients to be added, levels, technologies, bioavailability, monitoring, Human Resource Training (HRT) (for skill development) and Grand Mothers Taste (GMT) (for sensory perception), labelling etc. There has to be a national strategy for food fortification to ensure that MN imbalances do not occur. Consumer awareness has to be built to read and understand the labels. Lessons should be learnt from international and national experiences.

Supplementary Feeding Programmes

One of the largest supplementary feeding programmes in the world is the feeding component of the Integrated Child Development Scheme (ICDS) for pre-school children in India. This however, has failed to impact positively on child nutrition. One of the reasons may be targeting. The most vulnerable age group, 6-24 months infants escape because these kids cannot stay in the '*anganwadi*' centres and partake of feeding. Take-home food is shared by the family. Operation research is needed to

address this issue. The Mid-day meal programme, more recently introduced has helped to improve school attendance, but not nutrition.

Micronutrient Supplementation Programmes

The two large programmes are: 1) Anaemia prophylaxis programme in which ironfolic acid supplements are given to pregnant and lactating women and preschool children. Recently, adolescent girls were also included in this programme but implementation is tardy. Unfortunately this programme has failed to reduce the incidence of anaemia in India. Operation research is needed to identify the causes. Poor compliance is a possibility. The present level of supplements is meant for preventing anaemia and perhaps insufficient to treat moderate and severe anaemia, which are more common. Addition of other haemopoetic MN like vitamins B₁₂, and C and zinc in a multi-nutrient tablet also needs to be investigated.

2) Massive dose vitamin A supplementation to prevent nutritional blindness. In this programme, children between 6-60 months are given a massive dose of 200,000 IU of vitamin A every six months. In recent years, severe clinical forms of vitamin A deficiency (keratmalacia) leading to blindness have reduced markedly, but this cannot be attributed to the vitamin A supplementation programme which is being implemented poorly. Some eminent nutrition scientists have questioned the continuation of this programme but in view of the fact that biochemical evidence of vitamin A deficiency as judged by serum levels of vitamin A is rampant and dietary intake as discussed earlier is low, but recently, the experts have recommended its continuation in areas where vitamin A deficiency is a public health problem as judged by clinical evidence-prevalence of Bitot spots more than 0.5%.²¹

3. CHALLENGES OF FOOD PROCESSING AND FOOD SAFETY

Food processing prevents wastage, generates employment, and enhances nutrition security. Ready-to-cook and ready-to-eat foods would serve as convenience foods for busy housewives and others. The challenge is to develop low-cost and processed nutritious foods within the reach of the poor and low middle-income population. Food processing should not result in siphoning off food for high-end processed foods, which would benefit only the rich, depriving the poor of basic foods. Reasonably priced, ready-to-cook, nutritionally balanced processed foods have a place in infant and child feeding.

Food processing has to be viewed at primary, secondary and tertiary levels. Primary processing at the farm level (cleaning, sorting, grading and packaging) and linking

it with market would help to increase the income of farmers. However, often the farmers prefer to dump their produce of the day for perishables like vegetables, with a middle man, since they need the money for immediate use. A change in mindset with appropriate advocacy, training and some financial buffering systems need to be put in place, so that the farmers realise the importance of primary processing and value addition for better price. China has benefitted her farmers by setting up rural food processing industries. The idea is good, but appropriate strategies to link the small rural Food Processing Centres to organised Processing Centres with involvement of farmers, and appropriate forward-backward linkages are needed for a win-win situation. The dairy industry in India spearheaded by Amul is a successful experiment where both the producers and the consumers have benefitted. However it has not helped to improve milk consumption by the children of poor families due to distributive injustice. Processed foods have played a role during natural calamities and famines. The most recent experience of CFTRI in supplying ready to cook/eat balanced foods in tsunami-affected areas is an experiment worth documenting and emulating. IUFoST has recommended this Indian model to ICSU for formulating a Disaster Management Committee which may be in place shortly.

Food safety should be a matter of concern right from farm to plate. At farm level, contamination can occur through pests, microbial diseases, air-borne contaminants, and chemicals (fertilisers, pesticides). Good Agriculture Practices (GAP) should be the buzz word both for national consumption and export. Food safety has to be ensured even beyond the farm at the level of transportation, storage, value addition, marketing, food preparation, and serving by ensuring proper hygienic practices and storage. Thus the foods produced, stored, handled, distributed, and cooked should be safe, free from microbial and chemical contaminants at all levels of food chain. With growing problem of antibiotic resistance to enteric pathogens like *Salmonella*, *Shigella*, *Vibrio cholerae*, and other organisms like *E. coli* and *Klelbsiella* residing in gut of patients; need for prevention rather than treatment, has become vital²². Human resource to understand all dimensions of food safety, including Hazard Analysis and Critical Control Point (HACCP) to pick up the point of contamination is needed. With globalization and WTO regime, the challenge of meeting international standards has become imperative.

4. POLICIES, PROGRAMMES AND MISSIONS FOR NUTRITION SECURITY

The Article 47 of Constitution of India states that "State shall regard the raising of the nutrition and the standard of living of its people and the improvement of public

health as its primary duties". Since then several programmes, Missions and Acts like the National Nutrition Policy (1993), National Nutrition Plan of Action (1995), and National Nutrition Mission (2001) have been mooted with no follow-up action. More recently, the Coalition for Sustainable Nutrition Security under the leadership of Professor M.S. Swaminathan has recommended agenda for action²³. The Indian National Science Academy (INSA) has recently released two papers: 1) *Nutrition Security for India: Issues and the Way Forward, A Position Paper*, (2009) and 2) *Micronutrient Security for India – Priorities for Research and Action* (2011) based on extensive scientific consultation²¹. Prime Minster of India, Dr Manmohan Singh has called malnutrition a curse and constituted the National Council on India's Nutrition Challenges.

Nutrition should be stated as an explicit goal with measurable parameters for monitoring of missions such as National Food Security Mission, National Horticulture Mission whose emphasis is only on production, income and export and National Rural Health Mission whose emphasis is only on communicable and non-communicable diseases. As mentioned earlier, Food Security Bill – a diluted version of The National Advisory Committee's recommendation for Food Security only includes cereals and millets. Inclusion of millets is to be appreciated but food security needs a basket of foods including pulses, vegetables, fruits, foods of animal origin and oil. Money released from purchase of cereals can be diverted to these foods, provided there is awareness in the public. India is not lacking in policies and programmes beamed at improving nutrition security but lacks in their implementation. With proper leadership, convergence between the efforts of various departments and administrative efficiency, India too can become hunger-free. The economic, health and social cost of malnutrition is too heavy.

5. PRIORITY ACTION AREAS

A complex problem like child malnutrition cannot have a one shot simplistic solution. Some of the priority action points for improving nutrition security are suggested.

Maternal and Child Health and Nutrition

 Female health and nutrition should receive high priority to address the issue of LBW babies-where the problem of child malnutrition begins. Apart from science and technology, behavioural change through social engineering to eliminate gender prejudice and administrative efficiency to improve the working of existing safety net programmes are needed. 2. Promotion of the WHO guidelines for infant feeding. Exclusive breast feeding for the first 6 months and age-appropriate complementary feeding after that. **Media help to be taken for creating awareness**.

Increase Access to Food

- 3. Adopt nutritionally and environmentally promotive agriculture. For this, the component of human nutrition should be strengthened in agriculture (and medical) education and not left only to food and nutrition departments in agricultural universities.
- 4. Promote homestead production of vegetables, fruits, poultry (high egg-yielding breeds), milk, fish and even pulses and millets. It improves access to these income-elastic nutritious foods. Urban agriculture needs to be taken up in right earnest.
- 5. Reduce wastage of farm produce by building storage facilities/cold chain etc. Identify traditional methods for decentralised storage. Nation cannot feed over a billion people by allowing wastage of 30-40% farm produce.
- 6. Make agriculture remunerative with appropriate support systems and pricing policies and not populist schemes like Rs 1/- kg rice which impact adversely.
- 7. Use all scientific and technological approaches to augment food production, food protection and biofortification. Fight prejudice and opposition against GM crops with adequate research and monitoring to ensure their safety to health, environment and biodiversity.
- 8. Develop affordable, nutritious, ready-to-cook/eat processed foods with appropriate forward/backward linkages to benefit the farmers and resource-poor consumers.
- 9. Ensure food safety from farm to plate with proper legislation, awareness and monitoring.
- 10. Conduct operation research to find out lacunae in existing feeding and MN supplementation programmes where a lot of money is being spent without adequate impact on child nutrition.
- 11. Promote nutrition literacy among politicians, administrators and professionals from health, agriculture, education, media, and other categories (besides the public at large) through special short-duration sensitisation/awareness programmes and involvement of multi-media channels, including use of icons.

12. Pass the Food Security Act at the earliest by making it universal rather than targeted. Creamy layer can be eliminated.

Policy Issues

- 13. Leadership at all levels and governance to ensure convergence between the efforts of different departments/programmes.
- 14. Make nutrition an important input and output parameter for all Government programmes that can directly or indirectly impact nutrition.
- 15. Streamline targeting, monitoring and impact assessment. Women and children should be the priority
- 16. National Nutrition Monitoring Bureau which conducts surveys on food and nutrition should be a permanent institution and cover all the States of India. Suitable nutrition surveillance system should be put in place .
- 17. Nutrition should be the focus of national development, and not treated as trickle down beneficiary of economic development.
- 18. An integrated and holistic life-cycle approach from paediatric to geriatric is very important in all the programmes interlinking and networking with each other. Otherwise with fragmented programmes, the desired nutrition will not reach the target population.
- 19. Inter-Ministerial integration in all of the programmes and the idea of Nodal Agency in each Ministry with an identified person and then a Committee with a common charter inclusive of scientists, engineers and technologists in this Committee can mean a lot in the implementation. (Example has been the success of milk and dairy products because of the integrated approach).

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