The large decline in the observed calorie intake of the poverty-line class noted earlier could well be the outcome of this strategy in a context where cereals are treated as inferior goods. Therefore, unless it can be shown that the actual calorie intake continues to be adequate for the present age-sex-occupation distribution of this class, mindless continuation of this type of anti-poverty programmes may be fraught with danger. The alternatives, however, are not obvious at all, since income support-type interventions, which would have only the income effect without the off-setting substitution effect, could make matters even worse. Solutions would have to be sought in the behavioural domain, such as through social marketing efforts, in which our track record unfortunately has not been very good.

On the other hand, if for the purpose of argument it is assumed that this shift has improved the nutrition content of the food basket of the poverty-line class, and cereals are assumed to be inferior goods, then its immediate implication is that an income transfer mechanism would be more cost efficient than a food subsidy for achieving the same end result. Thus, if cereals are indeed being treated as inferior goods by the poverty-line class, the present food subsidy mechanisms are either undesirable or inefficient regardless of whether the final nutritional outcome is positive or negative. This is a very serious finding, which goes against conventional wisdom, and its implications are far-reaching. Therefore, before any further steps are taken regarding the food security system in the country, a careful appraisal needs to be made of the consumption behaviour of different expenditure classes in different parts of the country in order to gauge the appropriateness of such interventions.

In the October 2004 issue of NFI Bulletin, Imrana Quadeer and Anju Priyadarshi have discussed the implications of expenditure and consumption patterns in India on Nutrition Policy of India. This thought-provoking article has raised certain issues which merit further discussion and comment.

**IMPACT OF GREEN REVOLUTION ON FOOD SECURITY**

Food is the most important, though not the exclusive, determinant of health. However, any food, which can satiate hunger, does not ensure good nutrition and good health. For that a balanced diet inclusive of a variety of foods such as cereals/millets, pulses, vegetables, fruits and foods of animal origin is needed. Only a balanced diet can ensure supply of a proper blend of all the nutrients-carbohydrates, proteins, fats, vitamins, minerals and the new entrants-health promoting phytochemicals.

Thanks to the Green Revolution, India's total food grain production increased from 50 million tons in 1950-51 to over 200 million tons in the year 2000-01 - a four-fold increase. The population during the same period increased from 300 millions to 1 billion (1 billion)². Thus, the increase in food grain production surpassed population growth and India turned from a 'nation with a 'begging bowl'', to a country with food grain reserves to provide some degree of national food security. This impressive achievement, however, has some worrisome aspects.

- Green Revolution fatigue seems to have set in, and unless new technologies and strategies are urgently put in place, India's food grain reserves may disappear. As it is, part of the reserves is due to lack of purchasing power among the poorest of the poor who cannot afford to buy enough to meet even the basic calorie/protein requirement. The National Sample Survey Organisation (NSSO) surveys indicate that about 7 per cent of Indians sleep hungry every day. Programmes like food for work programme, subsidised public distribution system (PDS) and supplementary feeding programmes have had only marginal impact on ensuring household food security for the poor, perhaps, due to administrative constraints and leakages.

- The Green Revolution concentrated primarily on cereals like rice and wheat, which responded to innovations in agriculture technologies leading to development of high yielding varieties. However, these crops are water guzzling – particularly paddy and have had adverse environmental impact. Production of millets, legumes/pulses and oil seeds, which are less water demanding and nutritionally better endowed, has remained almost static². Apart from scientific and technological reasons, the pricing policy of the government in terms of minimum support price and procurement price as well as PDS has favoured production of rice and wheat, leading to the neglect of millets and legumes. Higher support price for fine cereals is responsible for the accumulation of cereal stocks, which reached 60 million tons in mid 2002; but has come down since³. Farmers, who traditionally raised millets, have shifted to growing and eating fine cereals with adverse impact on nutrition, environment, and threat to biodiversity with regard to some of the local minor millets.

**NUTRITION SECURITY vs FOOD SECURITY**

Food security has come to be regarded principally as food grain security, mainly meeting the requirements of energy and proteins. However, for nutrition security, food production should ensure availability of diverse foods, which can ensure both macronutrient as well as micronutrient security. Food grains (cereals and millets) alone cannot meet the requirement of micronutrients like vitamins and minerals, and health promoting phytochemicals. It is not the case of "either/or" but 'all'. Nutrition security is a broader term and implies food grain security as well. In fact, diversification even within food grains to increase the production and availability of millets and legumes should
With skewed income growth and increasing gaps between haves and have-nots there are serious problems of distribution, and diets of poor remain very deficient in these protective foods. That, however, cannot be a reason to ignore them. The problem is compounded by the losses of these perishable commodities due to poor storage facilities and inadequate infrastructure for food processing. Emphasis has to be on intensifying production in an ecologically benign manner and reducing wastage through appropriate cold chains and value addition through food processing. Horticulture is labour intensive and can generate employment particularly for women through farming and processing. Environmentally benign technologies like solar drying and fermentation need to be promoted to improve the off-season availability of vegetables and fruits.

Scientific opinion counters the fear that emphasis on horticulture and animal husbandry will take away land for food grains undermining basic food security. These crops are largely grown on land not suitable for food grains—wasteland, hill slopes, coastal areas etc. Animal production systems in India are based on farm waste and by-products. With research, efficiency can be improved. However, one has to be mindful of these concerns and ensure that animal production in India does not go the western way, (now being adopted by some South East Asian countries), where food grains are grown to feed livestock. It is estimated that in countries which are largely non-vegetarian, the per capita consumption of food grains is about 1000 kg as against the actual requirement of about 180 kg/year in communities which are largely vegetarian. Some of this however, cannot be avoided. Large increase in maize production in India is driven by the requirement of poultry feed.

**LESSONS FROM DIET SURVEYS**

Recent diet surveys by the National Nutrition Monitoring Bureau (NNMB) in rural populations clearly show that Indian diets are deficient in all types of foods; the gaps being marked for pulses and legumes, vegetables, particularly GLV, fruits, milk and even fats and sugar. Though inexpensive, the intake of GLV is very low, and here is a case for nutrition education. The intake of fruits is less than 25 per cent of the Indian Council of Medical Research (ICMR) recommended dietary allowance (RDA) of 100 g. The intake of roots and tubers among Indians is high because of the inclusion of onions (K. Vijayraghavan, personal communication). It may be pointed out that this calculation is based on the currently used estimates of Recommended Dietary Allowance (RDA), for vegetables and fruits, which need upward revision, as has been done internationally. Children's diets are deficient in cereals and millets as well.

As a result of inadequate intake of protective foods, the gap in the intake of micronutrients, particularly that of iron, vitamin A and riboflavin is larger than that of calories and proteins (Table). Without adequacy of micronutrients, calories and proteins supplied through food grains will not be optimally utilised.

Quadeer and Priyadarshi argue that, while the proportion of calories coming from cereals has decreased for the middle income and the rich due to dietary diversification, the poor still depend on cereals for their calories and protein requirement. These authors have also shown that almost 70 per cent of the very poor get less than 70 per cent of calorie requirement and 94 per cent get less than 90 per cent of the calorie requirement. In this scenario, they plead for concentrating on production of food grains and even suggest that adequate intake of food grains would take care of micronutrient deficiencies as well. While there is need for a protective net for the poor to ensure that their basic food needs are met, this net cannot be through over emphasis of food grains and neglect of other protective foods.

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**Table: Median intake of Nutrients by Rural Indians**

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Sex</th>
<th>Protein</th>
<th>Energy</th>
<th>Ca</th>
<th>Fe</th>
<th>Vitamin A</th>
<th>Vitamin B₁</th>
<th>Vitamin B₂</th>
<th>Folic Acid</th>
<th>Vitamin C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>M/F</td>
<td>81.4</td>
<td>56.9</td>
<td>30.2</td>
<td>33.0</td>
<td>12.5</td>
<td>66.7</td>
<td>28.6</td>
<td>60.7</td>
<td>33.3</td>
</tr>
<tr>
<td>4-6</td>
<td>M/F</td>
<td>87.3</td>
<td>60.9</td>
<td>45.0</td>
<td>35.0</td>
<td>15.5</td>
<td>66.7</td>
<td>30.0</td>
<td>69.0</td>
<td>37.5</td>
</tr>
<tr>
<td>10-12</td>
<td>M</td>
<td>69.6</td>
<td>67.3</td>
<td>39.7</td>
<td>28.8</td>
<td>12.7</td>
<td>82.0</td>
<td>38.5</td>
<td>74.0</td>
<td>52.5</td>
</tr>
<tr>
<td>10-12</td>
<td>F</td>
<td>64.6</td>
<td>73.8</td>
<td>38.5</td>
<td>50.0</td>
<td>29.0</td>
<td>90.0</td>
<td>41.7</td>
<td>86.1</td>
<td>47.5</td>
</tr>
<tr>
<td>&gt;18</td>
<td>M</td>
<td>93.8</td>
<td>80.1</td>
<td>81.0</td>
<td>50.0</td>
<td>18.7</td>
<td>100.0</td>
<td>43.7</td>
<td>59.4</td>
<td>70.0</td>
</tr>
<tr>
<td>&gt;18</td>
<td>F</td>
<td>97.8</td>
<td>88.8</td>
<td>68.0</td>
<td>40.7</td>
<td>15.3</td>
<td>109.0</td>
<td>46.1</td>
<td>50.0</td>
<td>55.0</td>
</tr>
</tbody>
</table>

* Moderate activity

**Source:** NNMB report 2002

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**References**

NFI's Silver Jubilee

The Nutrition Foundation of India has now completed twenty-five years of its service to the Nation. To commemorate this occasion, the Foundation organised Silver Jubilee celebrations from November 29th to December 1st, 2004. Dr M S Swaminathan (President, M S Swaminathan Research Foundation, Chennai) inaugurated the Celebration.

A major feature in the inauguration was the Release of the 25 Year Report of NFI by Dr Samlee Plianbangchang (RD, WHO, SEARO). This was followed by an Address by Dr Plianbangchang. This report will soon be available on the NFI website www.nutritionfoundationofindia.org.

The Chief Guest, Dr M S Swaminathan delivered the C Ramachandran Memorial Lecture on "Mission 2007: A Nutrition Secure India".

The inauguration was followed by a two-day seminar on "Towards India’s Nutritional Well-Being". The Seminar was attended by a large number of delegates including nutritionists, medical/para-medical people, policy makers and students. The details of the programme are given below:

Session 1: Nutrition Orientation to Food Production Policies
Chairman: Dr. M. S. Swaminathan
Augmentation of Pulse/Legume Production: Dr Masood Ali
Horticultural Production: Dr K L Chadha
Milk – Strategies for Further Augmentation of its Production and Consumption: Dr N Sharma
Fisheries: Dr S Ayyappan

Session 2: Promoting Better Access to Food for Poor Households
Chairman: Dr Sayeda Hameed
Poverty-Undernutrition Linkages: Dr Pronab Sen

Session 3: Energy Requirements: Need for Revision
Chairman: Dr. Ramesh Bijlani
Assessment of Energy Requirements: Dr Prakash Shetty
Energy Requirements for Indians: Dr B.S. Narasinga Rao
Body Compositions and BMI Criterion for Indians: Dr A.V. Kurpad
Health Implications of Under and Over Nutrition: Dr S.K. Bhargava

Session 4: Strengthening Nutrition Scientific Infrastructure
Chairperson: Dr Kamala Krishnaswamy
National Facility for Systematic Analysis of Food Stuffs: Dr Ghafoorunnisa
Monitoring Changing Nutritional Status: Dr K. Ramachandran
Nutrition of the Hospitalized Patients: Dr R.K. Tandon
Dual Fortification of Common Salt – Technological Hurdles and Way Ahead: Dr B. Sivakumar

Advanced Centre for Nutrition Research at NFI

During the Silver Jubilee Inauguration, Director General – Indian Council of Medical Research (ICMR) Prof N K Ganguly announced that ICMR would be setting up an Advanced Centre for Research in Nutrition at NFI. This Centre will deal with Nutrition Policy Research.

Regional Meeting on Food and Nutrition Security

The Nutrition Foundation of India is organising a three-day meeting on Food and Nutrition Security in South Asia (March 7-9, 2005). This meeting is being organised with the support of Government of India (GOI) and the co-operation of the United States Department of Agriculture (USDA).

Study Circle

Dr Asok C Antony, (Professor of Medicine, Indiana University School of Medicine, USA) spoke on ‘Periconceptional folates for the Prevention of Neural Tube Defects’ on November 16th, 2004.

Dr Werner Schultink, (Chief-Child Development and Nutrition UNICEF, New Delhi) delivered a talk on ‘How to Increase Effectiveness of Strategies for Control of Anaemia’ on December 16th, 2004.

NUTRITION NEWS

The XXXVI Annual Conference of Nutrition Society of India held at the University of Mysore, Mysore on 5th and 6th November 2004 was a great success. The meeting was attended by almost 1200 delegates from all over the country. The theme of the Meet was "Bridging the Nutrition Gap through Value Addition". Prof Mark Wahlqvist delivered the Gopalan Oration on 'The New Nutrition Science: Solutions for Development'. Dr Kamala Krishnaswamy delivered the Sixteenth Srikantia Memorial Lecture on 'Turmeric: The Salt of the Orient is the Spice of Life'.

Dr Prakash Shetty (FAO, Rome) delivered the XXXI Kamla Puri Sabharwal Memorial Lecture on December 2, 2004 at Lady Irwin College, New Delhi. The title of the Lecture was "Food and Nutrition Challenges for the Urbanising Developing World".

The Fourteenth Biennial Conference of the Asian Pacific Association for the Study of the Liver (APASL) was organised from December 11th -15th, 2004 in New Delhi. Dr Sarath Gopalan, Deputy Director, NFI, co-ordinated a session on "Nutrition in Liver Disease" which focused on specific clinical settings involving nutritional intervention in patients with liver disease. Dr Gopalan also participated as a Moderator in the panel discussion on "Nutritional Management: Pre- and Post-liver transplant."