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Reading Material



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Introduction

Adequate nutrition is a basic human need. Only if people can satisfy their nutritional requirements on a regular basis, and use and utilize adequate and safe food with the respective energy, protein, vitamin and mineral content, is one of the most important pre-condition for an active, healthy and decent life.

Ensuring Food and Nutrition Security is fulfilling basic needs and ethical obligations

„Hunger is one of the worst violations of human dignity. In a world of plenty, ending hunger is within our grasp. Failure to reach this goal should fill every one of us with shame. The time for making promises is over. It is time to act. It is time to do what we have long promised to do - eliminate hunger from the face of earth.“

Source: Kofi Anan, Secretary General of the United Nations, at the World Food Summit: five years later in June 2002 in Rome

Prolonged lack of food and nutrients leads to various physical and mental impairments of human beings. It prevents children from growing into productive members of the society and be adults who are fully able to participate in the economic and social development of their countries. Sustainable food and nutrition security is life saving for people today and beneficial for future generations.

Human Rights and the Right to Food

Food insecurity and malnutrition are viewed as a violation of human rights. The International Covenant on Economic, Social and Cultural Rights adopted by the United Nations General Assembly in 1966 defined and formalized the right to food as a basic human right, which had already been mentioned in the Universal Declaration of Human Rights of the United Nations in 1948, and has been re-affirmed in 1974.

Right to Food

“Every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties”.

(Source: United Nations 1974)

However, “today, more than 800 million men, women and children are denied the most basic human right of all: the right to food.”

(Source: Kofi Annan, Secretary General of the United Nations)

The Evolution of Food and Nutrition Security Concerns

Global FNS has a history of more than 50 year, and has evolved through a sequence of definitions and paradigms. After the historic Hot Spring Conference of Food and Agriculture in 1943, in which the concept of a “secure, adequate and suitable supply of food for everyone” was accepted internationally, bilateral agencies from donor countries such as the USA or Canada were created in the 1950s and started to dispose of their agricultural surplus commodities overseas.

In the 1960s, when it was acknowledged that food aid may hinder for developing self-sufficiency, the concept of food for development was introduced and institutionalized. The creation of the World Food Programme (WFP) in 1963 is one prominent example.

The food crisis of 1972/74 marked a dramatic turning point from the past era of food abundance of donor countries to highly unstable food supplies and prices on the world market. As a result, food security insurance schemes, which assured international access to physical food supplies, were developed in the 1970s. Improved food security assurance was to be achieved through better coordination among donor organizations and agencies and food availability surveillance in recipient countries.

In the 1980s, following the success of the green revolution which helped to increase food production (food availability), it was recognized that food emergencies and even famines were not caused as much by catastrophic shortfalls in food production as by sharp declines in the purchasing power of specific social groups. Therefore, food security was broadened to include both physical and economic access to food supply. In this decade, poverty alleviation and the role of women in development was promoted.

In the 1990s, concrete plans were defined to eradicate or at least reduce hunger and malnutrition drastically. In addition, the human right to adequate food and nutrition was internationally reaffirmed and committed national governments to a more proactive role. Finally, reduced international public support of donor agencies reduced food aid to crisis management and prevention.

In the 2000s, decreasing hunger and malnutrition has increasingly come to be seen in the context of overall development, poverty reduction and the achievement of the Millennium Development Goals (SCN 2004). These internationally accepted development targets can only be achieved, if adequate food and nutrition are ensured for all members of a society

A holistic understanding of Food and Nutrition Security

Food security historically referred to the overall regional, national, or even global food supply and shortfalls in supply compared to requirements. But, with increased observation of insufficient food intake by certain groups (despite overall adequacy of food supply), the term has more recently been applied mostly at a community, local, household or individual level (Foster 1992). Further, the term has been broadened beyond notions of food supply to include elements of access

However, food security is a concept that has evolved over time. The most common definition proposed by the World Bank (1986) and was summed up by Maxwell and Frankenberger as “secure access at all times to sufficient food for a healthy life”.

According to a currently accepted definition (FAO 2000), Food Security is achieved when it is ensured that all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life”. Food is here defined as any substance that people eat and drink to maintain life and growth. As a result, safe and clean water is an essential part of food commodities.

Definition of Food and Nutrition Security

“Food and Nutrition Security is achieved, if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily utilized by all individuals at all times to live a healthy and happy life.”

The nutrition focus adds the aspects of caring practices and health services and healthy environments to this definition and concept. This aims at what is more precisely called ‘Nutrition Security’, which can be defined as adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times and thus in principle is more than food security.

To underline the importance of nutrition in our holistic approach our definition combines food and nutrition and we use the term “Food and Nutrition Security” emphasizing several aspects, i.e., not only ‘Availability’, ‘Accessibility’, but also ‘Use and Utilization’ of food.

Aspects of Food and Nutrition Security

Two factors influence the framework: a physical and a temporal factor. The physical determinant is the food flow: Availability, Accessibility and Utilization. The temporal determinant of FNS refers to stability, which affects all three physical elements. In this context availability refers to the physical existence of food, be it from own production or on the markets. On national level food availability is a combination of domestic food production, commercial food imports, food aid, and domestic food stocks, as well as the underlying determinants of each of these factors. Use of the term availability is often confusing, since it can refer to food supplies available at both the household level and at a more aggregate (regional or national) level. However, the term is applied most commonly in reference to food supplies at the regional or national level.

The Conceptual Framework of the Nutritional Status at Household Level

A reduced state of health may be due in part to tenuous access to health care, poor housing and environmental conditions, and is possibly worsened by malnutrition, which predispose individuals to diseases.

Food alone is not sufficient to secure a sustainable satisfactory nutritional status and, therefore, aspects of health must be considered. As a result, nutrition is the function of food intake and health status.

Food and Nutrition Security at the different social/administrative levels

Availability, Accessibility, Use and Utilization of food and the Stability of these three elements differ in their nature, causes and effects at the Macro, Meso and Micro level respectively. For example, food may be available in a country but not in certain disadvantaged districts or among discriminated population groups. The seasonality of food availability and utilization, for example, due to cyclic appearance of diseases, may be a rural but not an urban phenomenon.

Measures to assess the availability of food at the macro level are different from those used at the meso or micro levels.

At the macro level, precipitation records can predict future food production. Food balance sheets provide information on food availability at national level. The World Food Programme (WFP) developed the Vulnerability Analysis and Mapping (VAM) project to analyse the vulnerability to food insecurity of target populations. A prominent part of VAM is related to access to food. The demographic and Health Survey (DHS), funded by USAID, provides health data for many countries to help them design their national policy. FAO has developed the Global Information Early Warning System (GIEWS), which collects data related to temporary food insecurity. Under the leadership of WHO, several health surveillance systems have been developed and implemented to monitor the epidemiology of various forms of malnutrition and of selected diseases. At the meso or sub-national level, food market surveys provide data on the availability of

food. Qualitative surveys, such as food focus group discussions, provide information on accessibility to food for those in greatest need. District health surveys describe health conditions that may reflect food utilization problems.

Agricultural production surveys, intra-household food frequency interviews, immunization surveys and anthropometric surveys of children under five can be used to assess the availability, accessibility, and use & utilization of food and its stability at micro level.

Most common Food and Nutrition Security indicators at different social and Administrative levels

The most commonly used FNS indicators at different social levels according to the matrix found in National food availability depends on supply and demand. Therefore, data on the production of different food commodities, fertility rate and the trends in internal population should be reviewed to determine the national situation of food availability. Food prices and per capita food consumption are indicators for national food accessibility. The rates of stunting, wasting and underweight in children, low Body Mass Index (BMI) in adults, and low birth weight are FNS impact indicators that designate the extent to which food is adequately being used and utilized and converted into a satisfactory national nutrition situation. *Fluctuations in food prices and regional shortages of food availability or accessibility are sensitive indicators for national food and nutrition instability.*

At the meso level delayed harvest time and reduced staple food production are indications of reduced food availability. Food prices are sensitive indicators for accessibility. Types of sewage disposal and diarrheal diseases (DD) rates provide information on the effectiveness of food utilization. The comparison between pre and post harvest food availability and accessibility as well as chronic energy deficiency of women (low BMI) indicate temporal food and nutrition insecurity.

1. *The lack of stored food and the consumption of wild foods are indicators for reduced food availability at household level.*
2. *A reduced number of meals per day and increased rate of under- or unemployment may indicate low food accessibility.*
3. *Appearance of wasting, goitre or anaemia among household members are outcome indicators of reduced food utilization at micro level.*
4. *Finally, changes in pre-harvest food consumption practices and migration may be sensitive indicators for temporal food insecurity.*

Examples of most common FNS indicators at different social and administrative levels

Social Level	Availability	Accessibility	Use & Utilization	Stability
Macro	Food production fertility rate population flows	Food price wages per capita food consumption	Stunting rate wasting rate LBW rate	Food price fluctuation regional gaps
Meso	Harvesting time staple food production	Market and retail food prices	Latrine coverage DD rate	Pre-/post harvest food Women's BMI
Micro	Food storage consumption of wild foods	Meal frequency food frequency employment	Weight-for-age goitre anemia	Pre-harvest food practices migration

Gender and Food and Nutrition Security

Food and Nutrition Security is linked to a number of cross cutting issues in development of individuals and societies. These include gender, livelihoods, poverty and poverty reduction, HIV / Aids as well as conflicts, crises and natural disasters.

Women are the key to food and nutrition security. They play an important role as producers of food, as managers of natural resources, in income generation and as providers of care for their families. Yet, women often continue to have limited access to land, education, credit, information, technology and decision making bodies. Women are thus impaired in fulfilling their potential socio-economic roles in food and nutrition security and in ensuring care, health and hygiene for themselves and their families. This is aggravated by the fact that women themselves are often more vulnerable or more affected by hunger and malnutrition than men, especially by iron deficiency and undernourishment during pregnancy and lactation.

Women's rights

In many developing countries, women produce most of the food consumed by their families and communities. Yet women rarely have secure tenure to the land they work. In Nepal, India and Thailand, for example, less than 10 percent of women farmers own land. Although traditional land tenure systems rarely granted women outright ownership of land, they frequently protected their rights to work and manage enough land to provide for their families' needs. In many cases, those rights are now being eroded by changing socio-economic conditions, land shortages and tilting programmes that fail to recognize the value either of customary tenure practices or of women's contributions to agriculture. Improving access to land for women is essential to increase both food security and sustainable production. Only through such measures can it be ensured that women possess collateral and the security to invest in land and technology.

A number of constraints limit women's ability to improve their own and their children's nutritional status. These include, e.g., fewer employment opportunities of poor women compared to men, significantly lower wages, less access to resources and information, less involvement in decision making, lower enrolment at school and earlier drop outs. In some countries, socio-cultural norms dictate that girls marry early in adolescence and have their first child soon thereafter. In conditions of gender inequality, women and girls are more poorly nourished throughout the life cycle, show higher rates of mortality, have less access to health care, and are subject to greater household food insecurity.

Almost 870 million people are suffering from hunger worldwide. In many parts of the world, more women are affected by hunger than men, particularly following natural disasters. Women are often economically and socially disadvantaged: many household and community decisions are still made by men, frequently to the detriment of women.

Female workers play an important role in agriculture and thus in food production. They average 43% of the agricultural labour force in developing countries, ranging from about 20% in Latin America to almost 50% in Eastern and South-eastern Asia and sub-Saharan Africa (FAO 2012). Male out-migration in search of work is increasing numbers of female farm managers. But while the number of women in agriculture is on the rise, they still face many disadvantages. Women often have limited or no access to land. Males are favoured, both in quantity and quality; in land allocation, with women only gaining access to land through a male relative or after the husband's death. Moreover, women's access to financial services is limited, and they face inequities regarding access to livestock, inputs such as seeds and fertilizers, technology, market information, knowledge, skills and advisory services. Female illiteracy further aggravates the situation (FAO 2011). It is estimated that yields on their farms could increase by 20–30%, and thus reduce the number of people facing hunger worldwide up to 17%, if women had the equitable access to productive resources (FAO 2011). Improving women's agricultural production is therefore smart economics.

Alongside food production and processing, women are also responsible to feed their families. If self-produced food is low in volume or diversity, women must find the financial means to buy market food. Yet many women in developing countries lack control over the household income, as well as income generation possibilities. Some women do not even receive their own generated income, as per cultural norms it is paid to their husbands. In turn, men are less likely to spend money for the benefit of the entire household, and prefer non-food items. There is a clear need to create awareness among men regarding the benefits of an adequate diet for the whole family.

An increase in women's control over household income usually has a positive impact on dietary diversity, thus benefiting children's health, nutrition and education and consequently food and nutrition security. Women also tend to save more of generated income, and thus improve the household's food security in times of natural disasters, such as drought. Intra-household food allocation can be another limiting factor: even though a household may have enough food, girls and women may still suffer from malnutrition.

The multiple roles of women are challenging in terms of time allocation. Agricultural activities increase women's workload and thus decrease the time left to care for their children. As a consequence, many children drop out of school in order to look after their younger siblings. Climate change and the progressive degradation of natural resources also increase the burden of women while further threatening food security. When extra household tasks are too great, e.g. caring for sick relatives, women do not have enough time for food production or income generation. This is particularly evident in societies affected by HIV / AIDS. Women are key to breaking the vicious circle of generational malnutrition. Children born to malnourished mothers often are underweight and face a 20% increased risk of dying before the age of five (UNICEF 2007). The health and nutrition of mothers directly influence the well-being of their children. The "window of opportunity", i.e. the period from the start of a woman's pregnancy until the second birthday of the child, is crucial. An insufficient supply of nutrients during a child's first 1000 days

can bring about lifelong repercussions, such as chronic health problems, cognitive and physical deficits, or impaired immune functions. However, women's ability to give birth to well-nourished babies and to adequately feed and care for their children is often undermined by their own poor nutritional status, low education, and low social status. Also, many women lack access to sexual and reproductive health services.

Steps to action and best practices

Promoting gender equality has been a fundamental principle of German development policy for many years. The following steps to action and best practices from concerned projects - implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of German Federal Ministry for Economic Cooperation and Development (BMZ) - have been proven as successful approaches and helpful starting points to increase the food and nutrition security of households.

Policy advice

Carry out, at all levels, policy dialogue and advice regarding gender-specific issues contributing to increased food security. Relevant topics include reform processes, land rights, finance, and equal voice opportunity for women in professional and rural organizations. The participation of female household heads and married women in local councils is of particular importance.

Support gender-mainstreaming approaches, as well as better coordination between sectors such as agriculture, health and education, at national and regional level.

Access to and control over resources

Support equal access to land, in both quality and quantity. The distribution of land titles and certificates should be gender equitable. This also applies to other natural resources required for food production, such as equal access to

irrigation water and pasture land. Women's participation in community institutions also needs to be increased. Support equal access to capital. Women and other underprivileged groups should have access to income, credits and financial advisory services. Their rights regarding (re-) investments and control over income need to be strengthened

Sustainable land management, Ethiopia

In the Ethiopian highlands of Amhara, Oromia and Tigray more than 50 % of the population - approximately 20 million people – live under the constantly rising threat of food insecurity. On behalf of BMZ, GIZ works to strengthen the competences, resources and capacity development of the Ministry of Agriculture, its decentralized structures and of small-scale farmers, both male and female. Approaches further develop and apply national gender-mainstreaming strategies relating directly to rural development, in cooperation with local agricultural authorities. Small-scale farm households - one fifth of them female headed - receive advice and support regarding sustainable land management. To date, 77,000 hectares of land have been rehabilitated and a further 79,000 hectares of forest are being maintained by participatory forest management principles. Innovative and locally adapted cultivation techniques and erosion control contribute to increased crop and livestock productivity for both male and female farmers, and increase the resilience of rural households to the effects of climate change. Women in particular benefit from the project, gaining better access to advisory services, information and skills. Female and gender-sensitive male advisors are key. The Ministry of Agriculture supports the access of women to innovative techniques and promotes their participation in watershed user groups. Due to cultural norms and traditions, women are often marginalised from community organizations and cannot advocate for their interests. The National Women's Office supports the establishment of women's groups and the representation of women at community level. Women's groups serve as dialogue platforms for their development priorities, which include the promotion of animal husbandry or fruit/vegetable production, with surplus creating additional income.

Particularly innovative is the linkage of sustainable land management methods with HIV/AIDS-education and family planning, which further reduces the pressure on natural resources and increases food security. Support equal access to agricultural inputs and advisory services for livestock and crop production. Advisory guidance should accompany agricultural inputs such as seeds, fertilizer, pesticides and veterinary medicine in order to achieve good results and increase food production. Advisory services need to take into account financial and intellectual capacity, as well as time availability of clients, and focus on both men and women and their specific demands and tasks. It has proven successful to initially start with gender-separated trainings, facilitating more open discussions.

Capacity development

- Apply participatory methods in all phases of project planning and implementation.
- Sensitise partner institutions and project personnel regarding gender-specific operating principles, together with recruitment, training and promotion of local female specialists in long-term and short-term positions in GIZ projects.
- Support women's presence in advisory services, as well as gender-sensitive training, thus strengthening and cross linking different institutions and stakeholders regarding gender issues.

Monitoring and evaluation systems

Promote the systematic integration of gender-disaggregated data in monitoring and evaluation systems. Project activities should aim to benefit men and women equally.

Questions to be answered in gender studies

1. To what extent do women have access to land, capital, equipment, inputs, advisory services and formal education?

2. How do socio-cultural and behavioral norms affect women's decisive power and role within the household and thereby compromise their ability to secure adequate nutrition for the whole family?
3. How do policies and programs work together and coordinate across sectors, e.g. include women's access to reproductive health services, family planning and nutrition education? How do projects create awareness among male household heads?
4. To what extent are women organized and mobilized, e.g. in producer groups or saving groups? To what extent do they have access to and participate in local decision-making bodies?

Food and nutrition insecurity endanger the attainment of the MDGs

Goal 1: **Eradicate extreme poverty and hunger:** Food insecurity and malnutrition erode human capital, reduce resilience to shocks and reduce productivity (impaired physical and mental capacity).

Goal 2: **Achieve universal primary education:** Malnutrition reduces mental capacity. Malnourished children are less likely to enroll in school; more are more likely to enroll later. Hunger and malnutrition reduces school performance.

Goal 3: **Promote gender equality and empower women:** Food secure and better-nourished girls are more likely to stay in school and, subsequently, have more control over future choices.

Goal 4: **Reduce child mortality:** Malnutrition is directly or indirectly associated with more than 50% of child mortality. Malnutrition is the main contributor to the burden of disease in the developing world.

Goal 5: **Improve maternal health:** Maternal health is compromised by an anti-female bias in allocations of food, health and care. Food insecurity and malnutrition are associated with most major risk factors for maternal mortality.

Goal 6: **Combat HIV/AIDS, malaria, and other diseases:** Food insecurity spurs coping mechanisms, such as migratory labor and/or prostitution, which increases the spread of HIV/Aids. Malnutrition hastens the onset of Aids among HIV-positive. Malnutrition weakens resistance to infections and reduces chances of survival for those who have malaria.

Goal 7: **Ensure environmental sustainability:** Food insecurity leads to unsustainable use of forestlands and resources.

Source: UN SCN 2004, iii and FAO 2002,

Indicators for food and nutrition security at national and regional level

In order to assess and analyse the Food and Nutrition Security conditions in a given country, multiple indicators have to be used to reflect the various levels and dimensions of the problem. Typical indicators at macro level are: prevalence of common diseases, HIV/AIDS infections, etc., mortality rates, national storage etc. For purposes of organization, the overall framework of malnutrition will be recalled by the following figure. The presentation of methods to analyse the Food and Nutrition Security situation in a given country is based on this conceptual framework.

Targeted food and nutrition security interventions

Targeted food and nutrition security interventions comprise a wide variety of measures aiming at improving food and nutrition security of specific population groups, which have been identified as vulnerable or food-insecure. The selection of feasible and (most) suitable approaches of targeted interventions depends on the prevailing conditions, the specific socio-economic features of the target population, the nature and causes of their food deficits, and the available resources and implementation capacities. Targeted interventions can be broadly categorized as:

1. Measures aimed at enhancing availability and access entitlement at the individual or household level, such as measures to promote food production among small and subsistence farmers, employment and income generation measures, as well as targeted subsidy and transfer systems also at the meso level.
2. Measures to improve food utilisation among the target groups, e.g. through health and nutrition education, measures of preventive and curative health care, provision of safe potable water, sanitation, promotion of suitable food preservation, food preparation and feeding practices, etc.

Although targeted interventions may be defined under macro-level policies, they are usually implemented at meso-level, i.e. as (components of) projects and programmes in certain areas with a high incidence of food insecure and vulnerable population groups (e.g. drought prone or disaster affected areas; low-income urban districts; slum and squatter areas). Indispensable prerequisites for targeted interventions are institutional capacities, which can identify and screen the food insecure and vulnerable population groups, implement the measures to ensure that the eligible target groups are effectively reached, and monitor programme performance. The institutions involved may be local self-help groups, community organizations, NGOs, government institutions, international and/or donor organizations. Depending on the conditions and the type of intervention, administrative, community or self-targeting approaches can be applied. The following table provides an overview of the main types of targeted interventions to improve food and nutrition security at household level, the relevant target groups, and the expected outcome on the factors determining household food and nutrition security.

Targeted food and nutrition security interventions, main target groups, and Impact on household food entitlement

	Type of interventions	Target groups	Impact on household food entitlement
Availability	1. Improvement of productive assets and targeted production support, e.g. – Land (tenure) reform – Natural resource conservation – Technology, water – Input supply, – Agricultural credit – Extension & training	– Small farmers – (Semi-) subsistence farmers – Tenant farmers – Victims of conflict, e.g. landless returnees	– Increased agricultural income = purchasing power = increased household food demand – Increased household food supplies from own production
Access	2. Income generation schemes (e.g. training, micro-credit programmes) – Public works / employment generation schemes – Food-for-work (FFW) programmes	– Rural and urban poor un- and under-employed – Rural landless – Victims of conflict, e.g. landless returnees	– Increased cash income = increased purchasing power = increased household food demand & supplies; – Increased income in kind of food = increased household food supplies
	3. Targeted food subsidies, e.g.: – Fair price shops – Subsidies for inferior goods – Geographic targeting	– Urban poor – Rural poor – Specific vulnerable groups (see below)	– Increased real income due to lower food prices = purchasing power = increased household food demand
Use and Utilization	4. Direct food transfers, e.g. – Relief assistance – Special/supplementary feeding programmes – Nutrition and health education (hygiene)	Specific vulnerable groups, e.g. – disaster affected people, war invalids, landmine disabled, internally displaced people (IDP) – Undernourished children – Female headed households – Pregnant & lactating women – Elderly, disabled & sick persons	– Increased individual and/or household food supplies through direct food transfers

Actions to improve availability of food

The improvements of productive assets and targeted production support are predominant the known agricultural support mechanisms. Small and subsistence farmers constitute the major vulnerable and food insecure population group in many countries. Enhancing their capacity to increase agricultural and food production can simultaneously mitigate problems of access, availability and stability. Although respective measures are part of overall agricultural sector development policies, there is a need to adapt and tailor targeted interventions to the specific needs, constraints and capacities of the target group of small and subsistence farmers. Depending on the situation, the following approaches may come under consideration.

Actions to improve availability of food

Field of actions	Examples
Improvement of food Production and agricultural productivity	<ul style="list-style-type: none"> – intensification and diversification of production, – improvement of access to land (land and land tenure reform), – appropriate technologies and improved agricultural input packages (improved seeds, fertilizers, etc.) – privatization of farms, – crop protection, – introduction /promotion of perennial crops (often in combination with ecological stabilization of arable land), – development of agricultural extension services, – agricultural price policy, – agricultural research for the development of improved farming systems (including appropriate use of the potential of biotechnology) geared towards small and subsistence farmers
Development and introduction of appropriate technologies in the fields of livestock, forestry and fisheries	<ul style="list-style-type: none"> – adapted livestock, veterinary, animal husbandry improvements – artificial insemination, – animal health and vaccination,

	<ul style="list-style-type: none"> – promotion of agro-forestry, – aquaculture
Resource management	<ul style="list-style-type: none"> – construction of terraces, – afforestation and/or reforestation – soil and water conservation measures (e.g. soil and stone bunds, intercropping, vegetation strips)
Improvement and extension of rural infrastructure	<ul style="list-style-type: none"> – small scale irrigation systems (e.g. water harvesting, river diversion, ponds, small dams) – construction of food stores, support to appropriated store management (prevention of losses) – construction and maintenance of feeder roads, roads and bridges – construction of market places – micro-credit schemes for small farmers
Marketing of agricultural products	<ul style="list-style-type: none"> – price information system – quality control – advertising – liberalisation of markets (internal, export, import)
Promotion of fair trade regulations	<ul style="list-style-type: none"> – remove export barriers (tariffs) – remove import tariffs on inputs – eliminate non-trade barriers on inputs (e.g., approval of seeds and biotech products)
Promotion of agro-industry, food processing and food storage	<ul style="list-style-type: none"> – cereal banks, central and decentralised grain reserves, – food safety regulations and control systems, – food fortification
Organizational and Institutional development	<ul style="list-style-type: none"> – promotion and support of self-help groups, cooperatives

Current Diet and Nutrition Scenario

Health and nutrition are the most important contributory factors for human resource development in the country. India has been classified by the World Bank as a country with a low-income economy, with per capita GNP of US \$ 950. It ranks 160 in terms of human development among 209 countries. Among the Indian population, about 28% in the rural and 26% in the urban areas are estimated to be below the poverty line, which is defined as the expenditure needed to obtain, on an average, 2400 Kcal per capita per day in the rural areas and 2100 Kcal in urban areas. Long-term malnutrition (under and over) leads to stunting and wasting, non-communicable chronic diet related disorders, increased morbidity and mortality and reduced physical work output. It is a great economic loss to the country and undermines development.

Nutrients

Carbohydrates, fats and proteins are macronutrients, which are needed in large amounts. Vitamins and minerals constitute the micronutrients and are required in small amounts. These nutrients are necessary for physiological and biochemical processes by which the human body acquires, assimilates and utilizes food to maintain health and activity.

Carbohydrates

Carbohydrates are either simple or complex, and are major sources of energy in all-human diets. They provide energy of 4 Kcal/g. The simple carbohydrates, glucose and fructose, are found in fruits, vegetables and honey, sucrose in sugar and lactose in milk, while the complex polysaccharides are starches in cereals, millets, pulses and root vegetables and glycogen in animal foods. The other complex carbohydrates which are resistant to digestion in the human digestive tract are cellulose in vegetables and whole grains, and gums and pectins in vegetables, fruits and cereals, which constitute the dietary fibre component. In India, 70-80% of total dietary calories are derived from carbohydrates present in plant foods such as cereals, millets and pulses.

Food Pyramid



Dietary fibre delays and retards absorption of carbohydrates and fats and increases the satiety value. Diets rich in fibre reduce glucose and lipids in blood and increase the bulk of the stools. Diets rich in complex carbohydrates are healthier than low-fibre diets based on refined and processed foods.

Proteins

Proteins are primary structural and functional components of every living cell. Almost half the protein in our body is in the form of muscle and the rest of it is in bone, cartilage and skin. Proteins are complex molecules composed of different amino acids. Certain amino acids, which are termed “essential”, have to be obtained from proteins in the diet since they are not synthesized in the human body. Other nonessential amino acids can be synthesized in the body to build proteins. Proteins perform a wide range of functions and also provide energy (4 Kcal/g). Protein requirements vary with age, physiological status and stress. More proteins are required by growing infants and children, pregnant women and individuals during infections and illness or stress. Animal foods like milk, meat, fish and eggs and plant foods such as pulses and legumes are rich sources of proteins. Animal proteins are of high quality as they provide all the essential amino acids in right proportions, while plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a combination of cereals, millets and pulses provides most of the amino acids, which complement each other to provide better quality proteins.

Fats

Oils and fats such as butter, ghee and vanaspathi constitute dietary visible fats. Fats are a concentrated source of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Dietary fats are derived from two sources viz. the invisible fat present in plant and animal foods; and the visible or added fats and oils (cooking oil). Fats serve as a vehicle for fat-soluble vitamins like vitamins A, D, E and K and carotenes and promote their absorption. They are also sources of essential polyunsaturated fatty acids. It is necessary to have adequate and good quality fat in the diet with sufficient polyunsaturated fatty acids in proper proportions for meeting the requirements of essential fatty acids. The type and quantity of fat in the daily diet influence the level of cholesterol and triglycerides in the blood. Diets should include adequate amounts of fat particularly in the case of infants and children, to provide concentrated energy since their energy needs per

kg body weight are nearly twice those of adults. Adults need to be cautioned to restrict intake of saturated fat (butter, ghee and hydrogenated fats) and cholesterol (red meat, eggs, organ meat). Excess of these substances could lead to obesity, diabetes, cardiovascular disease and cancer.

Vitamins and minerals

Vitamins are chemical compounds required by the body in small amounts. They must be present in the diet, as they cannot be synthesized in the body. Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. They are either water soluble or fat-soluble. Vitamins A, D, E and K are fat-soluble, while vitamin C, and the B-complex vitamins such as thiamin (B), riboflavin (B), niacin, pyridoxine (B), folic acid and cyanocobalamin (B) are water soluble. Pro-vitamin like beta-carotene is converted to vitamin A in the body. Fatsoluble vitamins can be stored in the body while water-soluble vitamins are not and get easily excreted in urine. Vitamins B-complex and C are heat labile vitamins and are easily destroyed by heat, air or during drying, cooking and food processing.

Minerals are inorganic elements found in body fluids and tissues. The important macro minerals are sodium, potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are micro-minerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood- clotting processes. Approximate Calorific Value of Nuts; Salads and Fruits are given in annexure 1.

Balanced diet

A balanced diet is one, which provides all the nutrients in required amounts and proper proportions. It can easily be achieved through a blend of the four basic food groups. The quantities of foods needed to meet the nutrient requirements

vary with age, gender, physiological status and physical activity. A balanced diet should provide around 50-60% of total calories from carbohydrates, preferably from complex carbohydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat.

In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human body from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also afford protection against oxidant damage. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants. Balanced Diet for Adults - Sedentary/Moderate/Heavy Activity is given in menu plans for sedentary adult man and woman are given below.

Balanced Diet for Adults - Sedentary/ Moderate/ Heavy Activity

(Number of portions)

Foods	gms/ml	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals & millets	30	12.5	9	15	11	20	16
Pulses	30	2.5	2	3	2.5	4	3
Milk & milk products	100ml	3	3	3	3	3	3
Roots & tubers	100	2	2	2	2	2	2
Green leafy	100	1	1	1	1	1	1
Other vegetables	100	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1
Sugar	5	4	4	6	6	11	9
Fat	5	5	4	6	5	8	6

To calculate the days requirement of above mentioned food groups for an individual, multiply grams per portion with number of portions.

Sample Meal Plan for Adult Man (Sedentary)

Meal Time	Food Group	Raw	Cooked Recipe	Servings Amounts
Breakfast	Milk	100 ml	Milk	1/2 Cup
	Sugar	15 g	Tea or	2 Cups
			Coffee	1 Cups
	Cereals	70 g	Breakfast Item	
	Pulses	20 g		
Lunch	Cereals	120 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	120 g	Rice	2 Cups
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	150 g	Veg. curry	3/4 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

1 Cup = 200 ml

Note: For Non-Vegetarians-Substitute one pulse portion with one portion of egg/ meat/ chicken/ fish
Use 25 g visible fat per day.

Breakfast Items: Idli - 4 Nos. / Dosa - 3 Nos. / Upma - 1-1/2 Cup / Bread - 4 Slices/Porridge - 2 Cups / Corn flakes with milk - 2 Cups.

Snacks: Poha - 1 Cup / Toast - 2 Slices Dhokla - 4 Nos.

Sample Meal Plan for Adult Woman (Sedentary)

Meal Time	Food Group	Raw	Cooked Recipe	Servings Amounts
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	10 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	50 g	Breakfast Item	
	Pulses	20 g		
Lunch				
	Cereals	100 g	Rice	1 Cup
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
Tea	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
	Sugar	10 g		
Dinner	Cereals	100 g	Rice	1 Cup
			Phulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish
Use 20 g visible fat and <5g salt during preparation of meal per day.

Breakfast Items: Idli - 3 Nos. / Dosa - 2 Nos. / Upma - 1 Cup / Bread - 3 Slices /
Porridge - 1-1/2 Cups / Corn flakes with milk - 1-1/2 Cup.

Snacks: Poha - 1 Cup / Toast - 2 Slices
Dhokla - 4 Nos.

Food groups

Foods are conventionally grouped as:

1. Cereals, millets and pulses
2. Vegetables and fruits
3. Milk and milk products, egg, meat and fish
4. Oils & fats and nuts & oilseeds

However, foods may also be classified according to their functions

Classification of foods based on function

Major Nutrients	Other Nutrients	
Energy Rich Foods	Carbohydrates & fats	
	Whole grain cereals, millets	Protein, fibre, minerals, calcium, iron & B-complex vitamins
	Vegetable oils, ghee, butter	Fat soluble vitamins, essential fatty acids
	Nuts and oilseeds	Proteins, vitamins, minerals
	Sugars	Nil
Body Building Foods	Proteins	
	Pulses, nuts and oilseeds	B-complex vitamins, invisible fat, fibre
	Milk and Milk products	Calcium, vitamin A, riboflavin, vitamin B12
	Meat, fish, poultry	B-complex vitamins, iron, iodine, fat
Protective Foods	Vitamins and Minerals	
	Green leafy vegetables	Antioxidants, fibre and other carotenoids
	Other vegetables and fruits	Fibre, sugar and antioxidants
	Eggs, milk and milk products and flesh foods	Protein and fat

Points to ponder

- Choose a variety of foods in amounts appropriate for age, gender, physiological status and physical activity.
- Use a combination of whole grains, grams and greens. Include jaggery or sugar and cooking oils to bridge the calorie or energy gap.
- Prefer fresh, locally available vegetables and fruits in plenty.
- Include in the diets, foods of animal origin such as milk, eggs and meat, particularly for pregnant and lactating women and children.
- Adults should choose low-fat, protein-rich foods such as lean meat, fish, pulses and low-fat milk.
- Develop healthy eating habits and exercise regularly and move as much as you can to avoid sedentary lifestyle.

Foods consumed should be safe and clean

- Safe and good-quality food is essential for maintaining good health
- Naturally-occurring toxins, environmental contaminants and adulterants in foods constitute a health hazard.
- Consumption of unsafe foods can lead to food-borne diseases.

What makes food unsafe

Microbes (bacteria and moulds) and their products are responsible for food spoilage. Natural enzymes present in food also lead to its deterioration. Besides, insects and rodents, adulterants, natural toxins and various chemical residues beyond permissible levels, make the food unwholesome. In addition to moisture and environmental conditions like temperature, storage time also influence the quality of the food.

How do we select safe food?

Selection of the right food is the first step to ensure safe and good quality diet. Food items purchased from reliable sources having a high turnover ensure their freshness. Some foods carry certification mark assuring good quality. For example AGMARK for honey and ghee; FPO (Fruit Products Order) for fruit and vegetable products (jams, squashes, etc); ISI (Bureau of Indian Standards) for food colours and essences.

Food grains purchased should be free from foreign matter and infestation (rodent excreta and insect remains). They should be of uniform size and should not be shrivelled, shrunken and mouldy. Foodstuffs should be free from artificial colours. There is a risk of adulteration when fats/oils are purchased loose from unsealed containers. Therefore, it is always safer to purchase reputed brand products in sealed sachets/ containers. It is necessary to buy pasteurized milk in sachets from a reputed dairy or a reliable vendor to avoid the risk of adulteration and contamination. Milk products such as butter, ghee and *khoa* should also be purchased from reliable sources. Whole spices, uniform in colour, size and shape

should be preferred. Since powdered spices are more likely to be adulterated, always buy certified products. Fruits and vegetables that show patches, mechanical damage and bruises, or are wilted and decayed with visible evidence of insects and moulds, should be avoided. Eggs should be fresh and free from cracks. Meat or poultry must be examined for characteristic colour, odour and texture, and should be purchased fresh or frozen.

Freshness of fresh-water fish is indicated by a stiff body, bright, clear and bulging eyes, reddish gills, tight scales and absence of stale odour or discolouration. Fresh fish will not show any pitting on finger pressure.

Best practices of storage

Agricultural commodities should be dried adequately and protected from moisture in a safe storage structure (eg. tin with a tight lid) to prevent damage from moulds. Microbes like bacteria and mould produce toxins (eg. aflatoxins). Rodent attacks, and the presence of insects and microbes, not only reduce the availability of nutrients but render the foods harmful. Frequent and careful disinfestation of the storage premises using pesticides like aluminium phosphide is essential. Some traditional household practices such as application of edible oils to grains, placing dried neem leaves in storage bins etc., are known to prevent infestations.

Why do foodborne diseases occur

Foodborne infections and toxicities are common particularly with consumption of susceptible foods such as milk products like *khoa*, meat, poultry and even cooked foods like rice. Improper processing, handling and cooking, and keeping cooked foods in warm conditions for several hours before eating, promote bacterial growth and toxin production.

Handling perishable foods

Perishable foods like milk, meat, vegetables and cooked foods, are prone to spoilage due to microbes. These foods should be stored under refrigeration, preferably at a temperature of 10 °C or less, which retards multiplication of microorganisms. However, even refrigerated foods, if stored for long, can get spoiled. Cross contamination can be avoided by keeping cooked and raw food separately.

In case food which is cooked has to be stored for some time, it should be kept either hot (more than 60°C) or be cooled quickly (below 10 °C). Most micro-organisms multiply at temperatures between 10 and 60°C. Refrigerated cooked food should be heated before consumption. However, repeated heating may be avoided.

Personal hygiene

Food handlers should observe good personal hygiene to maintain food safety. They should be free from obvious signs of illness, wounds and sores. Traditionally in India, cooked food is touched by the hands while preparing, serving and eating. Use of spoons and ladles should be encouraged to avoid contamination. Hands should be washed thoroughly before starting the preparation of food and after every interruption. Household pets like cats and dogs often harbour dangerous pathogens. They should be kept away from places where food is cooked, stored or served.

Common adulterants

Foods may be adulterated with non-food material or inferior quality product. Spoilt, stale or poor quality food is made attractive and fresh by adding harmful colours or other chemicals. Frequently adulterated food items are milk and milk products, cereals, pulses and their products, edible oils and spices. The different classes of adulterants include non-permitted colours like metanil yellow; non-edible oils like castor oil; cheaper agricultural produce like various starches in milk

powder; extraneous matter like husk, sand and sawdust; and metal contaminants like aluminum or iron filings. Consumption of adulterated foods could lead to disease outbreaks of epidemic proportions. Buying from a reliable and reputed source, careful checking of foods before purchase and insisting on certified brands will all minimize the risk of food adulteration.

How to minimize effects of pesticide residues

Pesticides, used during cultivation of crops, can remain as residues in foodstuffs, especially vegetables and fruits. Exposure of the population to pesticide residues may be harmful and can be minimized by washing the foodstuffs thoroughly in running water or by peeling. Cooking and other processes can also reduce such residues (Annexure 12). Insect control operations such as disinfestation in the kitchen by spraying pesticides is another source of contamination. Utmost care should be taken to ensure that eatables are well covered and protected from exposure to such harmful agents.

Points to ponder

- Buy food items from reliable sources after careful examination
- Wash vegetables and fruits thoroughly before use.
- Store the raw and cooked food properly and prevent microbial, rodent and insect invasion.
- Refrigerate perishable food items till consumption.
- Maintain good personal hygiene and keep the cooking and food storage areas clean and safe.

What are common Indian food beliefs, fads and taboos

Food habits are formed early in childhood, passed on from the elders in the family and perpetuated into adulthood. Food beliefs either encourage or discourage the consumption of particular foods. There can be neutral, harmless or harmful practices. Unfortunately, most of the harmful beliefs and prejudices

(taboos) are associated with the diets of women and children, who are also the most vulnerable to malnutrition. Exaggerated beneficial or harmful claims in respect of some foods, without scientific basis constitute food fads. In addition, the concept of hot and cold foods is widely prevalent. Hot foods are believed to produce heat in the body. Some examples are jaggery, sugar, groundnuts, fried foods, mango, bajra, jowar, maize, eggs and meat. Papaya fruit is strongly suspected to lead to abortion, though there is no scientific basis. Buttermilk, curd, milk, green gram dhal, green leafy vegetables, ragi, barley flour and apples are considered as cold foods which are actually nutritious. Vegetarianism is often practised in India on religious grounds. Since vitamin B₁₂ is present only in foods of animal origin, vegetarians should ensure an adequate consumption of milk. During certain illnesses like measles and diarrhoea, dietary restriction is practised. This can aggravate malnutrition in young children.

Effects of the precooking process

Foods, in their natural state, contain different nutrients in varying amounts. Cooking improves the digestibility of most foods. Flesh foods get softened on cooking and become easily chewable. Proper methods of cooking render foods palatable by improving the appearance, taste, flavour and texture, thereby enhancing acceptability. In addition, they help in destroying disease causing organisms and eliminating natural inhibitors of digestion. In the course of dietary preparation, depending on the recipe, foods are subjected to various processes such as washing, cutting, fermentation, germination and cooking. In the Indian cuisine, fermentation (*idli, dosa, dhokla*) and germination (sprouting) are common practices. These methods improve digestibility and increase nutrients such as B-complex vitamins and vitamin C.

Effects of washing and cutting

Foods should be washed well before cooking and consumption to remove contaminants like pesticide residues, parasites and other extraneous material. However, certain precautions need to be taken while washing and cutting to

minimize the loss of nutrients. Repeated washing of food grains like rice and pulses results in losses of certain minerals and vitamins. Vegetables and fruits should be washed thoroughly before cutting. Cutting of vegetables into small pieces exposes a greater surface area of the foodstuff to the atmosphere, resulting in loss of vitamins due to oxidation. Therefore, vegetables should be cut into large pieces. Cut vegetables should not be soaked in water for long, as water-soluble minerals and vitamins get dissolved. Water in which the food grains and vegetables have been soaked should not be discarded but put to use to prevent nutrient loss.

What are the effects of cooking?

There are many methods of cooking like boiling, steaming, pressure cooking, frying, roasting and baking. Boiling is the most common method of cooking, during which heat-labile and water-soluble vitamins like vitamin B-complex and vitamin C are lost. The practice of using excess water while cooking rice should be discouraged since it leads to loss of vitamins; just sufficient water to be fully absorbed should be used. Vegetables should be cooked on low heat using just adequate water in a covered vessel to preserve flavour and nutrients and to reduce cooking time. Use of baking soda for hastening cooking of pulses should not be practiced, as it results in loss of vitamins. Frying involves cooking food in oil/ghee/ *vanaspati* at high temperatures. Shallow frying involves use of much smaller amounts of oils than deep frying. Repeated heating of oils particularly PUFA-rich oils, results in formation of peroxides and free radicals and, hence, should be avoided by using just enough oil. Similarly, oils which have been repeatedly heated should not be mixed with fresh oil but should be used for procedures such as seasoning.

Microwave cooking

Microwave cooking is convenient, fast and preserves nutrients and also useful in reheating of food. But it can reheat or cook unevenly and leave some cold spots in the food by which harmful bacteria can enter into our body. So it is

discouraged to use large amounts or big pieces in the microwave oven otherwise mix the food in between for even heating or cooking. Never use partially heated food. Don't cook frozen food in the microwave oven directly it leaves some parts of the food partially cooked.

Always use glass or pottery dishes and food grade microwave friendly plastic dishes and wrap to reheat foods.

Points to ponder

- Avoid food faddism and discard erroneous food beliefs.
- Do not wash foodgrains repeatedly before cooking.
- Do not wash vegetables after cutting.
- Do not soak the cut vegetables in water for long periods.
- Do not discard the excess water left over after cooking. Use only sufficient water for cooking.
- Cook foods in vessels covered with lids.
- Prefer pressure/steam cooking to deep frying/roasting.
- Encourage consumption of sprouted/fermented foods.
- Avoid use of baking soda while cooking pulses and vegetables.
- Do not reheat the left over oil repeatedly.

Water

Water should be taken in adequate amounts and beverages should be consumed in moderation

- Water is the major constituent of the human body.
- Beverages are useful to relieve thirst and to meet fluid requirements of the body.
- Some beverages provide nutrients while others act as stimulants.
- Milk is an excellent beverage for all age groups as it is a rich source of nutrients.

Need for water

Water accounts for 70% of our body weight. It is a constituent of blood and other vital body fluids. Water plays a key role in elimination of body wastes and regulation of body temperature. The body loses water through sweat, urine and faeces. This loss must be constantly made good with clean and potable water. A normal healthy person needs to drink about 8 glasses (2 litres) of water per day. During very hot weather and while undertaking vigorous physical activity, this requirement increases as a considerable amount of water is lost through sweat.

When is water considered safe and wholesome

Water should be safe and wholesome i.e., it should be free from disease-causing agents like bacteria, viruses, parasites etc., and harmful chemical substances like pesticides, industrial wastes, heavy metals, nitrates, arsenic and excess of fluoride. Fluorosis, a disease with bone deformities and dental problems, results from drinking water containing an excess of fluoride over long periods. Generally, a concentration of 0.5 to 0.8 mg of fluoride per litre of drinking water is considered safe.

How is water rendered safe?

If a water source is not safe for drinking, boiling it for 10-15 minutes is a satisfactory method of purification of the water. It kills all disease-causing organisms and also removes temporary hardness. However, boiling will not remove other chemical impurities. Tablets containing 0.5 g of chlorine can disinfect 20 litres of water. There are many modern gadgets, which claim to provide safe and wholesome water. However, they vary in efficacy.

Milk

Milk is a well-accepted and wholesome food and beverage for all age groups. It contains most of the nutrients necessary for growth and development. It is, therefore, specially useful for feeding infants, toddlers, growing children and expectant women and nursing mothers. All the macro- and micronutrients are

present in an easily digestible and assimilable form in milk. Milk proteins possess high biological value which is almost equal to that of meat, eggs and other high-quality animal proteins. Milk proteins are valuable supplements to most vegetarian diets.

Milk is a rich source of bioavailable calcium which helps in the building up of strong bones. Milk fat serves as a vehicle for important fat-soluble vitamins A, D and E. Since milk fat is of the saturated type, those who have to be on a low fat diet can consume skimmed/toned milk. For strict vegetarians, milk is the only source of vitamin B₁₂. Milk is also rich in riboflavin, but is a poor source of vitamins C and iron. However, only pasteurized or boiled milk should be consumed to ensure protection from disease-causing agents.

What is lactose intolerance ?

Lactose, the sugar present in milk, helps in the establishment of lactic acid bacteria in the intestinal tract. If lactase, an enzyme required for digestion of lactose, is not present in sufficient amounts, such individuals develop abdominal symptoms on consumption of excess of milk. This is common in children following diarrhoea and is described as lactose intolerance. Drinking small quantities of milk at a time does not usually cause any gastrointestinal problems and there is no need to discourage intake of milk by children except in severe cases of diarrhoea.

What are soft drinks ?

Soft drinks are generally of two categories : natural soft drinks and artificial or synthetic soft drinks. Water is the main constituent of all beverages. Orange, lemon, grape, mango, pineapple and apple are generally used in making fruit juice. Cane sugar juice is also extensively used in India, particularly during summer. Natural fruit juices provide in addition to energy, some vitamins (beta carotenes, vitamin C) and minerals (potassium, calcium). Fruit juices being potassium rich are ideal beverages for those suffering from hypertension. However, they cannot be equated with fruits which also provide dietary fibre.

Compared to natural fruit juices, synthetic drinks do not contain nutrients unless they are fortified. Generally, synthetic drinks are prepared using preservatives, artificial colours and flavours such as cola, orange, mango and lime, and mostly they are carbonated. Carbonated beverages contain phosphoric acid and may damage the enamel of teeth, and affect appetite if taken in excessive amounts. Water used for preparation of beverages should be free from disease-causing agents and harmful chemical impurities. Beverages like buttermilk, lassi, fruit juices and coconut water are better alternatives to synthetic drinks.

What about tea and coffee?

Tea and coffee are popular beverages. They are known to relieve mental and muscular fatigue. This characteristic stimulating effect is due to their caffeine content. A cup (150 ml) of brewed coffee contains 80-120 mg of caffeine and instant coffee 50-65 mg, while tea contains 30-65 mg of caffeine. Caffeine stimulates the central nervous system and induces physiological dependence. Generally, low doses (20-200 mg) of caffeine produce mild positive effects like a feeling of well-being, alertness and being energetic. Higher doses (>200 mg) can produce negative effects like nervousness and anxiety, especially in people who do not usually consume caffeine-containing beverages. Therefore, moderation in tea and coffee consumption is advised so that caffeine intake does not exceed the tolerable limits. Tannin is also present in tea and coffee and is known to interfere with iron absorption. Hence, tea and coffee should be avoided at least for one hour before and after meals.

Besides caffeine, tea contains theobromine and theophylline. These are known to relax coronary arteries and thereby promote circulation. Tea also contains flavonoids and other antioxidant polyphenols, which are known to reduce the risk for coronary heart disease and stomach cancer. However, as a result of its caffeine content, excess tea consumption is deleterious to health. Decaffeinated coffee and tea are being marketed to obviate the adverse effects of caffeine.

Coffee consumption is known to increase blood pressure and cause abnormalities in heartbeat. In addition, an association between coffee consumption and elevated levels of total and LDL cholesterol ('bad' cholesterol), triglycerides and heart disease has been demonstrated. Therefore, individuals with heart disease need to restrict coffee consumption. Also, those who experience adverse effects from caffeine should stop drinking coffee.

Tender coconut water

Tender coconut water is a nutritious beverage. It has a caloric value of 17.4 per 100 gm. The concentration of sugar steadily increases from 1.5% to about 5.5% in the early months of maturation and this slowly falls to about 2% at the stage of full maturity. Tender coconut water contains most of the minerals such as potassium (290 mg%), Sodium (42 mg%), Calcium (44 mg%), magnesium (10 mg%), Phosphorus (9.2 mg%), iron (106 mg%), and copper (26 mg%). It is a oral rehydration medium and keeps the body cool. However, in patients with hyperkalaemia such as renal failure, acute adrenal insufficiency and in patients with low urine output, Tender Coconut Water should be avoided.

Alcohol

Alcoholic beverages contain ethyl alcohol in varying proportions. Beer contains 2-5% and wine 8-10% of alcohol, while brandy, rum and whisky contain much higher concentrations (30-40%). Alcohol has been extensively abused as an appetite stimulant and as a sedative-hypnotic drug. Alcohol intake, which is initiated as an innocent social habit may gradually result in a serious addiction. It may lead to several serious psycho-social problems and accidents. Alcohol provides higher calories (7 Kcal/g) than carbohydrates and proteins and, thus, can contribute to obesity. Ironically, excessive intake of alcohol is known to suppress appetite and interfere with absorption and metabolism of nutrients, leading to various nutritional deficiency diseases.

Excessive intake of alcohol suppresses appetite and as a result, leads to several nutritional deficiency diseases. People who regularly consume more than

two alcoholic drinks (one equals about 30 ml of ethanol) are at a higher risk for hypertension and stroke. Alcohol intake has also been shown to increase the risk of cancer of the mouth, larynx and oesophagus, prostate and of the breast in women. Excessive alcohol intake weakens the heart muscle (cardiomyopathy) and also damages the liver (cirrhosis), brain and peripheral nerves. It also increases serum triglycerides.

Processed and ready to eat foods

Processed and ready to eat foods are rich in salt, sugar and fats. They should be consumed judiciously. Sugar should be used sparingly.

- Urbanization has increased the intake and demand for processed foods.
- There is a trend towards replacing traditionally cooked foods with processed foods.
- Processed foods may not be nutritionally balanced unless fortified. Sugar, a processed food, provides empty calories.

What are processed foods

Foods that are subjected to technological modifications either for preservation or for converting into ready-to-use/eat foods, eliminating laborious household procedures, are called “processed foods”. Some of the examples are ready mixes, dehydrated foods, pasta products, canned foods, confectioneries, bakery, dairy products and breakfast foods. Manufacture of processed foods requires technology application and machinery, and as a result, processed foods are expensive.

Do we need processed foods?

There is an increased demand for processed, ready-to-eat and convenience foods due to changes in lifestyle. As more and more women go to work outside, and families become nuclear, consumption of processed foods, particularly in urban areas, will be on the increase. Today's consumer is looking

for convenient, easy-to-cook, and ready-to-eat foods which require less time to prepare than traditional home-cooked foods. Food processing is must to preserve highly perishable products like milk, meat, fish and fresh fruits and vegetables. Food processing increases the seasonal availability of foods and enables easy transportation and distribution over long distances.

Exercise and physical activity

Individuals over the age of 20 years should undertake a minimum of 30-45 minutes of physical activity of moderate intensity (such as brisk walking 5-6 km/hr) on most, if not all, days of the week. Greater health benefits can be obtained by engaging in physical activity of longer duration or more vigorous intensity (such as jogging, running, cycling and swimming).

Sedentary people embarking on a physical activity programme should undertake a moderate intensity activity of short duration to start with and gradually increase the duration or intensity. Other day-to-day activities like walking, housework, gardening, will be beneficial not only in weight reduction but also for lowering of blood pressure and serum triglycerides. It also elevates HDL (good) cholesterol in blood. Simple modification in lifestyle like deliberately climbing up the stairs instead of using the lift and walking for short distance instead of using a vehicle could also immensely help in increasing our physical activity.

Exercise programme should include 'warm up' and 'cool down' periods each lasting for 5 minutes. During exercise, the intensity of exercise should ensure 60-70% increase in heart rate.

Previously inactive men over the age of 40 years, women over the age of 50 years and people at high risk for chronic diseases like heart disease and diabetes should first consult a physician before engaging in a programme of vigorous physical activity such as running and swimming.

***Energy Expenditure on various Physical Activities (Kcal/Hr)**

Activity	Kcal/hr	Activity	Kcal/hr
Cleaning/Mopping	210	Shuttle	348
Gardening	300	Table Tennis	245
Watching TV	86	Tennis	392
Cycling 15 (Km/hr)	360	Volley Ball	180
Running		Dancing	372
12 (Km/hr)	750	Fishing	222
10 (Km/hr)	655	Shopping	204
8 (Km/hr)	522	Typing	108
6 (Km/hr)	353	Sleeping	57
Walking 4 (Km/hr)	160	Standing	132
		Sitting	86

* Approx. energy expenditure for 60 Kg reference man. Individuals with higher body weight will be spending more calories than those with lower body weight. Reference woman (50 kg) will be spending 5% less calories.

CALORIES USED

A 60-kg man will use the number of calories listed doing each activity below. A person who weighs more will use more calories, and someone who weighs less will use fewer calories.

Energy costs of physical activities

Activity	Examples of Activities	Energy (Kcal/min)
1	Sleeping, Resting, Relaxing	1.0
2	Sitting, Sitting (Light Activities); Eating, Reading Writing, Listening, Talking	1.5
3	Standing, Standing (Light Activity); Washing Face, Shaving Combing, Watering Plants	2.3
4	Walking (Slow), Driving, Dusting, Bathing, Dressing, Marketing, Childcare	2.8
5	Light manual work, sweeping, cleaning utensils, washing clothes, other house chores	3.3
6	Warm-up & recreational activities, walking up/ down stairs, cycling, fetching water	4.8
7	Manual work (moderate pace), Loading/unloading, Walking with load, Harvesting, Carpentry, Plumbing	5.6
8	Practice of Non-competitive sport/ Games, Cycling (15 kmph), Gymnastics, Swimming, Digging	6.0
9	High intense manual work & sports activities – Tournaments, Wood cutting, Carrying heavy loads, Running, Jogging	7.8

Forty-five minutes per day of moderate intensity physical activity provides many health benefits. However, even greater health benefits can be gained through more vigorous exercise or by staying active for a longer time. This also burns more calories. Regardless of the activity being selected, one can do it all at once or divide it into two or three parts during the day.

National Food Security Mission Operational Guidelines

The National Development Council (NDC) in its 53rd meeting held on 29th May, 2007 adopted a resolution to launch a Food Security Mission comprising rice, wheat and pulses to increase the production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12). Accordingly, a Centrally Sponsored Scheme, 'National Food Security Mission' (NFSM), has been launched from 2007-08 to operationalise the above-mentioned resolution.

The National Food Security Mission has three components (i) National Food Security Mission - Rice (NFSM - Rice); (ii) National Food Security Mission- Wheat (NFSM - Wheat); and (iii) National Food Security Mission - Pulses (NFSM- Pulses).

Mission objectives

Increasing production of rice, wheat and pulses through area expansion and productivity enhancement in a sustainable manner in the identified districts of the country;

- Restoring soil fertility and productivity at the individual farm level;
- Creation of employment opportunities; and
- Enhancing farm level economy (i.e. farm profits) to restore confidence amongst the farmers.

Strategy

To achieve the above objectives, the Mission would adopt following strategies:

1. Implementation in a mission mode approach through active engagement of all the stakeholders at various levels.

- Promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management (INM) including micronutrients, soil amendments, Integrated Pest Management (IPM) and resource conservation technologies along with capacity building of the farmers.
- Flow of fund would be closely monitored to ensure that interventions reach the target beneficiaries on time.
- Various interventions proposed would be integrated with the district plan and targets for each identified district would be fixed.
- Constant monitoring and concurrent evaluation for assessing the impact of the interventions for a result oriented approach by the implementing agencies.

Mission structure

National level

A General Council (GC) will be constituted under the chairmanship of the Union Agriculture Minister. A Mission Director will be appointed at the national level. The composition of the GC will be as under:

(i)	Minister of Agriculture	Chairman
(ii)	Secretary (A&C)	Member
(iii)	Secretary (DARE) & DG (ICAR)	Member
(iv)	Secretary, Ministry of Finance	Member
(v)	Adviser (Agriculture), Planning Commission	Member
(vi)	Agriculture Commissioner	Member
(vii)	Mission Director	Member Secretary

The GC will be the policymaking body providing suitable directives and guidance to the Mission and reviewing the overall progress and development of the scheme. The GC will be empowered to lay down and amend the operational guidelines, decide need based reallocation of resources across states and districts and approve projects as per the requirements. However, the subsidy

norms as approved by the Government shall in no circumstances be exceeded for any of the Mission components. The GC will meet at least twice a year.

A National Food Security Mission Executive Committee (NFSMEC) will be constituted under the Chairmanship of Secretary, Department of Agriculture & Cooperation to oversee the activities of the Mission and to approve the State Action Plans. The NFSMEC will comprise the following:

(i)	Secretary (A&C)	Chairman
(ii)	Secretary (DARE) & DG (ICAR)	Member
(iii)	Secretary, MOWR	Member
(iv)	Secretary, Department of Fertilizers	Member
(v)	Adviser (Agriculture), Planning Commission	Member
(vi)	Agriculture Commissioner	Member
(vii)	Five (5) experts on crop production	Member
(viii)	Mission Director	Member Secretary

Function of the NFSMEC will be to oversee the activities of the Mission and to approve the individual State Action Plans. The Chairman may nominate more members to the committee as per requirement. The NFSMEC will meet once in every quarter.

State level

A State Food Security Mission Executive Committee (SFSMEC) will be constituted by the State Governments under the chairmanship of Chief Secretary to oversee the activities of the Mission in the State. Secretary (Agriculture), Secretary (Irrigation), Secretary (Power) and representatives from other Departments concerned, State Agricultural Universities (SAUs), ICAR Institutes, Lead banks, etc. will be the members of the SFSMEC. A State Mission Director will be appointed in the scale of Director (from within the State Government or outside). The constitution of the State Food Security Mission Executive Committee (SFSMEC) will be as follows:

(i)	Chief Secretary of the State	Chairman
(ii)	Secretary (Agriculture)	Member
(iii)	Secretary (Irrigation)	Member
(iv)	Secretary (Power)	Member
(v)	Vice Chancellor(s)	Member
(vii)	Director/Project Director of ICAR Institutes	Member
(viii)	State Mission Director	Member Secretary

The State Governments will have to nominate or create a suitable autonomous agency registered under the Societies Registration Act for implementing the Mission at the State and district levels. The agency thus nominated will implement the Mission's programme in the State. Such an agency could be the State Agricultural Management & Extension Training Institute (SAMETI) at the State Level and the Agricultural Technology Management Agency (ATMA) at the district level.

Separate accounts for the scheme would be maintained by the State and the District level Agencies as per the Account code prescribed by the NFSMEC. The annual accounts would be duly audited by a chartered accountant every year. The State Level Agency will have the following responsibilities:

1. Prepare perspective and State Action Plan in consonance with the Mission's goals and objectives and in close coordination with SAUs and ICAR Institutes. Organize/conduct baseline survey and feasibility studies in the area of operation (district, sub-district or a group of districts) to determine the status of crop production, its potential and demand. Similar studies would also be undertaken for other components of the programmes.
2. Implementation of the Mission's programmes in the State through Farmers Societies, Non-Governmental Organizations (NGOs), Growers' associations, Self-Help Groups, State institutions and other similar entities.
3. Organize workshops, seminars and training programmes for farmers and other stakeholders at the State level with the help of State

Agricultural Universities and ICAR Institutes in the State.

Funds would be directly received by it from the National Food Security Mission to execute the approved Action Plan for the State.

District level

At the district level, the scheme will be implemented through the ATMA. The State Level Agency will provide the required funds to the District Level Agency for execution of the programme at the district / block level.

A District Food Security Mission Executive Committee (DFSMEC) will be constituted for project formulation, implementation and monitoring of the scheme components through the Agriculture Department. The District Collector or Chief Executive Officer of the Zilla Parishad (as per existing norms of the State Government) will be the Chairman of the DFSMEC.

DFSMEC will have representatives from the line Departments concerned including SAUs, Krishi Vigyan Kendras (KVKs), ATMA, progressive farmers, self-help groups of farmers and reputed NGOs as its members. The Deputy Director (Agriculture) / District Agriculture Officer will be the Member Secretary of the DFSMEC. The constitution of the DFSMEC will be as follows:

- (i) District Collector/CEO of Zilla Parishad Chairman
- (ii) Representatives from line Departments Member
- (iii) Nominated progressive farmers Member
- (iv) Representatives from self help groups of farmers Member
- (v) Representatives from reputed NGOs Member
- (vi) Representative of KVK / SAU in the District Member
- (vii) Project Director ATMA Member
- (viii) Deputy Director (Agriculture)/District Member Agricultural Officer

Project management team

A Project Management Team (PMT) will be constituted at the National level under the leadership of Mission Director. A PMT will also be constituted at the State and the district level under the leadership of a Project Manager drawn from the State Government. At the State level, the Project Manager will be of the level of a Director.

The PMTs will be assisted by technical experts to be appointed on contractual basis for technology transfer and implementation of the Mission. The PMTs will have the responsibility to ensure collaboration among various line departments in the Centre/ State / District to achieve the targets.

The Project management team will have the following responsibilities:

- (a) Guide the States/districts in organizational and technical matters.
- (b) Help in the implementation and monitoring of the various interventions of the NFSM.
- (c) Assist the States/districts in capacity building programmes and record the data on crop yield through crop cutting experiment samples.
- (d) Assist the district and state agencies in concurrent evaluation based on case studies in identified districts and document and disseminate the success stories.
- (e) Undertake publicity/information campaign to promote the Mission objectives.

ICAR institutes/ SAUs, their research stations and KVKs functioning in the district will provide technical support in formulation of projects, its implementation and monitoring. The technical staff will be sourced from these organizations for imparting training to the farmers and extension personnel involved in the implementation and monitoring of the NFSM.

Role of Panchayati Raj Institutions

Panchayati Raj Institutions will be actively involved in following activities:

- (i) Selection of beneficiary and identification of priority areas for the implementation of Mission interventions; and
- (ii) Implementation of Local Initiatives in the identified districts.

Area of operation of food security mission

NFSM - Rice, NFSM - Wheat and NFSM - Pulses will be implemented in 136, 141 and 171 identified districts of different States, respectively.

The GC, based on the latest available data, is empowered to include or exclude the districts for implementation of various components of the Mission.

Mechanism of fund flow

Funds for implementing the Mission's programme will be directly released to the State Level Agency with the approval of the NFSMEC. The State Level Agency would make funds available to the District Level Agency in accordance with approved programme of the district. Funds would be released in installments based on the progress reports and submission of utilization certificates.

The funds for the implementation of the activities of the components will be released by the State/District Level Agency to the nodal departments which will procure the required inputs for the district. The nodal departments will submit the utilization certificate to the State/District Level Agency which, will be compiled and a consolidated utilization certificate, duly authenticated by the DFSMEC and SFSMEC will be submitted to the Ministry of Agriculture, Govt. of India for further releases.

Monitoring

The National Food Security Mission will have a strong mechanism of monitoring and evaluation with the involvement of all the implementing agencies and the line departments. At the district level, monitoring will be undertaken by DFSMEC supported by the Project Management Team.

Close monitoring of physical and financial targets of various program interventions would be done by the monitoring teams. Format for monitoring these interventions would be prescribed by NFSMEC.

At the State level, the activities of the Mission will be monitored by a Committee to be constituted under the Chairmanship of the State Mission Director with members from the line departments, SAUs, lead banks, ICAR institutes and the national crop development directorates nodal for the State.

At the National level, the activities of the Mission will be monitored by a Committee to be constituted under the Chairmanship of the Mission Director with members from Department of Agriculture & Cooperation, Indian Council of Agricultural Research, SAUs, Directorate of Rice, Wheat and Pulses Development, research institutions concerned and officials of State Departments concerned.

Criteria for Identification of Areas and Beneficiaries

In accordance with the decision of the Government of India regarding implementation of Special Component Plan (SCP) for Scheduled Castes and Tribal Sub-Plan (TSP) for Scheduled Tribes, 16% of the total allocation for SCP and 8% for TSP will be earmarked.

- At least 33% allocation of the fund is to be made for small, marginal and women farmers. The allocation to SC/ST farmers will be made proportionate to their population in the district.
- All the farmers are entitled to avail the assistance for various components of the Mission limited to 5 hectares in a season.
- All India Soil and Land Use Survey (AISLUS) will be the nodal agency for identification of priority areas for the application of micronutrients, gypsum and lime.
- Various interventions in the Mission are location specific. The System of Rice Intensification (SRI) will be adopted in the districts which are

considered suitable for adoption of technology as decided by the State Agriculture Department on the basis of assured availability of water during various stages of crop production.

- A district level Seed Committee will be constituted by the Chairman of DFSMEC which will be tasked to verify the list of beneficiaries for seeds, its indent and the ultimate distribution to end users. In case the subsidy on seed is administered at source, the list of beneficiaries may be approved post-facto subject to random verification.

Zonal research stations of SAUs, KVKs, ATMA, reputed NGOs and other line departments will be involved in planning and execution of demonstration, training of farmers and their evaluation. The Project Management Team at the district level will help in developing synergy among various line departments to get the desired output.

Procedure for approval and implementation

The Department of Agriculture & Cooperation, Government of India would communicate the tentative annual outlay to each State, which in turn will indicate component-wise district-wise allocation. The agencies at the district level will prepare the annual action plan keeping in view their priority and potential and submit the plan to the State Level Agency. The States concerned will be required to prepare a State Action Plan based on the District Action Plans for the XI Plan. States could engage the Project Management Team or alternatively, outsource to technical consultants for preparing the Annual Action Plans and State Food Security Mission Document. The State Level Agency will get the State Action Plan vetted by the State Food Security Mission Executive Committee (SFSMEC) and furnish the same to Ministry of Agriculture for consideration by the NFSMEC.

SFSMEC is empowered to make inter-componental changes based on the local needs to the extent of 20 % of the total allocation for NFSM-Rice, NFSM-Wheat and NFSM-Pulses.

Position of ongoing schemes

The Centrally Sponsored Scheme on Integrated Cereal Development Programme (ICDP Rice/wheat) will be discontinued in the identified districts once the NFSM-Rice and NFSM-Wheat become operational there.

The National Food Security Mission-Pulses (NFSM-Pulses) will be implemented in existing as well as in additional area of 171 identified districts in 14 States of the country. The Pulse component of ISOPOM will cease to operate in these 171 identified districts except for the components which are not covered under NFSM-Pulses.

Mission interventions

Various interventions proposed under the three components (Rice, wheat and Pulses) of NFSM are as follows:

Demonstration

- i. Demonstrations of improved package of practices of rice and wheat, System of Rice Intensification (SRI) and hybrid rice will be conducted at farmers' fields to create awareness about the improved practices (improved/ hybrid seed, fertilizer management and other practices).
- ii. One demonstration on 0.4 ha for every 100 ha area of rice and 50 ha area of wheat will be conducted during the XI plan period. Number of demonstrations each year will be approximately 1/5th of the number for the XIth five-year plan. Only one demonstration will be allocated to a farmer.
- iii. The demonstrations will be conducted in a contiguous block by dividing the fields in two blocks, one for improved practices and the other for farmer's practices.
- iv. These demonstrations will be collaboratively conducted by the State Department of Agriculture, SAUs, ICAR institutes and KVKs and reputed NGOs.
- v. **Selection of beneficiary farmers:** Only the farmers willing to cooperate and contribute some of the resources should be selected. Selection of

beneficiaries should be done in a participatory manner by holding meetings in the village by explaining the objectives of the demonstrations and role and responsibilities including expectations from the participating farmer.

- vi. **Selection of site:** Demonstration site should be easily accessible for the farmers and the extension workers. It should not be on an isolated field. The selected site should be the representative of Soil type, prevailing soil fertility status of the area.
- vii. **Soil analysis:** As far as possible soil fertility status of the selected field should be known well in advance for deciding the use of fertilizer and soil ameliorants.
- viii. **Identification of technologies to be demonstrated:** This is very important step in planning a demonstration. The improved practices to be demonstrated should be identified in consultation with SAU through their regional research stations/KVKs located in the area. However, the most critical input should be given top priority such as in case of acidic soil, correction of soil acidity through liming should be done while conducting a demonstration on improved package. The variety to be included in the package should not be older than five years.
- ix. **Development of package of inputs to be distributed:** Once the technologies to be demonstrated are identified, a package should be finalized as to what inputs are to be provided for the conduct of these demonstrations in the form of a demonstration kit. Similarly the contribution of inputs to be provided by the beneficiary farmers (If required) may also be decided.
- x. **Distribution of demonstration kits and training of participating farmers:** A training programme should be organised to brief the beneficiary farmers about the procedure to be followed for conducting demonstrations. Farmers should be informed about the critical operations for the demonstrations. The demonstration kits may be distributed to the farmers during this training programme. The demonstrations should be conducted by extension functionaries of the state department of agriculture under the supervision of

district consultants.

- xi. District Consultant assisted by Technical Assistants of NFSM should monitor the conduct of demonstrations throughout the cropping season and should report the outcome in prescribed format to the district level PMT.
- xii. **Display board:** A display board should be put on the demonstration plot. In addition to other information, the display board should contain information about the critical input or farm operation that is required to be demonstrated.
- xiii. **Field day:** A field day is to be organised during reproductive phase of the crop preferably at grain filling stage. The participation of scientists from SAUs/KVKs should be ensured and some relevant extension literature should also be made available to the participating farmers.
- xiv. **Reporting of the Results:** The results of the demonstration should be compiled at block, district and state level. At state level the results of the demonstrations should be compiled in the form of a booklet.

Nutrition-Oriented Agriculture and Food Diversification

Household food security is a pre-condition to achieving nutrition security. To improve the households and community's situation the efficiency of existing utilisation of resources should be improved. At the same time conserving and, where possible, enhancing the productive capacity of the resources can be an aim. The strategy should involve sound land-use planning and subsequent implementation of actions at community and household level to match demands with the potentials of both the land and its people (FAO 1996).

Increased production and diversification of food need to be promoted in such a way as to offer particular benefit to the rural poor. Measures should include targeted interventions to increase the productivity of small-scale farmers such as production incentives, development of an efficient marketing infrastructure for food products and improved seeds. In addition more research input would be required to improve the food production situation in rain-fed and disadvantaged areas, e.g. areas where shifting cultivation is practised. *To ensure a proper impact of food production and diversification programmes, nutrition agricultural measures have to be accompanied by effective extension services, credit availability for men and women and encouragement in using inputs such as fertiliser and improved seeds. Technology combined with investment in people - especially education for men and women farmers, particularly on nutrition and health – can show high rates of return.*

In some rural areas the overriding nutritional problems are not just associated with the shortage of food, but also with the lack of job and income. Poor households are more likely to contain malnourished members. Women and children are often the most severely affected. Producer incentives and new technologies that increase production and employment in the agricultural sector, including the establishment of small- and medium-scale food-processing facilities, can help augment incomes, alleviate poverty and improve food security at household level. Incorporating nutritional considerations in production policies and

programmes can avoid some of the negative effects sometimes associated with new technology. The health and nutrition risks of technological change must be mitigated through appropriate technology design. There is substantial scope for agricultural, public health and nutrition workers and researchers to collaborate on improving the designs of agricultural programmes.

Selected agricultural interventions to improve household food security

Improvement of staple food production is necessary to ensure sufficiency of staple food (such as rice, sorghum, maize, etc.) throughout the year. Measures recommended are ones to improve production such as irrigation systems, terraces, up-land farming systems, etc. Interventions in the field of land entitlements and management of water supply for agricultural production are also included here. Introduction of improved and more productive seeds, improved soil management, encouragement of marketing of seeds as well as the implementation of essential infrastructure may become necessary. In up-land areas measure to improve cultivation techniques including mixed cropping systems and improved seed varieties could increase productivity. Promotion of food diversification to increase production of nutritious food items, with special emphasis on fat-, protein- and micro-nutrient rich foods. Examples are the increased production of mung, soy, and various other beans or seeds (sun-flowers, sesame, peanuts), various kinds of green leafy or yellowish coloured vegetables to increase consumption of iron and Vitamin A. Products have to be selected according to the production potential of the area, preferences of the population as well as the predominant nutrition deficiency found in the area. Specific measures can be implemented in up-land as well as in lowland areas, home or village gardens. Fruit tree production is a valuable investment to improve the quality of diet in the long term.

Increase production of food from animals; animal raising programmes, including the introduction of new and more productive breeds, vaccination programmes and fodder production. Raising of big animals (cows, buffaloes, etc.)

is mainly seen as a measure to increase household income, while poultry raising can contribute directly to food consumption within the family. Fish raising is also a valuable measure where appropriate places and water are available. However, measures to be implemented at community and household level are not independent from higher levels, they need political commitment, support and structures through which the measures are implemented.

Food production in urban areas

Feeding the growing population of cities in developing countries has become a major concern during the past decade. Food supply coming from rural areas is and in the future will continue to be the base to ensure food security in cities. But agriculture in and nearby cities has to play a very important complementary function to

- increase agricultural production by using available land, water and waste resources.
- improve quality and quantity of food supply (more food and fresh food rich in micro- nutrients, introduction of home gardens, or poultry raising).
- improve the socio-economic situation, creating jobs and income from food production especially of poor population groups,
- contribute to sustainable development of urban areas and to prevent food crisis of large population groups.

Food quality and safety

Acceptable levels of food quality and safety can be achieved by implementing and monitoring quality assurance measures along the entire food chain. Food control measures are diverse and complex. The technical dimensions involved are different for nearly every food product, for the various technologies used in food preparation, processing and manufacturing and for the many types of facilities in which food is produced. The various measures range from good agricultural and good veterinary practices at the farm level to good manufacturing and good hygienic practices applied in food processing. In view of the many

concerns of consumers and the scope and dimensions of food quality and safety problems, technical assistance is often needed. Governments are expected to ensure that the food industry produces safe food and that the risks to human health and economic fraud or unfair trade practices are minimised.

Many developing countries do not have access to the latest information related to new technologies. They may lack technically trained staff, equipment, methods and facilities to analyse food for contaminants, toxins, chemical or drug residues or microbiological contamination. In some countries the legal framework related to food quality and safety needs to be revised and regulations governing food standards are lacking or outdated. Food control infrastructure may be weak and may not have sufficient financial support. Many countries need improved regulatory food inspection and laboratory services, development of a food control enforcement programme and administration and co-ordination of food control activities.

Many developing countries rely on food exports for foreign exchange and thus have a particular interest in strengthening national food control systems, harmonising national food regulations with international standards and establishing import and export food inspection and certification systems to ensure conformity with the World Trade Organization's agreements regarding sanitary and phytosanitary measures and technical barriers to trade. (Whitehead 1999, FAO, Food and Nutrition Division).

Nutrition education and communication

Promoting better eating habits and positive health behaviour is one of the most challenging tasks in overall efforts to improve nutrition. In addition to access to a variety of safe and affordable foods, people need accurate information as to what constitutes a healthy diet and how to meet their nutritional needs. Besides education, strategies to promote healthy diets must include motivation and the creation of opportunities for people to change their behaviour while recognizing

individual preferences, lifestyles and constraints of time and resources (FAO/WHO 1992). Dietary guidelines give the recommended dietary allowances for an individual. They are most useful to serve as the basis and provide the guiding principles for the dissemination of nutrition education messages. More recently, governments and private organizations have issued dietary guidelines reflecting growing concern about prevention of diet-related non-communicable diseases.

A Nutrition Secure India - Role of Agriculture

Suneetha Kadiyala, P K Joshi, S Mahendra Dev, T Nanda Kumar, Vijay Vyas

India continues to suffer from under-nutrition among large sections of its population. The country is unlikely to realise the first millennium development goal by 2015. How can agriculture be used to improve nutritional status?

India's progress in improving nutrition has been unacceptably slow: given the country's positive economic trajectory, nutrition has improved at only half the expected pace. Almost one in two Indian children is stunted and 40% are underweight. One-third of all Indian women are underweight. Rates of micronutrient deficiencies are extremely high, with almost 80% of children and 56% of women being anaemic.

Nutrition Insecurity in India

The data on nutrition indicators reveal significant socio-economic inequalities. Several recent studies show the persistence of economic inequities with respect to nutrition improvements over the last two decades (Sen et al 2011; Subramanyam et al 2011; Pathak and Singh 2011). These findings, in the light of India's economic growth, suggest that India's under-nutrition problem has roots in systemic factors affecting virtually the entire population. The prevalence of underweight among children is 14% to 20% higher among the scheduled castes (SCs) and scheduled tribes (STs) than children from other castes. Moreover, the reduction in the prevalence of under-nutrition has been far slower among children belonging to SCs and STs than children from other castes (Thorat and Sabharwal 2011).

With sustained political commitment and leadership, countries such as China, Vietnam, Senegal, Thailand and Brazil have taken bold actions to successfully accelerate reductions in under-nutrition and are on track to reach the first millennium development goal (MDG) target by the year 2015. For example,

Thailand, Vietnam and Brazil positioned nutrition as an investment and an integral part of socio-economic development making this transformational change possible. But India will meet the first MDG target only in 2043 with its present pace of actions (Haddad 2009). In the meantime, under-nutrition continues to exert a physical, cognitive and economic toll, costing India as much as 3% of its gross domestic product (GDP) per year. The Copenhagen Consensus 2008 lists combating micronutrient under-nutrition as the best development investment, with the rate of return in terms of improved health, reduced deaths and increased income opportunities more than 15 times that of the investment.

Need for Meaningful Convergence

The multiple causes of under-nutrition, at the individual, household and societal levels, are now well-recognised. Globally and locally in India, reasonable scientific consensus exists on what direct health and nutrition interventions will work. The central and state governments allocate substantial resources to an array of health and nutrition programmes or schemes, such as the Integrated Child Development Services Scheme, mid-day meals, the reproductive and child health programme and National Rural Health Mission (NRHM) to deliver these direct interventions. The challenge for India now lies in making these interventions truly effective at scale. While effectively scaling-up direct nutrition and health interventions is essential, it is not enough: India must invest in cross-sectoral efforts to act on the deep-rooted causes of under-nutrition in order to sustainably tackle two-thirds of the under-nutrition burden. As noted above, under-nutrition reductions in countries such as Brazil, China, Senegal and Thailand have shown the need to complement these interventions with approaches that address under-nutrition's deep-rooted causes.

This comprehensive approach to solving the under-nutrition crisis is gaining momentum in India. The prime minister's National Council on India's Nutrition Challenges, formed in 2008 is multisectoral, with representation from more than one dozen ministries. The council's key recommendations include

creation of new institutional arrangements that encourage different sectors to work together. Several states, including Karnataka, Madhya Pradesh, Gujarat and Orissa are experimenting with moving nutrition into “Mission Mode” at the state level to accelerate reductions in under-nutrition.

Under-nutrition in India (%)

Nutrition indicators	NFHS II (1998-99)	NFHS II (2005-06)
Stunting (children <3)	51	45
Wasting (children <3)	20	23
Underweight (children <3)	43	40
Anaemia (<11.0g/dl) (children 6-35 months)	74	79
Vitamin A deficiency (children <5)	NA	57
Women with BMI <18.5	36	33
Men with BMI <18.5	NA	28
Women with anaemia	52	56
Men with anaemia	NA	24

Source: National Family Health Survey (NFHS)-3 (2005-06).<http://www.nfhsindia.org/pdf/India.pdf>

Why focus on agriculture?

The pathways through which agriculture affects nutrition are now widely accepted (World Bank 2007; Gillespie and Kadiyala 2011). Global evidence suggests that many developing countries are exploiting these links, but India seems to lag behind (Headey 2011). The challenges facing the agriculture sector in India may be significant, but so are the opportunities. First, the agriculture sector employs nearly 58% of the total Indian workforce and generates more than 55% of the rural income, so the potential for agriculture to influence nutrition at scale is large. Second, more than 80% of rural women engaged in the labour force work in the agriculture sector. This provides a significant opportunity to unleash the gender dimensions of agriculture-nutrition linkages. Third, the commitment of the Government of India and across the States to invest in

agriculture is very strong. A policy space now exists to strengthen agriculture to improve nutrition outcomes.

Some policy options

Several entry points exist for the agriculture sector to make agriculture more pro-nutrition (Dev and Kadiyala 2011). Below are some specific policy approaches as a starting point to make the agriculture sector more “pro-poor” and “pro-nutrition”.

Leveraging existing platforms

The thrust of Indian agriculture sector is to move forward with key schemes and missions such as Rashtriya Krishi Vikas Yojana (RKVY), National Horticulture Mission (NHM) and National Food Security Mission, initiated in the Tenth and the Eleventh Five-Year Plans. Such large-scale platforms should focus on improving Indian citizens’ nutrition security, especially in districts with a substantial overlap between poverty and under-nutrition. RKVY, a bottom-up and demand-driven platform, gives states the incentive to develop comprehensive plans for the agricultural sector, taking into consideration the available technologies, agro-climatic conditions and natural-resource issues. It encourages effective integration of livestock, poultry and fish farming with the crop sector. RKVY’s flexibility and decentralized planning and implementation make integrating nutrition-security concerns into its agenda a possibility. NHM paid dividends by increasing production of horticultural commodities. Now is the time to harness NHM’s potential by realigning its goals and strategy from a nutrition perspective. The opportunities to dovetail its implementation, leveraging other platforms such as RKVY, National Rural Livelihoods Mission (NRLM) and state level nutrition missions are worth serious exploration.

A minimum of 15% of all RKVY and NHM funds could be channelled to plans that integrate nutrition security concerns into their planning, implementation and monitoring. For example, RKVY, NHM and other platforms could use pro-

nutrition funds for programmes that manage water, prevent agriculture-associated waterborne diseases (such as malaria), develop an ecologically sound small-ruminant sector, and create nutrition- sensitive value chains.

Improving access

While leveraging the existing platforms, as noted above, has a huge potential to boost production of nutrient-rich foods, India can do more. Food still constitutes, on average, more than half of the expenditures of Indian households. The overall consumption pattern in the last two decades is one of stable rice and wheat consumption for the poor, a rise in fat consumption, sharp declines in coarse cereal consumption, continued decline in pulses consumption and rising consumption of high-value foods (micro - nutrient rich fruits, vegetables, livestock and fish). Given these contrasting trends, determining whether the average Indian diet has improved or deteriorated during the last 25 years requires further empirical investigation.

Improve access to nutrient-rich foods

The agriculture sector is responding to changing demand patterns. In aggregate, the high-value food segment accounts for about 47% of the total value of agricultural output. Because India has a large share of small and marginal holdings, the country should explore providing incentives to small farmers to grow vegetables and fruits for household consumption – a strategy that is successful in Thailand. Pulse production in the last two decades, with the exception of 2010, has remained stubbornly low. The urgent need for a technological breakthrough to increase the yield potential of pulses is widely acknowledged. India now needs to match this with the required investment in research and development and effective extension services to ensure the poor and vulnerable have access to pulses. A majority of the livestock and small ruminant population is concentrated in marginal smallholdings, and women play a significant role in animal husbandry through direct involvement in major operations like feeding, breeding, management and healthcare. Therefore, progress in this sector will result in a

more balanced development of the rural economy, particularly in poverty reduction and improved access to nutrient-rich diets. Decentralized procurement of food grains under the public distribution system must be mandated to ensure revival of agriculture in resource-poor areas. Inclusion of nutritious and diverse foods (such as millets, eggs, soy beans and so on) in the decentralized procurement basket offers an excellent opportunity to provide locally acceptable nutritious food to the people while mitigating the problems of storage of food commodities. It also offers a real potential to fortify food commodities with key micronutrients (for example, fortifying wheat with iron). Food stamps or conditional cash transfers targeted to women for the purchase of perishable nutrient-rich foods such as milk, fruits, and vegetables could be considered. Such reforms offer a win-win solution, improving diet quality as well as stimulating and diversifying local agricultural production.

Biofortification of staple crops

India must intensify and accelerate its efforts to realize the potential of biofortified crops-not necessarily genetically modified organisms (GMOs). Biofortification is a process of breeding higher levels of micronutrients (especially zinc, iron and Vitamin A) directly into key staple foods using conventional breeding methods or biotechnology. Several efforts to conventionally- bred (using non-GMO breeding techniques) beta-carotene-rich sweet potato and iron- and zinc-biofortified pearl millet are underway. India must prioritise public research investment to ramp up the development of technologies and effective supply chains to increase the production and consumption of these nutrient-rich foods.

Leveraging agriculture to empower women

Accelerating under nutrition reduction in India requires realigning agriculture and rural development policy to empower women in agriculture. Resources targeted to women and women's groups significantly improve agricultural productivity, women's control of resources or assets, and health and nutrition outcomes.

The country should promote women's cooperatives, producer women's groups and other forms of group efforts, where they do not already exist. This would enable women to overcome the constraints of small, marginally profitable landholdings, thereby improving the dissemination of agricultural technology and other inputs, as well as marketing of produce.

The NRLM under the Ministry of Rural Development offers significant potential for convergence with the agricultural sector to empower women to care for themselves and their children. NRLM's federation of self-help groups (SHGs) could radically alter the balance of power not only in the markets they participate in as both producers and consumers, but also in their communities and households.

Women's groups, including SHGs under NRLM, can become instrumental in meaningful convergence of health, nutrition, education and other broad-based schemes addressing the deep-rooted causes of under-nutrition. Examples of such group-centric pro-nutrition approaches include producing and consuming nutrient-rich foods through homestead horticulture and poultry interventions; establishing and maintaining micronutrient food fortification units; producing and marketing low-cost, nutrient-dense supplementary foods; developing primary food processing; enabling women and their children to access essential health and nutrition services; and catalyzing critical behaviour change for optimal health and nutrition outcomes in the long run through community mobilization, including the involvement of panchayati raj institutions, around nutrition-specific issues and actions.

Empowering women in agriculture, which is essential to India's nutrition security, requires securing women's rights to land, providing efficient and effective legal support and enhancing women farmers' access to inputs. For example, entitling women in land records as cultivators on family farms, where women operate the land registered under the name of the male household members, would make a significant difference in accessing various government programme

benefits. The government could accomplish this with a comprehensive, countrywide directive that recognizes women's claims in all government land transfers, including transfers for social protection, income generation (crop cultivation, fish cultivation), or resettlement. While linking women in agriculture to the Mahatma Gandhi National Rural Employment Guarantee Scheme is certainly in the discourse, these linkages are yet to be operationalised.

Institutions of information, extension, credit, inputs and marketing needs have a profound gender bias that must be corrected urgently by taking into account women's mobility, domestic responsibilities and social constraints. Improving employment conditions and support systems for women are vital to strengthen their capacity to care for themselves and their children. Easy access to maternity entitlements and optimum quality daycare and healthcare facilities for children within the community or at the work place are critical to translate higher incomes into health and nutrition benefits.

Recommendations

India's central development strategy should be to systematize structural and sector-specific measures the government can implement immediately to promote nutrition security while not losing sight of the long-term changes needed to create a modern, inclusive and just India. Establishing a vibrant and effective governance mechanism and institutional frameworks with budgets, authority, timelines and accountability to demonstrate progress towards reductions in under-nutrition should be given the top priority.

Agriculture is fundamental to India's inclusive and sustainable structural economic transformation. It must therefore play a more significant role in promoting nutrition security. The government can maximize the potential of existing architectures across sectors to make them more pro-nutrition oriented and to promote meaningful coherence and convergence across sectors. This policy note highlighted some practical policy options for such an engagement, within the existing agriculture-related mechanisms, schemes and platforms.

To incentivise states, 15% of the budget of the existing programmes (for instance, RKVY, NRLM, NHM and others) should go to district-level action plans (particularly in those districts where under-nutrition is high) that can demonstrate progress in relevant nutrition security indicators. Translating these investments into nutrition outcomes will also require India and its states to pursue effective social behaviour change communication and mobilization strategies to change demand, behaviours and consumption patterns, especially for adolescent girls, vulnerable mothers and young children.

Critical steps include pilot programmes to pressure-test new pro-nutrition approaches to understand their feasibility, scope and niche; scaling up such innovations; and operations research to improve programme implementation. Commitment to tracking agriculture programmes for relevant nutrition indicators and evaluating the impact of the programmes on nutrition outcomes is central to understanding which approaches reduce the under-nutrition burden, where, and why. India must also scale up its investments in integrated data systems (including health, nutrition, economic, and livelihoods) at regular intervals for diagnostics, problem solving and tracking progress.

Ignoring the agriculture-nutrition pathways in India will have enormous economic and social costs.

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References:

“Dietary Guidelines for Indians” – A Manual, National Institute of Nutrition, Hyderabad, 2010.

Gender and Food and Nutrition security, Federal Ministry of Economic cooperation and Development, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2013

Georg Bokeloh, Göttingen, Maria Gerster-Bentaya, Stuttgart, Lioba Weingärtner, Rottenburg, “Achieving Food and Nutrition Security”- Actions to Meet the Global Challenge, A Training Course Reader, on behalf of Federal Ministry of Economic Cooperation and Development, InWEnt-Capacity Building International, Germany, 2009

National Food Security Mission, Operational Guidelines, Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India, 2007

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