



NUTRI-GUIDE



ICAR- Agricultural Technology Application Research Institute, ZONE-VII

Indian Council of Agricultural Research

Adhartal, Jabalpur – 482004 (M.P.)

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CONTENTS

Particular		Page No.
	<i>Foreword</i>	v
	<i>Preface</i>	vii
Chapter 1	Role of Nutritive food in our daily life	1
Chapter 2	Nutrient and their source	3
Chapter 3	Nutrient Requirement and assessment for human	5
Chapter 4	Dietary goals and guidelines for rural women	7
Chapter 5	Malnutrition and nutrition	8
Chapter 6	Low cost balanced diet for nutritional security	10
Chapter 7	Nutritional and food requirement for Infant	11
Chapter 8	Nutritional and food requirement for Pre-school Children	15
Chapter 9	Nutritional and food requirement for school going children	20
Chapter 10	Nutritional and food requirement for Adolescent	23
Chapter 11	Nutritional requirement of farm women/Farmers	25
Chapter 12	Nutritional intake through nutritional kitchen garden	26
Chapter 13	KVKs' efforts on Nutritional security	29
Chapter 14	Role of food fortification for nutritional security	35
Chapter 15	Nutritional Value of Agricultural Crop to Improve Nutritional Practice	37
	Appendices-I	39
	Appendices-II	40



त्रिलोचन महापात्र, पीएच.डी.

एफ एन ए, एफ एन ए एस सी, एफ एन ए ए एस
सचिव एवं महानिदेशक

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FOREWORD

Growing human population and climate change are the major challenges for Indian agriculture to ensure food and nutritional security. Malnutrition amongst children is an indicator of human development and in India, 44% of children under the age of 5 are under-weight and under-nourished. Thus, it becomes important that we target malnutrition through nutrient-enriched food. The Indian Council of Agricultural Research (ICAR) is committed to develop biofortified crop varieties to supplement human nutrition through diet. In this regard, the efforts taken by Agricultural Technology Application Research Institute (ATARI), Jabalpur is appreciable in preparing this 'Nutri-Guide' that will help to bring awareness and enable food and nutritionally secure rural India.


(T. MOHAPATRA)

Dated the 2nd January, 2017
New Delhi

PREFACE

Food has always been an important aspect for all living being and humans are no exceptions. Survival of the human being is in fact dependent on food from the moment it born. After sometime the infant is gradually introduced to other food besides milk. Knowledge of the right type and quality of food offered from infants to adolescents from this phase is essential so that adequate growth and development could occur.

The nutrition requirement of various age groups differs; hence the efforts have been made to address it through locally available food materials according to recommended dietary allowances. The nutrition needs right from Infancy, childhood, adolescence, pregnant and lactating women have been taken care of. The issues faced by these age groups in securing nutrition have been detailed.

Although the material on various aspects of food and nutrition is available, still nutrition literacy is found lacking especially among rural farm women. Use of locally available materials like vegetables, pulses, fruits, minor millets, coarse cereals in required quantity is important for fulfilling nutritional requirement of all age groups in general and for vulnerable groups namely Infants, young children, pregnant and lactating women in particular.

The care has been taken to form nutrition strategies addressing the needs of various age groups. It is hoped that introduction of nutrition rich diet would reduce malnutrition in infant, children and pregnant women. Home scientists in KVKs are working to reduce malnutrition in the district in convergence with agriculture and allied departments through introduction of nutrition rich foods in daily diet.

We believe that this Nutri-guide will be of great use to home scientist, extension personnel, and research and development specialists in formulating nutrition related programmes for farm women & children.

Authors sincerely thank to all home scientists for their inputs in preparation of this "Nutri-Guide".

Authors

1

ROLE OF NUTRITIVE FOOD IN OUR DAILY LIFE

Food is the basic necessity of life. Everybody eats food and most people enjoy it. From the beginning, scientists were curious about the food they consumed, its passages in the body and its effects. This curiosity led to the developments of the sciences of nutrition. Nutrition is defined as the scientific study of food and its relation to health. It can also be defined as the science which deals with those processes by which body utilizes food for energy, Growth and maintenance. Most people eat what they like or because it is norm or out habit. Their choice of food is not influenced by the awareness of its nutritive value. Few people know the way body utilizes food. It is also necessary to understand that a delicious dish is not necessarily a nutritious one.

What's nutrition- Nutrition is the science of food and its interaction with an organism to promote and maintain health. Thus Nutrition is a combination of processes by which all parts of the body receive and utilize the materials for the performance of their function and for the growth and renewal of all the components.

Nutrition status is the condition of the body as it related to consumption and utilization of food. The nutritional status of a person may be either good or poor. Good nutrition status refers to the intake of a well-Balanced diet, which supplies all the essential nutrients to meet the body's requirements. such persons may be said to be receiving optimum nutrition. Poor nutritional status refers to an inadequate or even excessive intake or poor utilization of the nutrients to meet the body's Requirements. Over eating can also result in poor nutritional status of persons.

Health

Health is defined by the world health organization of the United nations as the "state of complete physical, mental and social well beings and not merely the absence of disease and infirmity.

The essential requisites (or dimensions) of "health" would include the following:

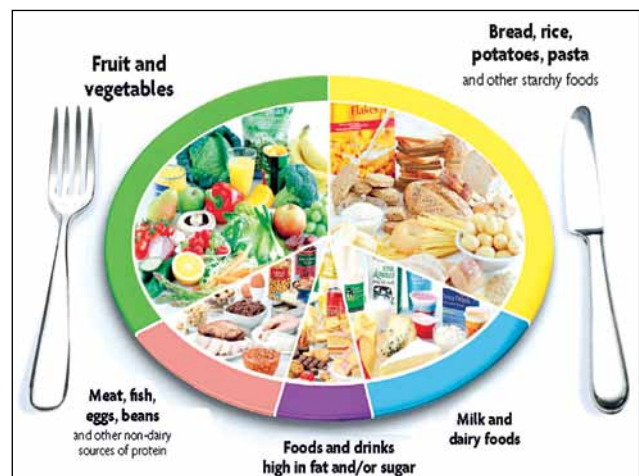
- Achievement of optimal growth and development, reflecting the full expression of one's genetic potential.

- Maintenance of the structural integrity and functional efficiency of body tissues necessary for an active and productive life.
- Mental well-being.
- Ability to withstand the inevitable process of ageing with minimal disability and functional impairment, and
- Ability to combat disease, such as
 - a. Resisting infections
 - b. Preventing the onset (and retarding the progress) of degenerative disease such as cancer and
 - c. Resisting the effect of environmental toxins and pollutants.

Nutrition status-

Signs of Good nutritional status-Shiny hair, smooth skin, clear eyes and alerts expression and flesh on well developed structure reflect good nutritional status of a persons. A persons ought to be of correct weight in relation to his. His physical and mental response should be normal.

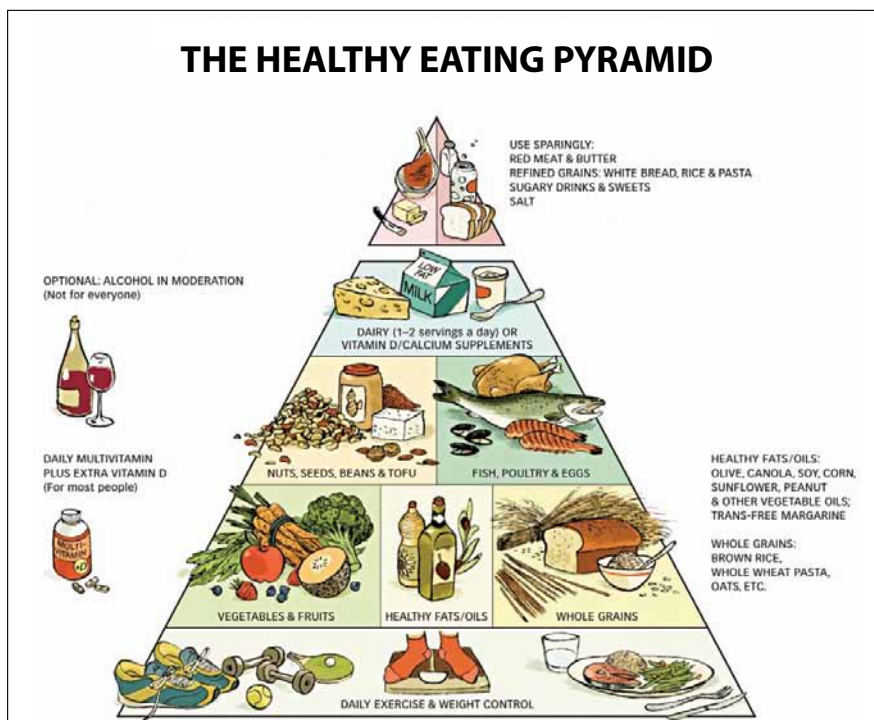
Signs of poor nutritional status-Poor physique, very little stamina, dull lifeless hair, dull eyes, slumped posture, Fatigue and depression. He may be grossly overweight or underweight. The three important aspects namely those of diet, sleep and elimination habits are irregular. Clinical symptoms of nutritional deficiencies may be presents, but may not exhibit any symptoms



What are nutritional requirements?

The amount of each nutrient needed is called the nutritional requirement. These are different for each nutrient and also vary between individuals and life stages, e.g. women of childbearing age need more iron than men.

Food Group	Percentage
Cereals and millets	60
Body –building foods	15
Other vegetables and fruits	10
Protective foods	10
Energy group	05



The five food groups and their major nutrients

Food groups	Main nutrients
Cereal grains and product Rice, Wheat, Ragi, Bajara, Maize, jower, Barley, Rice, Flakes, wheat, flour	Energy, Protein, invisible fat, vitamin-B1, Vitamin-B2, Folic acid, Iron, fibre
Pulses ad legumes Bengalgram, Blackgram, Greengram, Redgram, Lentil (Whole as well as Dhals), Cowpea, Peas, Rajmah, soyabean, beans	Energy, protein, Invisible fat, vitamin-B1, Vitamin-B2, Folic acid, Calcium, Iron, Fibre
Milk and Meat products Milk, curd, skimmed milk, Cheese, Chicken, liver, fish, Egg, meat	Protein, Fat, Vitamin-B2, Calcium
Fruits and Vegetables Fruits -mango, Guava, Tomato, papaya, Orange, sweet lime, water melon Vegetable -(Green leafy), Amaranth, Spinach, Gogu, Drumstick leaves, Coriander leaves, Fenugreek leaves	Carotenoids, Vitamin-C, Fibre, Invisible fat, Vitamin-B2, Folic acid, iron Carotenoids, Vitamin-B2, Folic acid, Calcium, iron, Fibre
Other vegetables -Carrots, Brinjal, ladies finger, Beans, Capsicum, onion, Drumstick, cauliflower	Carotenoids, Folic acid, Calcium, Fibre
Fats and sugar Fats -Butter, ghee, Hydrogerated fat, cooking oils like groundnut, Mustard, coconut Sugar -Jaggery and sugar	Energy, fat, Essential fatty acids Energy

2

NUTRIENTS AND THEIR SOURCE

What are Nutrients-Nutrients are chemical components of food that supply nourishment to the body. They are required by the body in the right amounts and they must

be eaten regularly. Each nutrient –Proteins, carbohydrates, fats, minerals, vitamins and water performs a specific function in our body.

Nutrients source in our daily life

Major nutrients		Other nutrients
Energy Rich foods	Carbohydrates and fat	
	Whole grain, Cereals, millets	Protein, Fibre, minerals, Calcium, Iron & B-complex, vitamins
	Vegetables oils, Ghee, butter	Fat soluble vitamins, essential, fatty acids
	Nuts and oilseeds	Protein, Vitamins, minerals
	Sugar	Nil
Body building foods	Proteins	
	Pulses, nuts and oilseeds, milk and milk product, meat, fish, poultry	B-complex, vitamins, invisible fat, fibre, calcium, vitamin A, Riboflavin, Vitamin B12, 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
	Egg, milk and milk products, Flesh foods	Protein and fat

Function of Nutrients- A Nutrients must accomplish at least one of the following three Function:

- **Supply energy to the body**
- **Build and repair body Tissues**
- **Regulate body processes**

Nutritional adequate Foods

A Nutritionally adequate diet should be consumed through a wise choice from a variety of food-

- Nutrition is a basic prerequisite to sustain life.
- Variety in food is not only the spice of life but also the essence of nutrition and health.
- A diet consisting of foods from several food groups provides all the required nutrients in proper amounts. Cereals, millets and pulses are major sources of most nutrients.
- Milk which provides good quality proteins and

calcium must be an essential item of the diet, particularly for infants, children and women.

- Oils and nuts are calorie-rich foods, and are useful for increasing the energy density.
- Inclusion of eggs, flesh foods and fish enhances the quality of diet.
- However, vegetarians can derive almost all the nutrients from diets consisting of cereals, pulses, vegetables, fruits and milk-based diets.
- Vegetables and fruits provide protective substances such as vitamins/ minerals/ phyto nutrients.

Why do we need nutritionally adequate food?

Nutrients that we obtain through food have vital effects on physical growth and development, maintenance of normal body function, physical activity and health. Nutritious food is, thus needed to sustain life and activity.

Our diet must provide all essential nutrients in the required amounts. Requirements of essential nutrients vary with age, gender, physiological status and physical activity. Dietary intakes lower or higher than the body requirements can lead to under-nutrition (deficiency diseases) or over-nutrition (diseases of affluence) respectively. Eating too little food during the vulnerable periods of life such as infancy, childhood, adolescence, pregnancy and lactation and eating too much at any age can lead to harmful consequences. An adequate diet, providing all nutrients, is needed throughout our lives. The nutrients must be obtained through a judicious choice and combination of a variety of foodstuffs from different food groups.

Carbohydrates

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 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 pectin's in vegetables, fruits and cereals, which constitute the dietary fiber component.

Protein

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. 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.

Fat

Oils and fats such as butter, ghee and vanaspati 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.

Vitamin

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 (B₁), riboflavin (B₂), niacin, pyridoxine (B₆), folic acid (B₉) are water soluble. Pro-vitamin like beta-carotene is converted to vitamin A in the body. Fat soluble 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 tissue.

3

NUTRIENT REQUIREMENT & ASSESSMENT FOR HUMAN

Nutrient requirement can be defined as the minimum amount of the absorbed nutrient that is necessary for maintaining the normal physiological function of the body.

Methods of assessment of nutritional status;

The nutritional status can be assessed by two methods

(A) Direct

- (a) Clinical methods
- (b) Anthropometric methods
- (c) Biochemical methods
- (d) Dietary Procedures

(B) Indirect

- (a) Under nutrition – Ref appendix -1
- (b) Over nutrition - Ref appendix -1
 - **Functional Foods:** Functional foods can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions of the body, beyond adequate nutritional effects. functional foods must remain foods and they must demonstrate their effects in amount that can normally be expected to be consumed in the diet. They are not pills or capsules but part of normal food pattern.
 - **Dietary /Food supplements:** Dietary /Food supplements are concentrated sources of nutrients or other substances with nutritional or physiological effect whose purpose is to supplements the normal diet.

Balanced Diet

A balanced diet should provide around 60-70% of total calorie from carbohydrate, 10-12 % from protein and 20-25 % of total calories from fat.

Meets Nutritional Requirement
Prevent degenerative disease
Improves longevity
Prolongs productive life
Improve Immunity & help in coping up stress.
Increase endurance level and Develops optimum cognitive ability.

- **Recommended Dietary allowances (RDA)-** The estimated nutrient allowance that is adequate in 97% to 98% of the healthy population specific for life –stage, age and gender. RDA includes addition of safety factor to the requirement of the nutrients, to cover the variation among individuals; losses during cooking and lack of precision inherent in the estimated requirement. The RDA is the dietary intake goal for individuals. but purpose is not to assess diets of individuals or groups.

Dietary Guidelines - A broad framework for action

Right nutritional behaviour and dietary choices are needed to achieve dietary goals. The following 15 dietary guidelines provide a broad framework for appropriate action:

- Eat variety of foods to ensure a balanced diet.
- Ensure provision of extra food and healthcare to pregnant and lactating women.
- Promote exclusive breastfeeding for six months and encourage breastfeeding till two years or as long as one can.
- Feed home based semi solid foods to the infant after six months.
- Ensure adequate and appropriate diets for children and adolescents, both in health and sickness.
- Eat plenty of vegetables and fruits.
- Ensure moderate use of edible oils and animal foods and very less use of ghee/ butter/ vanaspati.
- Avoid overeating to prevent overweight and obesity.
- Exercise regularly and be physically active to maintain ideal body weight.
- Restrict salt intake to minimum.
- Ensure the use of safe and clean foods.
- Adopt right pre-cooking processes and appropriate cooking methods.
- Drink plenty of water and take beverages in moderation.
- Minimize the use of processed foods rich in salt, sugar and fats.
- Include micronutrient-rich foods in the diets of elderly people to enable them to be fit and active.

RECOMMENDED DIETARY ALLOWANCES FOR INDIANS																
Group	Particulars	Body weight kg	Net energy Kcal/d	Protein g/d	Visible fat g/day	Calcium mg/d	Iron mg/d	Vitamin µg/kg		Thiamine mg/d	Riboflavin acid mg/d	Nicotinic acid mg/d	Pyridoxine mg/d	Ascorbic acid mg/d	Free folic acid µg/d	Vit B12 µg/d
								Retinol	β carotene							
Man	Sedentary work		2425							1.2	1.4	16				
	Moderate work	60	2875	60	20	400	28	600	2400	1.4	1.6	18	2	40	100	1
	Heavy work		3800							1.6	1.9	21				
Woman	Sedentary work		1875							0.9	1.1	12				
	Moderate work	50	2225	50	20	400	30	600	2400	1.1	1.3	14	2	40	100	1
	Heavy work		2925							1.2	1.5	16				
	Pregnant woman	50	+300	+15	30	1000	38	600	2400	+0.2	+0.2	+2	2.5	40	400	1
	Lactation															
	0-6 months		+550	+25	45	1000	30	950	3800	+0.3	+0.3	+4	2.5	80	150	1.5
	6-12 months	50	+400	+18						+0.2	+0.2	+3				
Infants	0-6 months	5.4	108/kg	2.05/kg		500				55 µg/kg	65 µg/kg	710 µg/kg	0.1	25	25	0.2
	6-12 months	8.6	98/kg	1.65/kg				350	1200	50 µg/kg	60 µg/kg	650 µg/kg	0.4			
Children	1-3 years	12.2	1240	22			12	400	1600	0.6	0.7	8	0.9	40	30	0.2-1.0
	4-6 years	19	1690	30	25	400	18	400		0.9	1	11			40	
	7-9 years	26.9	1950	41			26	600	2400	1	1.2	13	1.6	40	60	
Boys	10-12 years	35.4	2190	54	22	600	34	600	2400	1.1	1.3	15	1.6		70	
Girls	10-12 years	31.5	1970	57			19			1	1.2	13				
Boys	13-15 years	47.8	2450	70	22	600	41	600	2400	1.2	1.5	16	2		100	0.2-1.0
	13-15 years	46.7	2060	65			28			1	1.2	14				
Boys	16-18 years	57.1	2640	78	22	500	50	600	2400	1.3	1.6	17	2	40	100	0.2-1.0
	16-18 years	49.9	2060	63			30			1	1.2	14				

Source: Gopalan, C, Rama Sastri B.V. and Balasubramanian, S.C., 2004, Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad.

4

NUTRITIONAL GOALS AND GUIDELINES FOR RURAL WOMEN

Six tips for rural women for good health-

- Six to eleven serving of bread, cereal.
- Three to five servings of vegetables
- Two to four servings of fruits
- Two to three servings of milk, yogurt and cheese
- Two to three servings of meat, poultry, fish, beans, eggs and nuts

Guidelines for Good health for Rural Population-

- Maintain regularity in routine diet.
- Eat as much natural foods as you can.
- Consume seasonal foods as far as possible.
- Eat well but do not “Overeat”
- Avoid Excessive salt and spice.
- Avoid too many sweets, especially sugar.
- Eat foods which contain carbohydrates, especially starch and fiber.
- Avoid foods that contain large amounts of Cholesterol and saturated fats.
- Watch your weight and maintain ideal weight.
- Avoid eating the same kind of foods all the time. eat a variety of foods.

DIETARY GOALS

- Maintenance of a state of positive health and optimal performance in populations at large by maintaining ideal body weight.
- Measurement of adequate nutritional status for pregnant women and lactating mothers
- Improvement of birth weights and promotion of growth of infants, children and adolescents to achieve their full genetic potential.
- Achievement of adequacy in all nutrients and prevention of deficiency diseases.
- Prevention of chronic diet-related disorders.
- Maintenance of the health of the elderly and increase the life expectancy.

Diet and nutrition tips for women

- **Focus on whole, plant-based foods.** Fill most of your plate with fruits and leafy green vegetables. Also include a variety of whole grains, beans, and other legumes to give you filling fiber and keep you going throughout the day. Try to find minimally processed or locally grown foods whenever possible and make these foods the mainstay of your diet.
- **Bone up on calcium.** Women are at a greater risk than men of developing osteoporosis, so it's important to get plenty of calcium to support your bone health. While dairy products are high in calcium, their animal fat and protein can accelerate bone loss. So also consider plant-based sources of calcium like beans, broccoli, kale, Brussels sprouts, and collard greens.
- **Make sure you get enough iron.** Many women don't get enough iron in their diet. On top of that, women lose a lot of this important mineral during menstruation. Boost your intake by eating iron-rich foods such as lean red meat, dark poultry, lentils, spinach, almonds, and iron-fortified cereals.
- **Cut back on alcohol and caffeine.** Women who have more than two alcoholic drinks a day are at higher risk of osteoporosis. Caffeine consumption interferes with hormone levels and also increases the loss of calcium. Both alcohol and caffeine can also worsen PMS and menopause symptoms and adversely affect fertility. Try to limit alcohol consumption to one glass a day and caffeine to one cup a day.
- **Cut down on added sugars.** Sugars that are not found naturally in foods contribute zero nutrients but lots of calories to your diet. Naturally occurring sugars are found in products containing milk (lactose) and fruit (fructose), while added sugars can be hidden in the ingredients list as agave nectar, cane crystals, corn sweetener, crystalline fructose, dextrose, evaporated cane juice, high-fructose corn syrup, invert sugar, maltose, malt syrup, and more.

5

MALNUTRITION AND NUTRITION

Malnutrition

Malnutrition is a state in which a prolonged lack of one or more nutrients retards physical development or causes specific clinical disorders e.g iron deficiency, anemia, goitre etc. Malnutrition can also be defined as an impairment of health resulting from deficiency, excess or imbalance of nutrients. It includes under nutrition and over nutrition. kwashiorkor, a protein –deficiency disease, highlights this fact since in most cases of kwashiorkor the cause is intake or poor quantity protein rather than inadequate quantity over a prolonged period of time. More recently malnutrition is defined as an unintentional weight loss of more than 10 percent, associated with a serum albumin level below 3.2g/dl. Some Characteristics of people suffering from malnutrition are dull lifeless hair, greasy pimpled facial skin; dull eyes, slumped posture, fatigue and depression are easily evident by their spiritless expression and behavior, and lack of interest in their surroundings. Such people may be underweight or overweight. sleep may be affected, and also the eliminations habits. Constipation is a common problem.

Role of Nutrition Rich food reduced malnutrition

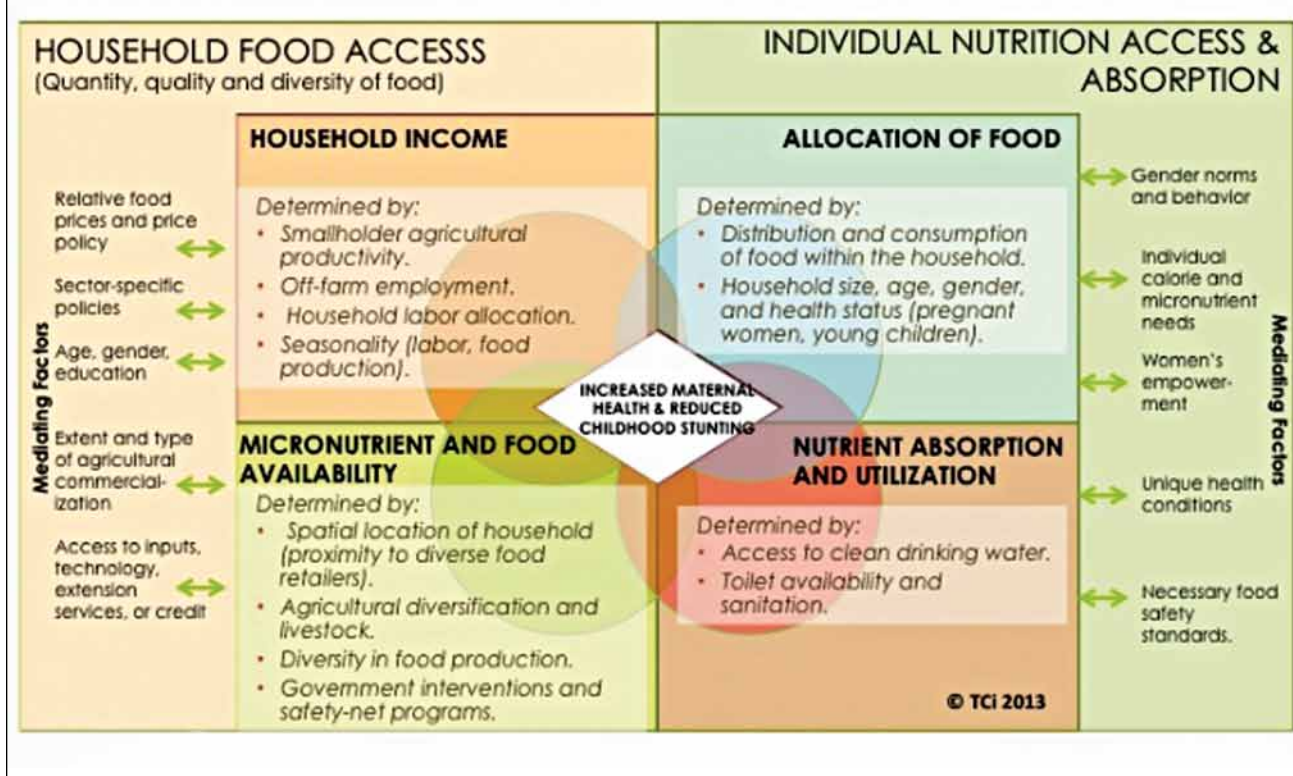
- Most populations with micronutrient deficiencies consume staple diets of refined cereal grain-or tuber-based diets, which often provide adequate protein and energy, but insufficient amounts of micronutrients.

The following examples include five micronutrients which are considered to be of public health importance and which may be markers of overall micronutrient status. Furthermore, there is a high prevalence of vitamin A, iron, and zinc deficiencies worldwide.

- In general, adding carrots, an orange, beef, spinach, and lentils (or black beans) to the staple diets will meet the recommended nutrient densities for these five micronutrients.
- Vitamin A nutrition will be improved by including:
 - A small portion of plant foods rich in carotenoids (the precursor for vitamin A). Examples include:
 - Carrots, mangos, papaya, and melon
 - Green leafy vegetables
 - Palm oil
 - Animal foods, which include the highly bioavailable form of vitamin A. Including small portions of animal foods will exceed the recommended nutrient density for vitamin A.
 - Vitamin C nutrition will be improved by including:
 - Citrus fruits, including an orange, guava, amla, kiwi, cranberries, strawberries, papaya, mango, cantaloupe, spinach, Swiss chard, tomato, asparagus, or Brussels sprouts.
 - Minimal cooking (e.g., steaming or stir-frying) is recommended because ascorbic acid (vitamin C) may be destroyed by heat.
 - Folate nutrition will be improved by including:
 - The best sources are green leafy vegetables, Brussel sprouts, and organ meats (chicken liver is a great source).
 - Legumes (e.g., lentils or beans and peas in larger portions)
 - Prolonged heating in water should be avoided as 50% or more of folate is destroyed during cooking. Consuming the cooking water from the vegetables increases folate intake.
 - Iron and zinc nutrition will be improved by including:
 - Small amounts of flesh food
 - Legumes will slightly improve the amount of iron in the diet but will not be adequate unless some meat or fish is included. The form of iron in legumes (non-heme iron) has poor bioavailability.
 - Education about enhancers and inhibitors of iron:
 - Vitamin C (ascorbic acid) enhances iron absorption.

- Food preparation methods including fermentation of phytate-containing grains during bread baking (e.g., including yeast in the bread), which minimizes the effects of phytates in inhibiting both iron and zinc absorption.
- In addition to improving dietary diversification, proper dietary practices and food preparation methods must to be taught for any food-based approach to be effective. Examples include
 - Vegetables rich in vitamin C, folate or other water-soluble or heat labile vitamins need to be minimally cooked with small amounts of water.
 - For iron and zinc, increasing the enhancers of absorption and reducing the inhibitors of absorption is important.

Agriculture – Nutrition Pathways: Conceptual Framework



6

LOW COST BALANCED DIET FOR NUTRITIONAL SECURITY

Low cost Balanced Diets reducing malnutrition

Diets of poor can be improved nutritionally by

1. Replacing a single cereal with mixed cereals, one of them being millet.
2. Inclusion of at least 50g green leafy vegetables to improve the intake of vitamin A, iron and calcium.
3. Inclusion of inexpensive yellow fruits like papaya or mango and greens to increase vitamin A and C intake.
4. Inclusion of at least 150ml of milk improves intakes of riboflavin, calcium besides improving protein quality of the diet.
5. Another extra 10g of oil increase energy and essential fatty acid intake.

Table-Low cost balanced diet with local available foods

Ingredients	Amount (gm)
Pulses	460
Leafy vegetable	50
Other vegetables	60
Roots and tubers	50
Milk	150
Oil and Fat	40
Sugar and jiggery	50

Source-Gopalan, c.,B.V Ramasastry and S.C balasubramanian (1991), Nutritive value of Indian foods, National institute of nutrition, ICMR, Hyderabad, India

Dietary guidelines to reduce the cost of a meal in rural area-

- Cereals, since they are less expensive, can be increased to more than the normal amount present in balance diet.
- Inclusion of millets like ragi, jowar and bajara can reduce the cost of a meal.
- Big and thick roties can be prepared to save time and fuel.
- Combination of cereals and pulses improve the quality of cereal as well as pulse proteins.
- Pulses like horse gram can be included to reduce the cost of a meal.
- Fermenting, malting and sprouting can be done at home which enhance the nutritive value without increasing the processing cost.
- Greens particularly from trees like drumstick or aphyll are cheaper. Locally available kitchen gardens produce can be used.
- Leaves of cauliflower, carrots, knol-knol and beet root which are highly nutritious can become part of meal. curry leaves can be used in consumable form like chutneys, powder or in ground form in curry leaves pulao.
- Inexpensive and nutritious fruits like papaya and guava can be included in the diet.
- Inclusion of dry fish (like nethil) may supply good amount of nutrients without increase the cost.
- Jiggery can be used instead of sugar.
- Toned milk with low fat is less expensive but gives all the other nutrients except fat. Steamed food are less expensive than fried food. low cost diets have less amount of fats oil and sugars.
- Natural food are less expensive compared to processed and preserved foods.
- Foodstuff that are distributed through public distribution system (Ration shop) can be used.
- Unbranded food can be included.
- Inclusion of locally available ingredients and seasonal foods reduce the cost of a meal.



NUTRITIONAL AND FOOD REQUIREMENTS FOR INFANTS

Infants and pre-school children are dependent on their mother for nourishment and if her selection of foods for them is incorrect, they may suffer from malnutrition. during the process of weaning, most poor children are a prey to faulty nourishment since they may be fed *sago kanji (gruel)* as a substitute for milk and no other foods providing good quality protein *sago kanji* provides supplies carbohydrates but very little proteins, lack of proteins in the diet may result in severe wasting of body tissues. This may lead to multiple deficiencies and kwashiorkor result. This is many cases, is fatal or if the child on treatment does survive, it many leave its effect in the form under –development brain.

Principles governing the formulation of the recipes

As mentioned earlier, an infant aged 6 months to 1 year requires about 13 g. of protein and 800 calories daily. Breast-milk that may be available to them provides approximately 5 g. of protein and 300 calories. The recipes now suggested as weaning foods for the infant are so planned as to supply the rest of the requirements.

Likewise, a pre-school child, depending upon his age, requires daily about 20 g. of protein and about 800-1.500 calories. The supplements suggested here are expected to provide about half the total daily requirement of protein and about 1/3 the total caloric needs.

The cereals and millets commonly used in various regions of our country are rice, wheat, Jowar, Bajra, ragi, maize etc. Cereals in general provide about 350 calories per 100g. They are however, relatively poor sources of protein, the content varying from about 77 in rice to about 12% in wheat. The protein content of the millets Jowar, Ragi and bajra fall in between. Pulses are about the richest natural sources of proteins. They contain about 22 to 25% protein and like cereals. Supply about 350 calories per 100 g.

ICMR Recommended dietary allowances for infants

Nutrient	Month	
	0-6	6-12
Body weight kg	5.4	8.6
Energy kcal/kg	108	98
Protein g/kg	2.05	1.65
calcium mg	500	500
Vitamin A ug	350	350
p-Carotene ug	1400	1400
Thiamin ug/kg	55	50
Riboflavin ug/kg	65	60
Niacin ug/kg	710	650
Pyridoxine	0.1	0.4
Vitamin C mg	25	25
Folic acid ug	25	25
Vitamin b 12 ug	0.2	0.2

Weaning-The term ‘weaning’ comes from the word ‘wemain’ which means to accustom. Weaning begins from the moment supplementary food is started and continues till the child taken off the breast completely.

Composition of weaning food containing amylase activity for 100 gm

Item No	Particulars	Gm
1.	Wheat /maize/bajra (cambu) flour	35
2.	Malted ragi flour	5
3.	Bengal gram flour	12
4.	Edible groundnut flour/edible low fat soya flour	17
5.	Powdered jiggery	30
6.	Calcium carbonate (700g), ferrous sulphate(150g) and vitamin premix (150g)	1
100gm weaning food contains 15 g of protein and 375 kcal		

Mixture contains 200mcg of vitamin A, 3.5mcg of vitamin D, 0.5 mg of thiamin, 0.5 mg of riboflavin, 5mg of niacin, 300mg of calcium, 12 mg of iron, 0.5 mcg of vitamin B12, 50 mcg of folic acid and 30mg of ascorbic acid.

Types of supplementary foods-

Liquid supplements

- Milk
- Juice of fresh fruits

- Soup from green leafy vegetables
- Fish liver oil

Solid supplements mashed well before feeding

- Cereal and starchy gruels
- Vegetables
- Fruits
- Non-Vegetarian foods
- Pulses

Low cost supplementary foods developed in India

Name of the product	Composition
Indian multipurpose Food (C.F.T.R.I)	Low fat groundnut flour and Bengal gram flour (75:25) Fortified with vitamin A and D, B1, B2 and calcium carbonate.
Malt Food (C.F.T.R.I)	Cereal malt, low fat groundnut flour, roasted Bengal gram flour (40:40:20) Fortified with vitamins and calcium salts.
Balahar Food (C.F.T.R.I)	Whole wheat flour, groundnut flour and roasted Bengal gram flour (70:20:10:) fortified with calcium salts and vitamins.
Supplementary food (N.I.N)	Roasted wheat flour, green gram flour, groundnut and sugar or jiggery.
Win Food (Gandhi gram rural Institute)	Pearl millet, Green gram dal, groundnut flour and jiggery (50:15:25:25)
Supplementary food (A.H.S.C.W)	Roasted maize flour, green gram flour, roasted groundnut and jiggery (30:20:10:20)

Suggested recipe for infants

(1) Ragi Porridge

Ingredients	Quantity
Ragiflour	50 g
Bengal gram dal flour (Roasted)	4 teaspoons
Groundnut cake powder (Rosted)	4 teaspoons
Jaggery	20 g

Methods

Boil jiggery solution. mix ragi and Bengal gram flour and make a batter with hot water. pour the batter slowly into the jiggery solution, stirring continuously for 10-15 minutes. serve warm.



Nutritional value per 100 gm

Calories (kcal)	450
Protein (gm)	5.3gm
Iron (mg)	6.3 mg
Carotene	132 gm

(2) Shishu Ahar

Ingredients	Quantity
Puffed rice or broken wheat	40 g
Bengal gram flour	20g
Groundnut	10g
Jaggery	30g

Methods

- Roast and grind puffed rice, Bengal gram flour and groundnut separately
- Mix all the dry ingredients.
- Before serving, add jiggery and make a paste with milk /water



Nutritional value per 100 gm

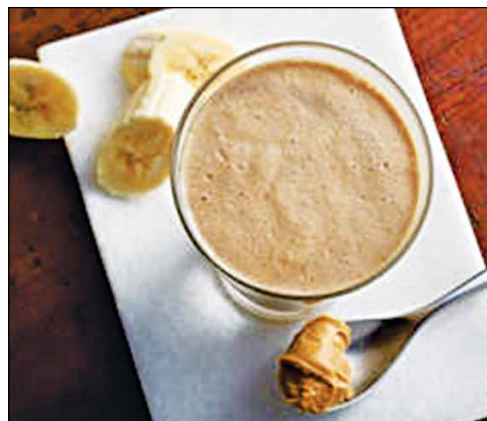
Calories (kcal)	290
Protein (gm)	7.3
Iron (mg)	6.3
Carotene (ug)	78

(3) Banana Groundnut Food

Ingredients	Quantity
Milk	30g
Banana	30g
Jaggery	30g
Groundnuts	10g

Methods

- Mash the banana
- Roast and grind groundnuts
- Mix all the ingredients to form a smooth paste



Nutritional value per 100 gm

Calories (kcal)	264
Protein (gm)	6.3
Iron (mg)	5.63
Carotene (ug)	76.3

(4) MILLET PORRIDGE

Ingredients	Quantity
Roasted bajara powder	30 gm
Greengram dal powder roasted	15gm
Powdered roasted groundnut	10gm
Sugar	30gm
Spinach	30gm



Methods

- Boil the leafy vegetable in water till soft, mash and strain through a clean cloth.
- Add the millet. Pulse and groundnut powders to the vegetable juice.
- Add jiggery and cook for a few minutes to a semi-solid consistency.

Nutritional value per 100 gm

Calories (kcal)	635
Protein (gm)	8.36
Iron (mg)	10.23
Carotene (µg)	44.36

(5) Wheat flour/ Maize (Kasaar)

Ingredients	Quantity
Wheat flour/ Maize flour	80 Gram (1 Bowl)
Jiggery /Sugar	40 Gram
Oil/ Ghee	2 spoon



Methods

- Take wheat flour/ Maize flour and cook it in Ghee/Oil on low flame till Golden brown.
- Cut pieces of Jiggery/ Grind sugar
- Add small pieces of Jiggery or Grind Sugar to the above cooked wheat flour/ Maize flour and Mix It well.

Nutritional value

Calories	466 K.cal
Protein	10.00 g
Iron	4.70 mg.
Carotene	45.5 µg.

8

NUTRITIONAL AND FOOD REQUIREMENT FOR PRE-SCHOOL CHILDREN

The years between 1 and 6, growth is generally slower than in first year of life but continues gradually. The child may gain in weight 150-200 gm per month between one and two years Activity also increase markedly during the second year of life as the child becomes increasingly mobile. Development of a full dentition by about the age of 2 years also increase the range of foods product that can safely be eaten.

Table-ICMR Recommended dietary allowances for pre-school children

Nutrient	Years	
	1-3	4-6
Body weight kg	12.2	19.0
Energy kcal/kg	1240	1690
Protein g/kg	22	30
calcium mg	400	400
Vitamin A ug	400	400
Iron mg	12	12
Beta-Carotene ug	1600	1600
Thiamin ug/kg	0.6	0.9
Riboflavin ug/kg	0.7	1.0
Nicotinic acid mg	8	11
Pyridoxine mg	0.9	0.9
Ascorbic acid mg	40	40
Folic acid ug	30	40
Vitamin B 12 ug	0.2 to 1	0.2 to 1

Nutrition related problem of pre-schoolers

In more than 50 percent of deaths in children, malnutrition is the direct or indirect cause. Survey on pre -school children by the national nutrition monitoring Bureau (2007) Found that they did not get sufficient amount of nutrients such as vitamin A, Folic acid, iron and calcium.

Protein Energy malnutrition-Protein energy malnutrition as defined as a range pathological condition arising from coincident lack of varying proportion of protein and calorie, occurring most frequently in infants and young children and often associated with infection.

The prevalence Rate of severe degree of PEM in our community is 3-5 %.For every 3 to 5 cases of severe PEM, we can detect 80-90 cases of mild to moderate PEM and about 10 % of well nourished Children.

The following are the cause for underweight for age which may participate into PEM:

- Due to poverty, mother is not able to provide sufficient food to the child resulting in under nutrition.
- The starchy gruels made from local staple food like Rice, wheat, bajara,ragi,jowar,maize would result in "dietary bulk with a low calorie density".
- Abrupt weaning, late weaning ignorance of importance of weaning can lead to under nutrition.

Symptoms of different type of PEM

- Kwashiorkor
- Marasmic Kwashiorkor
- Marasmus
- Nutritional dwarfing
- Underweight child

Diet given to Protein energy malnutrition children

Items	Raw amount g	Energy Kcal	Protein g	Iron mg	Retinol mg
Parboiled Rice	100	346	6.4	1.0	-
Dhal	30	100	6.0	1.6	20
Milk	500	320	16.0	1.0	215
Sugar	50	200	-	-	-
Bread	100	245	7.8	1.1	-
Butter	15	135	-	-	120
Egg	50	80	6	1	475
Plantain	50	30	-	0.9	20
Orange	100	50	-	0.3	276
Vegetable	100	50	2	-	20
Oil	10	90	-	-	-
Total		1646	44	10	1146

Source: Gnanasundaram, S.,1988,II Annual conference of nutrition Society of India (Tamilnadu chapter)-Bulletin

Dietary pattern of Protein Energy malnutrition

- From locally available staple foods.
- Inexpensive
- Easily digestible
- Consisting of minimum of 100 ml of milk per day. If the patient can afford, more milk as well as eggs can be given.
- Cereal and pulses combination 5:1 Proportion.
- Evenly distributed throughout the day
- Consisting of all the five food groups
- Of increased quantity of food which the child is already used to.
- Of many number of feedings to increase the quantity of food.
- High in calories by adding oil and banana. Banana is also a bowel binder.

Agricultural crop used for Low cost recipes for children recovering from PEM

Agricultural Crop	Product
Ragi, green gram	Puttu
Ragi, Bengal gram, wheat	Puttu, Payasam
Rice, Bengal gram	Porridge
Redgram, Spinach, dal, Wheat, Rava, greengram dal, groundnut powder	Vegetable upma

Deficiency of vitamin A

Vitamin A deficiency is preponderant in children. While it is rare during infancy, preschool children are at a greater risk. The corneal lesions, however, are rarely seen in the children above the age of 6 years. A great majority of the cases xerophthalmia occur between 1 and 3 years, coinciding with peak-prevalence of severe protein energy malnutrition.

Socioeconomic factors

Children from rural and tribal families belonging to low – income group are more vulnerable to vitamin A deficiency. Cases are common in remote villages. The mothers of vitamin A deficient children are generally illiterate and unaware of the importance of diet in disease. Because of food fads and false beliefs, Foods like colostrums, green leafy vegetables and papaya which are rich in vitamin A are avoided. The poor families cannot afford animal foods which are rich in preformed vitamin A.

Clinical signs

- Night Blindness(XN)
- Conjunctival xerosis(XIA)
- Bitot's spots(XIB)
- Corneal xerosis(X2)
- Keratomalacia(X3B)
- Increased susceptibility to infection

Nutrition Education-

- Ensuring adequate intake of vitamin A and carotene rich foods by pregnant mothers for building up vitamin stores in mother and the fetus.
 - Supplements of vitamin A and Beta-carotene rich foods like Carrots, pumpkin, spinach and other dark green leafy vegetables to be given in puree form (boiled and mashed) with addition of a little ghee or oil and fruits like papaya, mango are to be given to the infants from 4-6 month onwards at least once daily.
 - Ensuring regular intake of vitamin A and beta – carotene rich food by preschool children.
 - Nutrition education /information on vitamin A is to be communicated extensively to all sections of population by all concerned sectors, NGOs, extension agencies and the food industry.

Suggested Agricultural and horticultural product recipe for Vitamin A deficiency

Recipe	Reasons
Boiled egg	Rich in vitamin A and good quality protein
Coriander and mint Chutney with bread /chapatti	Not only rich in beta carotene but also rich in other nutrients
Carrot salad, carrot kheer, carrot juice papaya	Rich in beta carotene and vitamin C, protein
Tomato juice, tomato juice, mango juice	Rich in beta carotene and vitamin C
Palak dal, palak powder dry	Rich in beta carotene and protein

Suggested ready to eat recipe for pre school children

(1) CHIDWA MIX

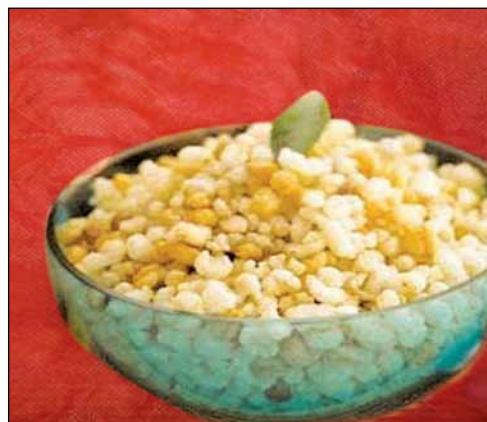
Ingredients	Quantity
Chidwa (rice flakes)	100gm
Bengal gram (roasted & de-husked)	30gm
Groundnut (roasted)	20gm

Methods

- Roast Chidwa and grind.
- Grind roasted Groundnut (without skin) & Bengalgram separately.
- Mix all thoroughly. Store in dry airtight container.

Nutritional value per 100 gm

Calories (kcal)	381
Protein (gm)	12.39
Iron (mg)	15.63
Carotene (µg)	22.6



(2) Rice soya mix

Ingredients	Quantity
Rice	30gm
Soybean	20gm
Sugar	50gm

Methods

- Roast rice and Soybean separately. Grind rice and Soybean and mix together.
- Add powdered sugar and store in an air tight bottle.

Nutritional value per 100 gm

Calories (kcal)	390
Protein (gm)	11
Iron (mg)	2.29
Carotene (µg)	85



(3) RICE food MIX

Ingredients	Quantity
Rice	75gm
Moong dal	25gm

Methods

- Roast rice and mong dal separately. Grind rice and mong dal to a fine powder.
- Mix the dry powder and fill in an air-tight bottle.



Nutritional value per 100 gm

Calories (kcal)	346
Protein (gm)	11.2
Iron (mg)	1.5
Carotene (µg)	12

(4) GEHUNA

Ingredients	Quantity
Bajra (roasted)	45 gm
Greengram dal (roasted)	10gm
Sugar	30gm

Methods

- Roast wheat, green gram dal and groundnuts separately. Grind and mix them up and store in air-tight containers. Instead of green gram, Bengal gram can also



Nutritional value

Calories (kcal)	369
Protein (gm)	9.36
Iron (mg)	11.23
Carotene (µg)	56

(5) WHEAT GRAM PORRIDGE

Ingredients	Quantity
Roasted Wheat flour	25gm
Powdered, roasted Bengal gram	15gm
Powdered, Rosted groundnut	10gm
Sugar or Jiggery	30gm
Spinach	30gm

Methods

- Roast groundnut. Wheat and Bengal gram and powder them.
- Mix the wheat, Bengal gram and groundnut powders and prepare a batter by addition of jiggery, dissolved in a suitable amount of water and made into a thin syrup. Boil spinach in water till soft, mash and strain through a clean cloth.
- Add the vegetable juice to the batter and cook for a few minutes with continuous stirring till semi-solid.



Nutritional value

Calories (kcal)	652
Protein (gm)	9.69
Iron (mg)	6.63
Carotene (µg)	88.36

9

NUTRITIONAL AND FOOD REQUIREMENTS FOR SCHOOL CHILDREN (6-12 YEARS)

The school –age period has been called the latent time of growth. The rate of growth slows and body changes occur gradually.

ICMR recommended dietary allowances of school children

Nutrient	Years		
	7-9	10-12	
		Boys	Girls
Weight kg	26.9	35.4	31.5
Energy kcal	1950	2190	1970
Protein g	41	54	57
Fat g	25	22	22
Calcium mg	400	600	600
Iron mg	26	34	19
Vitamin A mcg	600	600	600
Beta carotene mcg	2400	2400	2400
Thiamin mg	1.0	1.1	1.0
Riboflavin mg	1.2	1.3	1.2
Nicotinic acid mg	13	15	13
Pyridoxine mg	1.6	1.6	1.6
Ascorbic acid mg	40	40	40

Nutrition related problem in pre-school children

- Underweight
- Constipation
- Dental caries
- Obesity

Dietary guild lines

- Nutritional requirement should meet their increasing activity and growth and special requirement because of sickness or injury's.
- The diet should be containing all basic five food groups.

Suggested agricultural nutritious crop for reducing malnutrition in school going children-

- Vegetable such as Fenugreek, tomato, green leafy vegetables, carrot, lemon, cucumber
- Wheat, rice, pulses (all type)
- Fruits like orange, guava
- Drumstick leaves, coriander

Suggested recipe for School going children

(1) GROUNDNUT BISCUITS

Ingredients	Quantity
Groundnut (Roasted)	25gm
Wheat flour	25gm
Sugar	20gm
Baking powder	A pinch
Salt	

Methods

- Powder the main ingredients and mix them. Add baking powder and salt and mix thoroughly.
- Bake stiff dough by kneading mixture with fat (except for recipe groundnut biscuits-in which there is no need for additional fat). Roll like chapattis.



- Cut out any shape desired with tin-lids or any sharp instrument.
- Place the biscuits on metal trays and bake them well on heated sand in a dekchi.
- Remove the biscuits when they are golden-brown; this usually takes about 20 minutes.
- The quantities indicated are for use as supplement per child per day. For feeding larger groups of children, proportionately higher amounts can be used.

Nutritional value per 100 gm

Protein(gm)	5.36
Energy (kcal/100g)	436
Iron (mg/100 g)	3.3

(2) BENGALGRAM – SEASAME BISCUITS

Ingredients	Quantity
Bengal gram flour	10gm
Maida	15gm
Sesame	15gm
Sugar	20gm
Vanaspati	8gm
Salt	A pinch
Baking powder	A pinch



Methods

- Same for groundnut biscuits

Nutritional value per 100 gm

Protein(gm)	11.23
Energy (kcal/100g)	863
Iron (mg/100 g)	6.35

(3) HORSEGRAM BISCUITS

Ingredients	Quantity
Horse gram flour	25g
Maida flour	25g
Sugar	20g
Vanaspati	5g
Salt	A pinch
Baking powder	A pinch



Methods

- Same for groundnut biscuits.

Nutritional value per 100 gm

Protein(gm)	5.36
Energy (kcal)	402.23
Iron (mg)	3.69

(4) WHEAT SOY LADOO

Ingredients	Quantity
Wheat & soy flour	30gm
Greengram dal	20gm
Groundnut	8gm
Sugar or jiggery	20gm
Wheat can be replaced by jowar, maize, or ragi	

Methods

- Roast wheat, green gram dal and groundnut and powder them. Make jaggery syrup and add the flour mixture to it. Mix well and make into balls.



Nutritional value per 100 gm

Protein(gm)	6.39
Energy (kcal)	869
Iron (mg)	7.35

10

NUTRITIONAL AND FOOD REQUIREMENT OF ADOLESCENTS

The period of transition from childhood to adulthood is called adolescence with accelerated physical biochemical and emotional development. There are many physical and mental changes which influence of hormones. It is

during that period that final growth spurt occurs with increase in height and weight. The profound growth of adolescence there I increased demands for nutrition.

ICMR recommended dietary allowances of adolescents

Nutrient	Years			
	13-15		16-18	
	Boys	Girls	Boys	Girls
Body, weight kg	47.8	46.7	57.1	49.9
Energy kcal	2450	2060	2640	2060
Protein g	70	65	78	63
Fat g	22	22	22	22
Calcium mg	600	600	500	500
Iron mg	41	28	50	30
Vitamin A ug	600	600	600	600
Beta carotene ug	2400	2400	2400	2400
Thiamin mg	1.2	1	1.3	1
Riboflavin mg	1.5	1.2	1.6	1.2
Niacin mg	16	14	17	14
Pyridoxine mg	2	2	2	2
Ascorbic acid mg	40	40	40	40
Folic acid ug	100	100	100	100
Vitamin B12 ug	0.2-1	0.2-1	0.2-1	0.2-1

Dietary guidelines

- Adequate well balanced nutritious foods should be taken to prevent obesity or under nutrition.
- An adolescent girl should take enough calcium rich food in her diet to increase bone density
- Iron rich foods may be included in the diet to prevent anemia.

- Include fruits and vegetables in the diet to meet the vitamins, minerals and fiber requirement.

Nutritional related problem in adolescents

Eating disorder-Anorexia nervosa, Bulimia Nervosa

- Anaemia, Under nutrition

Suggested recipe for adolescent's girl

(1) RAGI LADDU

Ingredients	Quantity
Ragi flour	50 gm
Groundnut	15gm
Jaggery	50gm
Oil	5ml

Methods

- Steam cook ragi flour for 20 minutes. Roast groundnut, remove the outer red skin and powder coarsely. Prepare jaggery syrup of three thread consistency. Add steam cooked ragi flour, groundnut powder and oil. Mix all the ingredients thoroughly and make ladoo.



Nutritional value per 100 gm

Protein(gm)	6
Energy (kcal)	406
Iron (mg)	3.14
Carotene	22.08

(2) RAJMA SALAD

Ingredients	Quantity
Rajama soaked overnight and boiled	100 gm
Tomatoes, chopped	25 gm
Onion, thin sliced	25 gm
Spring onions, chopped	30 gm
To be mixed for dressing	
Lemon juice	10 gm
Salt and peeper	5 gm

Methods

- In a glass bowl, add all the ingredients, except lemon juice. Pour lemon juice over the salad and let it marinate for 30 minutes. Toss just before serving



Nutritional value per 100 gm

protein (gm)	9.36
Energy (kcal)	256
Iron (mg)	4.36

11

NUTRITIONAL REQUIREMENT OF FARM WOMEN/FARMER

Women are considered as the backbone of economy of agriculture. Heavy work is bound to leave in impact on the health of the farm women is directly related to well being of the entire family. many literature indicates that rural women face higher risk of morbidity and mortality because of strenuous physical work. Women with poor health and nutrition are more likely to give birth to unhealthy babies with poor health they also less likely to them able to provide population of rural women were in

grip of severe to moderate malnutrition. many studies reported that malnutrition status as well as nutrition knowledge is unsatisfactory and needs intervention.

Nutritional problem in farm women –Farm women suffer anemia, protein energy deficiency, under nutrition, cardio vascular disease etc. manly farm women suffers Protein energy deficiency because inadequate intake of nutrient rich diet.

Prevalence (%) of chronic Energy deficiency (CED) among women by physiological status

BMI grades	BMI Range	Prevalence %
CED III	Less than 16	23
CED II	From 16 to 17	14
CED I	From 17 to 18.5	26
Low –normal	From 18.5 to 20	23
Normal	From 20 to 25	14
Overweight & obesity	>25	-

Food Composition and nutrient content value of balanced diet for farm women

Food composition	Amount (g/day)	Nutrient	Value
Cereals & millets	400	Energy (kcal)	2730
Animal Foods	60	Protein (g)	80
Pulses (legumes)	80	Visible fat(g)	30
Green leafy vegetables	50	Calcium (mg)	850
Other vegetables	150	Iron (mg)	20.0
Roots & tubers	100	Zinc (mg)	12
Fruits	100	Magnesium (mg)	600
Milk	300	Vitamin A ((µg)	120
Fats & oils	30	Beta carotene ((µg)	4800
Sugar & jiggery	40	Thiamine(mg)	2.0
Nuts & oil seeds	25	Riboflavin(mg)	1.5
Pulses can be replaced with animal foods (egg, meat, fish and chicken)for non –vegetarians to meet the requirements		Niacin (mg)	20
		Vitamin B6	80
		Vitamin B12	250

Vegetables is very essential in the human's life. It provide energy, protein, vitamins, minerals facts, fibers and essential amino acids. There are seven food group among them vegetables are richest source of vitamins and minerals as well as contain good amount of fiber. Vegetables occupy an important place in our daily life particularly vegetarians. Vegetables are the only source to increase not only the nutritive values of foods but also its palatability. For a balanced diet, an adult should have an intake of 85 gm of fruits and 300 gm of vegetables per day as per the dietary recommendation.

Advantages of Nutritional Kitchen garden:

- Kitchen gardening is the best means of recreation and exercise in spare time for all the family members.
- There is reduction in the vegetable bill because there is no transport charge
- Kitchen gardening secures enough vegetables within the means of all classes of societies at a reasonable production cost
- Fresh and nutritious vegetables are available whenever required.
- Kitchen gardeners feel satisfied by consuming their self grown vegetables.
- More nutrients can be assured in daily diet by increasing the availability.

Constraints

- Land is the limiting factor in cities and towns.
- Limited choice of size, shape and location.
- Attack of monkeys, etc.
- Lack of knowledge to the kitchen gardeners about vegetable cultivation.
- Problems in maintenance of kitchen garden tools

Location of Nutritional garden

Location of kitchen garden plays a crucial role for its success. The Kitchen garden should be located on the eastern or southern side of the house allows maximum sunlight. If there is no space available in eastern or southern side, it may be located according to the availability of the land. The kitchen garden should be

near the building and well protected from cattle. In this way, it will be easier for family members to put in their labour in odd hours also. It is also convenient to collect the produce from the kitchen garden. As far as possible, the location should be such that kitchen garden plots are closed to the well, water tap or other source of irrigation. The facilities should be developed to utilize drain water from the kitchen and bathroom for the irrigation of kitchen garden crops especially colocasia, banana, guava, lemon and spinach beet. Kitchen garden should be away from tall growing trees to avoid shade and harmful effect from their roots.

Area of the nutritional garden

The area of the kitchen garden depends on the availability of the land, the members of family for whom vegetables are to be grown and the time that can be spared for its care. To meet the requirements of a five member family, an area of about 250 square meter land is sufficient. However, it is very difficult to have this much area in cities due to unaffordable cost of land. Therefore, any vacant space may be utilized for growing of vegetables. The vegetables can be grown on roof or any available space by utilizing different sized pots filled with necessary mixtures required for plant growth and development.

Plan and layout of the nutritional garden

For successful management of kitchen garden, planning is very essential. Layouts differ depending on the location, size, shape and slope of the land. Kitchen garden should be protected from all the sides. A simple bamboo protection will serve the purpose. The climbers like dolichos bean, snap beans, cucurbits, etc. can be grown on them. Fruit plants like Papaya, lemon, guava, grape, phalsa and banana can be planted in the sides.

The location of the plots, the crop to be grown, the probable dates of planting, spacing between the plants, the varieties of each crop to be used should be planned well in advance. The main aim in layout is the most economic utilization of space, which can be obtained by considering the following points:

- Fence should be used for training cucurbits, beans, etc.
- Continuous crop pattern should be followed in the form of succession and companion cropping.
- The ridges which separate the beds should be utilized for growing root crops.
- Vegetables like staked tomato may be grown on one side of the foot path and leafy vegetables on the other side.
- Crop rotation principles should be followed.
- Staggered sowing/transplanting of crops should be done at short intervals to ensure regular supply for longer period.
- Early maturing crops should be planted in continuous rows, so that the area may be available at once for accommodating/planting late crops.
- The compost pits should be placed in two corners of the garden.

those vegetables should be grown which are suited to the region and produce satisfactory yield. If space is limited, only most preferred vegetables are grown which give better yield and nutrition per unit area. The cultivars should be selected according to the suitability of the region and as per time of sowing. Tomatoes, chillies, capsicum, radish, carrot, palak, fenugreek, pointed gourd, bitter gourd, cabbage, lettuce are desirable for small gardens. One should grow those vegetables in the kitchen garden in which freshness is of great importance as far as edible and food values are concerned.

Layout Plan of a Kitchen Garden

Total Area 250 square meter (25 x 10 m)

Total number of beds for vegetable growing = 10

Area of one bed = 18 square metre (4 x 4.5 sq.m)

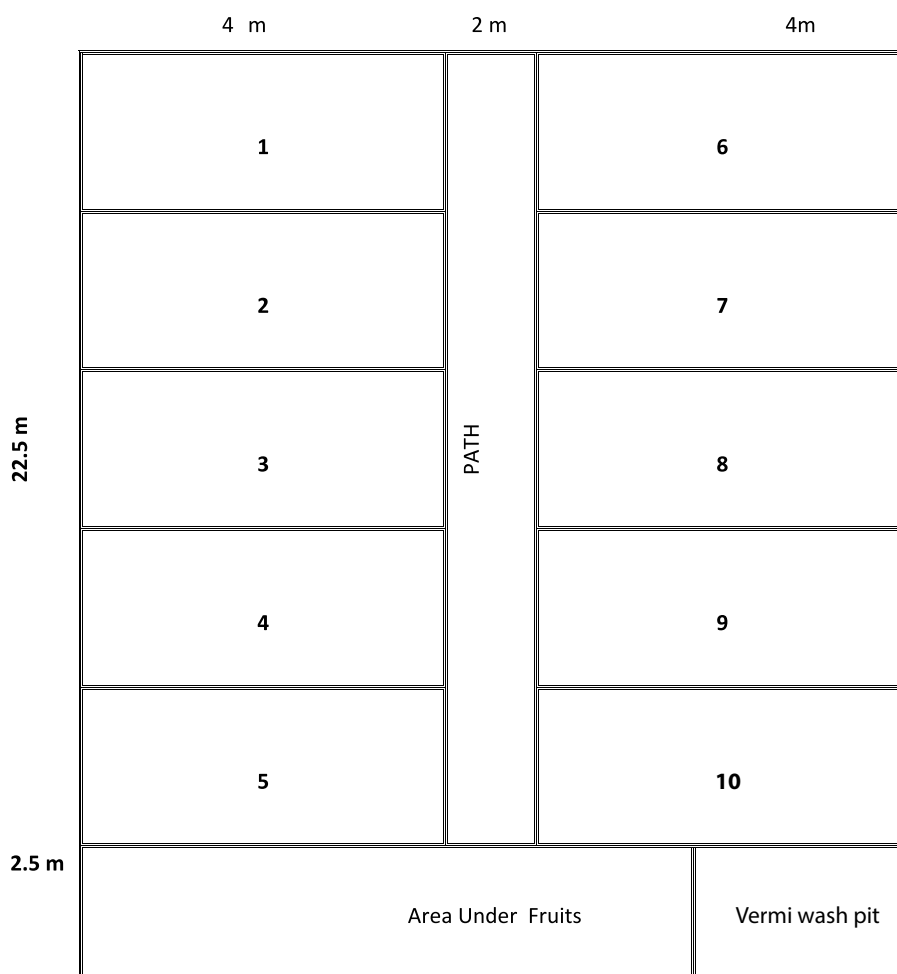
Area under vegetables = 10x18 = 180 square metre

Area under fruits = 10 m x 2.5 = 25 square metre

Area under path, ridges, etc = 45 square metre

Crops for the Nutritional garden

Crop selection for kitchen garden depends mainly upon the size of the garden and choice of the family. Only



Crop rotations

Various crop rotations are given in Table1. The kitchen gardeners can adopt them as per their suitability.

Table1: Crop rotations for kitchen garden

Plot No.	Crop	Month
1.	Early cauliflower	June- September
	Carrot	October- December
	Onion	January- May
2.	Cowpea	July- September
	Cabbage	October- December
	Onion	January-May
3.	Cauliflower mid-season	August-November
	Garden Peas	November-January
	Cucumber	February- April
	Amaranths (half plot) Bitter gourd (half plot)	May- July May-July
4.	Okra	July- September
	Tomato hybrid	October-March
	Muskmelon	April-June
5.	Amorphophallus	April- November
	cauliflower late (half plot)	December- March
	temperate radish (half plot)	December-January
	spinach beet (half plot)	February-March
6.	Tomato	July-November
	Broccoli	November- January
	Sweet corn (half plot)	February-May
	Watermelon (half plot)	February- June
7.	Chillies (half plot)	July – December
	Capsicum (half plot)	September - December
	Cabbage (half plot)	December- March
	Broccoli (half plot)	December- March
	Amaranths (half plot) Okra (half plot)	April-Jun April-June
8	Cucumber	July-September
	Potato	October-January
	Cowpea (half plot)	February-May
	French bean (half plot) or Summer squash (half plot)	February-June February-June
9	Brinjal round+ long	July- December
	Broccoli	December-March
	Cucumber	April-June
10	Bitter gourd half plot	July-November
	Bottle gourd half plot	July-November
	Fenugreek	November-March

Note: Rotate the vegetables from one plot to another every year. Crop rotations vary as per climatic condition of the area.

Perennial and quick growing fruit trees for kitchen garden

- Drumstick cv. PKM-1, one plant
- Banana cv. Hari Chhal, one hill
- Papaya cv. Pusa Delicious and Pusa Nanha, 2 plants each
- Kagzi lime-one plant
- Guava cv. Allahabad Safeda, one plant
- Mango cv. Amrapali, 1 plant

13

KRISHI VIGYAN KENDRA'S EFFORTS FOR NUTRITION SECURITY

Case -1

Technology Assessed: Assessment of backyard nutritional kitchen garden.

The kitchen gardening is an imperative tool of our daily life. The main aim of kitchen, home, or nutritional garden is to meet the daily requirements of family all the year round with, fresh vegetables rich in nutrients and energy. Kitchen garden plays an important role in increasing vegetable production and to provide balanced nutrition to all classes of society. KVK's Raisen, Ashoknagar (MP); and Dantewada (CG); Cuttak (Odisha) conducted 43 trials on assessment of backyard nutritional gardening for farm women to address the problem of unavailability of fresh vegetables. Result showed increased yield of vegetables 373 kg/plot with saving of Rs.12635 per/plot; with increase nutrient intake.

Table: performance of backyard nutritional kitchen garden

Details	No. of Trials	Yield Kg/plot	Net Return (Rs)
Unplanned (Farmers Practice)	43	100	1100
Plan round the year availability of nutritive vegetables & Fruits in the garden (400 sq/ m) (Recommended practice)		473	13735



Farm women Adopted krishi vigyan Kendra technology & Intake of various nutrient through nutritional kitchen garden

Technology/cropping pattern used by Krishi vigyan Kendra's scientist for nutritional kitchen garden:

S.N	Name of Vegetables	Season	Seed quantity (gm)/plot
(1)	Tomato and onion	June –sep	20
	Radish	Oct-November	20
	Beans	Dec-Feb	20
	Okra	Mar-may	20
(2)	Brinjal	June-Sep	20
	Beans	Oct-November	40
	Tomato	June- sep	20
	Amaranths	May	20
3.	Chili and radish	Jun-sep	15
	Cowpea	Dec-Feb	25
	Onion	Mar-may	15
4.	Cluster beans brinjal	Jun-sep	25
	Beet root	Oct-Jan	20
5.	Okra and radish	Jun-august	20
	Cabbage	Sep- December	15
	Cluster beans	Jan-march	25
6.	Onion	Sep-December	15
	Okra	Jun-march	25
	Coriander	April-may	300



Nutrient intake farm women used kvk Nutrition kitchen garden technology

S.N	Vegetable name	Minerals (mg/100 gm)								
		Potassium	phosphorus	magnesium	Sodium	calcium	iron	zinc	Copper	manganese
1.	cauliflower	88	20	6	9	10	0.2	0.11	0.011	0.082
2.	eggplant	122	15	11	1	6	0.25	0.12	0.058	0.112
3.	Cucumber	76	12	7	1	8	0.15	0.1	0.021	0.041
4.	Peas	434	187	62	5	43	2.46	1.9	0.277	0.84
5.	Spinach	167	15	24	24	30	0.81	0.16	0.039	0.269
6.	Onions	100	21	7	2	13	0.14	0.13	0.04	0.092
7.	Carrot	183	23	8	5	23	0.27	0.3	0.052	0.062
8.	Potato	542	62	31	41	43	0.79	0.36	0.184	0.567
9.	Okra	216	51	58	10	123	0.45	0.69	0.136	0.47
10	Pumpkin	564	74	22	2	37	1.4	0.56	0.223	0.218

S. N	Vegetables Name	Protein, Calorie and dietary fiber contain in Nutritional kitchen garden vegetable (Above)									
		Cauliflower	eggplant	cucumber	peas	spinach	onions	carrot	Potato	okra	pumpkin
1.	Protein	1.14	0.82	34	8.58	0.86	0.82	0.59	2.29	3	1.76
2.	energy	14	35	8	134	7	26	27	103	35	49
3.	Dietary fiber	1.4	2.5	3	8.8	0.7	0.8	2.3	3.8	4	2.7

Case -2

Technology Assessed: Assessment of soybean products (Protein Rich Foods) for household food security of farm families.

Farm women done heavy work in daily life such as agricultural, general household work. During household work farm women & their children have daily nutritional

requirement is less than recommended dietary allowances. KVK's Harda, Morena, Neemuch, Ratlam, Ujjain (MP) conducted 34 trials on assessment of value addition of soybean products in diet for household food security For farm women children and found that 0.8 % BMI Physical fit with good Nutrition. The farm women involved in the study were satisfied with value added product of soybean.

Table: Assessment of soybean products

Details	No. of Trials	Increase in Wt. (kg)	Increase in Ht.(cm)	Increase in BMI (%)	Improved clinical assessment (%)
No use of soybean in diet (Farmers Practice)	34	-	-	-	-
Soybean products (Recommended practice)		0.64	1	0.8	20

Technology used by Krishi vigyan Kendra's scientist on soybean for malnutrition reduction among children and farm women

- Soybean flour
- Soybean multigrain Ata
- Soybean laddoo
- Soybean tofu



Soybean Milk Preparation



Soybean Toffu preparation



Rural youth Training On nutritional Garden

Nutrition level achieved beneficiaries by Krishi vigyan Kendra technology

S.N	Nutrient/100 gm	Product Name		
		Soy Tofu	Soya Aata	Soya laddoo
1.	Protein(g)	5-8	11-12	8-10
2.	Fat (g)	3-4	3	11-12
3.	Energy (kcal)	250-260	280-290	450-480
4.	Cho (g)	2-4	-	5-7
5.	Water (g)	84-90	-	50-60
6.	Fiber (g)	0.1	-	0.36
7.	Calcium (mg)	1.0	-	1.36
8.	Iron (mg)	1.8	-	1.39
9.	Phosphorus (mg)	0.95	-	0.89
10.	Vitamin (B1)	0.05	-	0.05
11.	Vitamin (B2)	0.04	-	0.047
12.	Vitamin (B3)	0.5	-	0.6

Case -3

Technology Assessed: Assessment of yield potential of Oyster mushroom & paddy straw mushroom income generation and nutritional security.

Non availability of suitable and improved oyster mushroom & paddy straw mushroom species influences greatly its production. By introducing high yielding species the oyster mushroom & paddy straw mushroom can be enhanced. KVK's Jagatsinghpur, Bargarh, Bolangir, Puri, Nuapada, Sambalpur, Dhenkanal, Hoshangabad, Morena, Ganjam, Kandhamal, Jajpur, Kendrapara, Keonjhar, Koraput Conducted 160 trails on oyster mushroom species like *Pleurotus pulmonarius*, *P.sajarkaju*, *H.ulmarius*, *Hypsizy gousulmarius* (Blue Oyster), *P. florida*, *P. eryngii* and *P. ostreatus* &

Bhadrak, Cuttack, Balasore, Jajpur, Khordha, Sundargarh-II, Mayurbhanj-II, Deogarh, Dhenkanal, Nayagarh, Puri, Sonepur conducted 140 trials paddy straw mushroom species like *OSM-II, V.volvaceaeto* assess the performance of mushroom sp. Results revealed that 0.77% higher mushroom obtained over farmers practice with oyster mushroom species influences; net return per beg Rs 95 per beg higher over farmers practice. The trails revealed that the performance of oyster mushroom (*Pleurotus pulmonarius*) was more profitable than the local mushroom species. Similarly Result revealed paddy straw mushroom 178 % higher mushroom obtained over farmers practice with paddy straw mushroom species influences; similarly the net return 231.4/bed over farmers practice. The trails revealed that the performance of paddy straw mushroom (*OSM-II, V.volvaceaeto*) was more profitable than the local mushroom species

Mushroom production as an income generation

Table- Performance of Oyster mushroom & paddy straw mushroom

Details	No. of trials	Production per Unit (Kg/ beg)	Cost of Input(Rs/ beg)	Incremental Income (Rs/beg)	Net return (Rs/beg)	Savings in Rs	BC Ratio
Local mushroom species (Farmers Practice)	160	0.9	25	72	47	22	2.88:6.68
Oyster Mushroom (<i>Pleurotus ulmonarius</i>) (Recommended practice)		1.67	25	167	142	117	
Local mushroom spices	140	1	60	130	70	10	1.16:6.02
Paddy straw mushroom (<i>OSM-II, V.volvaceaeto</i>)		2.78	60	361.4	301.4	241.4	

Mushroom production as a nutritional security

Indian agriculture will continue to be a main strength of Indian economy. with the variety of agricultural crops grown; we have achieved food security by producing around 200 million tonnes of food grain. However, our struggle to achieve nutritional security is still on. Though we have significant achievements in milk, vegetable and fruits production still we have to do more. In future ever-increasing populations, depleting agricultural land, change in environment; water shortage and need for quality food products at competitive rates are going to be important issues. To meet these challenges and provide food and nutritional security to our peoples, it is important to diversify the agricultural activates in area like horticultural.

Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environment related issues. one of the major areas that can contributes towards goal of conservation of natural resources as well as increased productivity is recycling of agro-waste including agro-industrial waste.

Medicinal values of mushroom

- Good for heart
- Low calorie food
- Prevents cancer
- Anti- Aging property
- Regulates digestive system

Nutritive value of different mushrooms(per 100 gm)						
Mushroom	Carbohydrate	Fibre	protein	Fat	ASH	Energy kcal
Agaricus bisporus	46.17	20.90	33.48	3.10	5.70	499
Pleurotus sajor-caju	63.40	48.60	19.23	2.70	6.32	412
Lentinula edodes	47.60	28.80	32.93	3.73	5.20	387
Pleurotus ostreatus	57.60	8.70	30.40	2.20	9.80	265
Volvariella volvaceae	54.80	5.50	37.50	2.60	1.10	305
Calocybe indica	64.26	3.40	17.69	4.10	7.43	391
Flammulina velutipes	73.10	3.70	17.60	1.90	7.40	378
Auricularia auricula	82.80	19.80	4.20	8.30	4.70	351



Farm women adopted Krishi vigyan Kendra technology for income generation and nutrition security

Case -4

Technology Assessed: Assessment of dual purpose poultry breed for income generation and nutritional security

Poultry has developed fast as a big industry. Poultry farming needs comparatively lesser investment and space and can be a good source of regular earning. It is a good source of high quantity manure for agricultural land. Poultry industry gives quick returns and help solving problem of quality protein food for young and growing individuals.

Poultry production is good for farmers community for Extra income generation (Egg & meat production also). Farm women involves in poultry; Due to unawareness of bread expected production is less than. Result low family income & extra cost of production unit. KVK' Balasore, (colour breed), Bargarh, kendrapara (*chhabra*), Deogarh (*denimred*), mayurbanj –I, samalpur (*rainbow rooster*), Naupada (*denim red*) (odisha); hosangabaad, Sidhi (*Kadaknaath, narmada nidhi*), (MP) conducted 144 trial on assessment of rearing of improved poultry breed in backyard for farm women to address the problem of local breed of chicks. Result showed an Increase in weight was recorded as 0.8% with incremental income of Rs. 6100.



Farm women adopted Krishi Vigyan Kendra technology for income generation and nutritional security

Poultry production for income generation

Table- Performance of dual purpose poultry breed for income generation

Details	No. of trials	Increase in weight (kg/6month)	Production of egg/6 month	Cost of input (Rs/20birds)	Incremental income (Rs/20birds)	Net Return	Saving in Rs	BC ratio
Local practice (Farmers Practice)	144	1.2	150	-	-	-	6100	8.1
Dual purpose (Recommended practice)		2	180	1000	8100	7100		

Poultry production for nutritional security (Egg & meat)

Nutritional value/100 gm

S.N.	Nutrient name	Egg	Meat
1.	Calorie (kcal)	155	272
2.	Total fat	11	25
	Saturated fat (gm)	3.3	7
	Polyunsaturated fat (gm)	1.4	5
	Monounsaturated fat (gm)	4.1	10
3.	Cholesterol (mg)	373	130
4.	Sodium(mg)	124	40
5.	Potassium(mg)	126	104
6.	Total carbohydrate (gm)	1.1	0
	Dietary fibre (g)	0	0
	Sugar (gm)	1.1	-
7.	Protein (gm)	13	11

Cereals are common food staples because they are versatile, tasty, readily available, affordable and culturally acceptable. Cereals are the best choice for fortification because they are widely and regularly consumed, and often at every meal, by all age groups including infants, and mostly processed in centralized facilities with established distribution and marketing capacity.

Rice is predominantly consumed in Asia and the far East but the consumption of wheat is significant and growing resulting in an actual decrease in the consumption of most micronutrient especially iron, which is not well absorbed from these cereals and vitamin B12, which is missing altogether, reinforcing the old adage that man cannot live by Bread alone.

Advantages of fortification-

1. They are food staples, Consumed in significant quantities by all age groups and economic classes at nearly every meal.
2. Most of the nutrient being added are naturally present but greatly reduced during milling; hence requires only restoring deficient nutrient levels.
3. Fortification at the mill is fairly simple, easy to control and regulate.
4. The mills producing the bulk of the flour are large, modern and centrally located.
5. Cereals are the best suited staple food for B vitamin fortification.
6. The concept, Technology and sustainability of cereals fortification are well established.
7. The milling equipment, design and quality control procedures for flour fortification have all been developed and are readily available.
8. There are a number of commercial concerns operating worldwide that supply fortification premix and mill equipment at reasonable prices due to heavy competition.
9. Cereal fortification is safe because a person's cannot eat enough to exceed the upper safety levels of micronutrient intakes.
10. Fortification at the mill is relatively inexpensive and affordable.

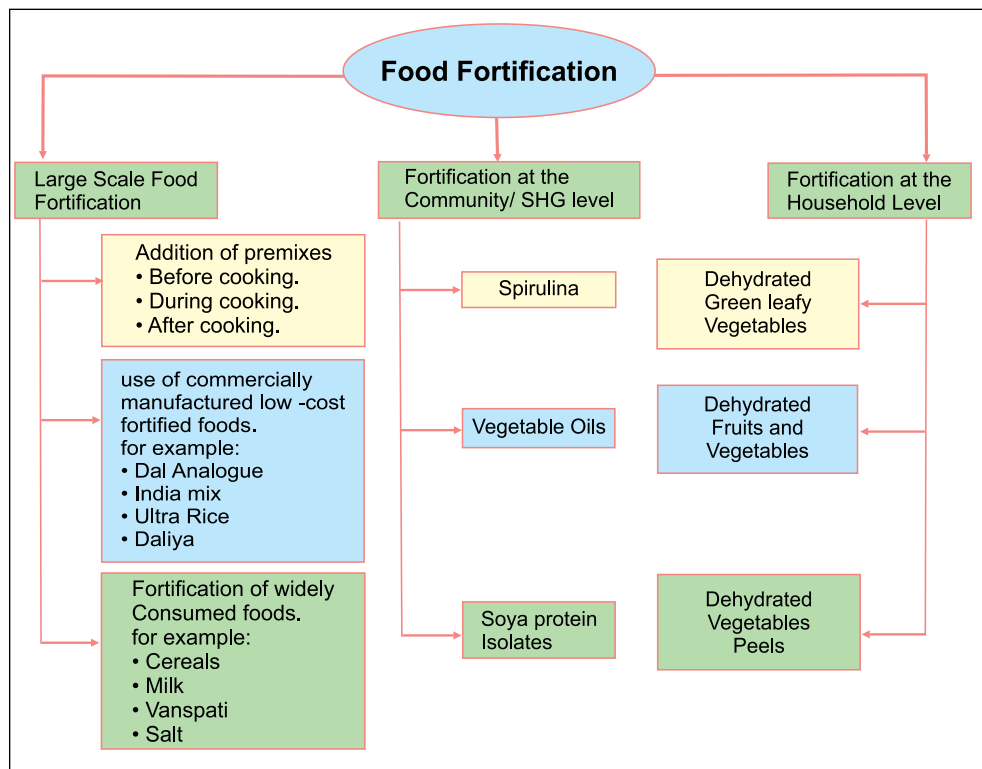


Fig. 1 : Food fortification at different levels

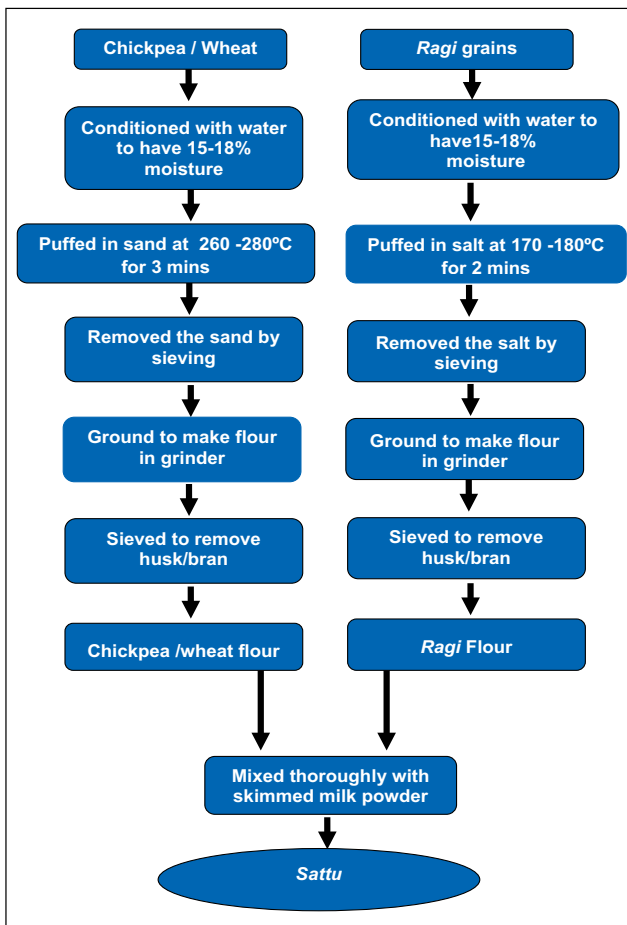


Fig. 2 : Fortification and development of ragi based sattu

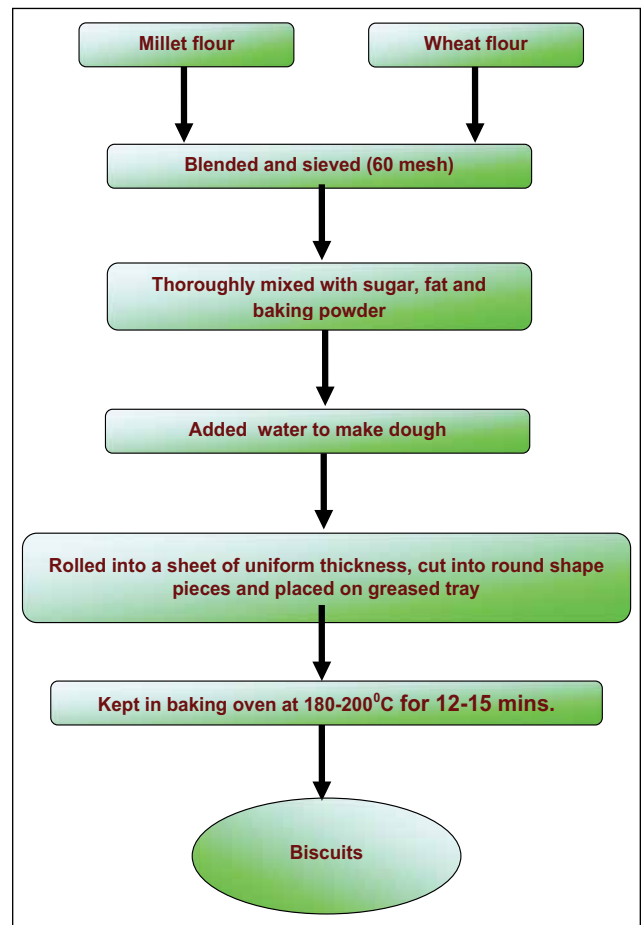


Fig. 3 : Fortification and development of ragi based biscuits

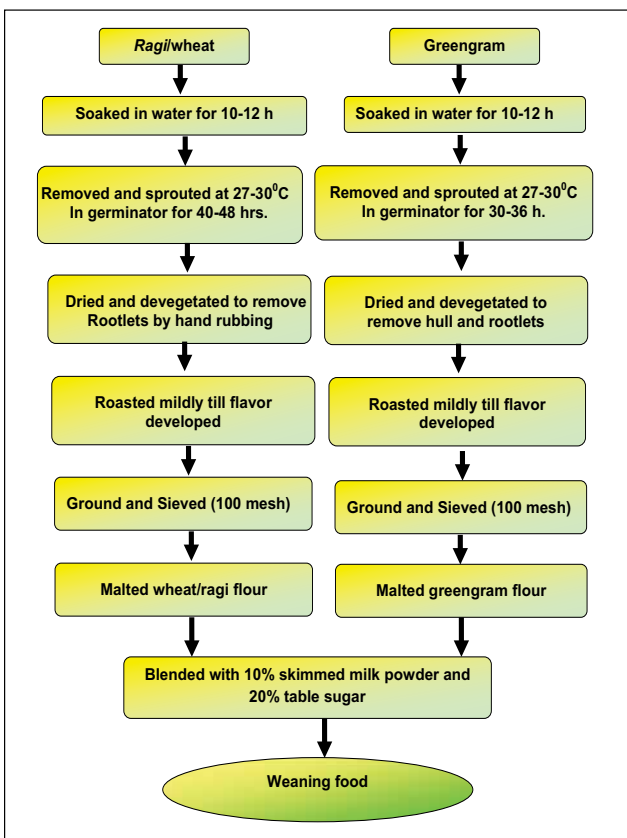


Fig. 4 : Fortification and development of ragi based weaning food

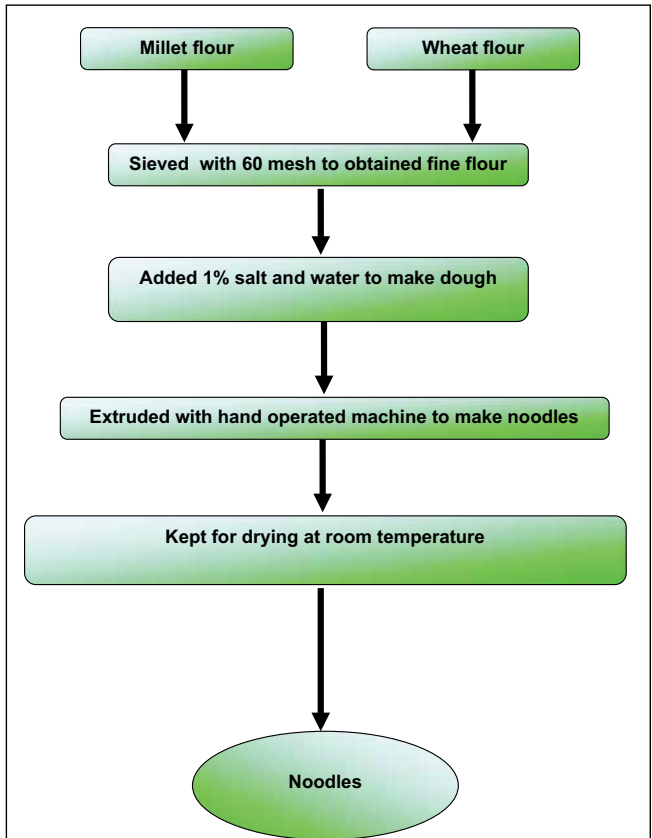


Fig. 5 : Fortification and development of millet based noodles

15

NUTRITIONAL VALUE OF AGRICULTURAL CROP TO IMPROVE NUTRITIONAL PRACTICE

Horse Gram

Horse gram is rich in dietary iron and calcium. It is also one of the richest vegetarian sources of protein. However, the calcium and iron are combined into certain chemical compounds, rendering them un-absorbable by the body. Germination of the horse gram is a simple method of food processing that increases the availability of iron and calcium, resulting in increased nutritive value. Sprouted horse gram is also digested much more easily. Horse gram is frequently consumed during winters and cold weather in India and is used to tide over coughs and colds because it tends to increase the level of heat in the body. However, when the sun is up, if the horse gram is heating the body up, it must be balanced by eating sprouted green gram.

100gms of horse gram supplies 321 calories, 22gms of protein, 287 mg of Calcium, 311 mg of Phosphorus and 7mg of Iron.

Flax seeds

Flax seeds come in two basic varieties - brown and yellow or golden (also known as golden linseeds). Most types have similar nutritional characteristics and equal numbers of short-chain omega-3 fatty acids. The exception is a type of yellow flax called solin (trade name Linola), which has a completely different oil profile and is very low in omega-3 Fatty Acids.

One hundred grams of ground flax seed supplies about 450 calories, 41 grams of fat, 28 grams of fiber, and 20 grams of protein.

Oats

Oats are low in fat & salt; they are a good source of natural iron. Being a good source of calcium, they are ideal for heart, bones & nails. It is the best source of soluble fiber. A serving of oats (half a cup, cooked) has nearly 4 grams of viscous soluble fiber (Beta Glucan). This fiber helps lower blood LDL cholesterol, the so-called "Bad" cholesterol. Oats absorb the extra fat & flush it out of the system. That is why they cure constipation because of the high soluble fiber & assist in regulating gastro-intestinal functions. A

diet which is rich in oats may also help stabilize blood glucose level. Oats helps in nervous disorders. Oats helps to cope with ovarian & uterine problems associated largely associated with the onset of menopause in women. Oats have some unique fatty acids & antioxidants which together with vitamin E slow cell damage & have been shown to reduce the risk of cancer.

Ragi

Ragi is also known as finger millet in English. Ragi is considered to be of Indian origin and it is versatile millet with high value of calcium 344mg/100gm. No other cereal has this much calcium. The iron content of ragi is 3.9mg/100gm, which is higher than the other cereals except bajra. Ragi is recommended as a wholesome food for diabetic patients. Ragi's protein content has high biological value, so it is easily incorporated into the body. Several amino acids crucial to human health are found in the grain. Some of these amino acids are deficient in most other cereals. Phosphorus content is also high.

Traditionally ragi is used as the weaning food in the form of porridge gruel etc. Now ragi vermicelli, an instant food is available in the market. Ragi can also be made into rotis, dosas, porridge, cookies and even tasty laddus.

Nutritive value of course grains (100 gm of edible portion)

Name of food	Energy kcal	Calcium m.g.	Iron m.g.
Bajra	361	42	8.0
Jowar	349	25	4.1
Maize	342	10	2.3
Ragi	328	344	3.9

Pearl Millet

Pearl millet is known as *bajra* in Hindi, and *kambu* in Tamil. Pearl millet is used in various industrial products. 100 gm edible portion of pearl millet consists of 11.6gm protein, 67.5gm carbohydrate, 8mg iron and 132 microgram of carotene which is highly essential to safeguard our eyes. Even though it has some anti-nutrients such as phytic acid, polyphenol and amylase inhibitors, after soaking in

water, germination and other cooking procedures reduce the anti-nutrient. Pearl millet is used as an important source of food, feed and fodder wherever it is cultivated in our country.

Pearl millet has high levels of vitamins B, and dietary minerals potassium, phosphorus, magnesium, iron, zinc copper and manganese. It is gluten free and is ideal for those with wheat allergies. Pearl millet has been found to be nutritionally superior to rice and wheat, and a study based on research in India showed that pearl millet and pulses are somewhat better at promoting human growth than a wheat diet.

Sorghum

Jowar is an important cereal. The Industrial use of sorghum is predominant than other coarse grains. It is used in alcoholic beverages; bread making industry uses wheat-sorghum combination. Commercial weaning food industries utilize the sorghum - cowpea combination and sorghum - soyabean combination. It has 10.4gm protein, 66.2gm carbohydrate 2.7gm fibre and other micro and macronutrients.

Dark Green Leafy Vegetables and Cabbage Family Vegetables

Dark green leafy vegetables (kale, collard greens, watercress, etc.) are especially important while pregnant or lactating because they supply so many vitamins and minerals, including vitamins A and C, calcium, and iron. Dark leafy green vegetables also are rich in phytochemicals like beta carotene and lutein which protect against many forms of cancer. Certain greens like spinach and Swiss chard are high in oxalic acid, which inhibit the absorption of much of the calcium and iron. Cooking helps to neutralize some of the oxalic acid.

Vegetables from the cabbage family (broccoli, brussels sprouts, cabbage, etc.) are exceptional sources of vitamin A, vitamin C, and calcium. They are also rich in phytochemicals that have anticancer properties.

Dark green leafy vegetables and cabbage family vegetables provide important nutrients that help to promote a plentiful milk supply for your baby. Buy fresh, organic vegetables whenever possible and eat at least one serving every day.

Beans and Legumes

Beans and legumes are good sources of protein, fiber, calcium, iron, thiamin, and niacin. They are a crucial part of a vegetarian diet. Make a big batch of beans when you have time and freeze them in small containers. Canned beans are available also. They are just slightly lower in nutrients than home cooked due to the high heat processing. Canned beans usually contain high amounts of sodium, however. Draining and rinsing away the canning liquid will remove a lot of the sodium.

Whole Grains

Whole grains like brown rice, quinoa, millet, and oats supply fiber, minerals, B complex vitamins, and protein. Buy the least processed grain types you can find. Many commercially prepared grains have the germ and bran removed to increase shelf life and shorten preparation time. Even if they are "enriched," this does not replace the nutrition that was lost in the processing.

Nuts and Seeds

Nuts and seeds are good sources of fiber, protein, minerals, and essential fatty acids. Be sure to eat flaxseeds, chia seeds, pumpkin seeds, and/or walnuts to get omega-3 fatty acids, which are important for baby's brain and nervous system development as well as your own health. Nuts and seeds can be eaten raw or toasted. Small seeds like sesame and flax must be ground in a coffee grinder, seed grinder, or blender in order for nutrients to be utilized. Nut and seed butters are delicious on crackers or toast or used as a dip or sauce.

Gomez classification of malnutrition in children

Percent of reference weight for age = $[(\text{patient weight}) / (\text{weight of normal child of same age})] * 100$

Percent of reference weight for age	Level of malnutrition	Grade
90-110%		Normal
75-89%	Mild	Grade I
60-74%	Moderate	Grade II
<60	Severe	Grade III

Waterloo classification of malnutrition in children

- Percent weight for height = $[(\text{weight of patient}) / (\text{weight of a normal child of the same height})] * 100$
- Percent height for age = $[(\text{height of patient}) / (\text{height of a normal child of the same age})] * 100$

	Weight for height (wastng)	Height for age (stunting)
Normal	>90	>95
Mild	80-90	90-95
Moderate	70-80	85-90
Severe	<70	<85

Day Celebration awareness For nutrition & health security in human

S.N	Date of celebration	Day name for awareness of rural women
1.	7 th April	World health day
2.	1-7 th August	World breast feeding day
3.	14 -19 th November	ICDS week
4.	16 th July	School health day
5.	8 th march	International women day
6.	1 st October	World Elders day
7.	12 th October	World arthritis day
8.	16 th October	World Food Day
9.	20 th October	World osteoporosis day
10.	21 st September	World Alzheimer's day
11.	24 th March	World tuberculosis day
12.	1 st December	World AIDS day
13.	26 th November	Anti obesity day
14.	30 th September	World heart day
15.	29 th July	Oral Rehydration salt day
16.	1 st week of October any day	Ulcer awareness day
17.	15 th March	World kidney day
18.	22 nd September	Cancer day
19.	31 st May	Anti -Tobacco day
20.	7 th November	National cancer Awareness day
21.	October month	Breast cancer Awareness monthly
22.	2 nd Octobers	Swacha bharat mission

