

Food and Nutritional Security in Present Day Agriculture

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India has 18% of the world's population and 15% of the total livestock. Of the country's total geographical area of 329 million hectares, 174 million hectare is degraded. But, India is bestowed with extremely diverse agro-ecological conditions that provide most conducive environment for growth of diverse flora and fauna. Approximately 12% of world's flora and 7% of world's fauna is found in India for which the country is recognized as one of the mega centres of bio-diversity. It is estimated that global population by 2050 will be around 11 billion and India will emerge as most populous country with 1.5 billion people. With the increase in industry, roads for communication, housing and urbanization, the per capita availability of land is decreasing day by day. To feed the burgeoning human population, obviously the demand for food will escalate. In this context we will need to search for newer plants and look for newer genes in order to ensure food and nutritional security and increase the farm productivity. In addition to that most of the agro products are found to contain pesticide residues which harm human health and make us incompetent in the global market. Thus, emphasis should be given not only to increasing productivity of crops but also producing quality food.

Crop diversification :-

Rice is cultivated in 113 countries of the world and plays a variety of roles that are related to important aspects of food security as well as to rural and economic development. It is the principal crop of Asia and rice based production system and their associated post-harvest operations employ nearly 1 billion people in rural areas of developing countries. When the developing countries are considered together, rice provides 27% of dietary energy supply and 20% dietary protein intake. In Asia alone, over 2 billion people obtain 60-70% of their energy intake from rice and rice products. Over 90% of the world's rice is produced and consumed in Asia. It also is a staple food of India and Orissa occupying highest area under any crops. In the last three decades, 632 varieties of rice were developed and released for commercial cultivation in India. In Orissa rice workers in the Orissa University of Agriculture and Technology (OUAT) and Central Rice Research Institute (CRRI) contribute a lot in developing high yielding, insect pest and disease resistant varieties of rice suiting to various agro-ecological situations. That resulted in huge production of rice leading to disastrous sale. On the other hand due to less cultivation and production of pulses and oilseeds their per capita availability is decreasing day by day and price is

increasing. Thus, there is an urgent need for crop diversification. Therefore, now emphasis is on diversifying to fibre crops (cotton), oilseeds (groundnut, sunflower, mustard, sesamum etc.), pulses (rajmash, arhar, mung, bean, urd bean etc.), fruits and vegetable crops, floriculture and medicinal and aromatic plants.

The importance of fruit crops in human nutrition is well known. As per the Indian Council of Medical Research (ICMR) the per capita consumption of fruits should be 120g / person / day to ensure the nutritional security of projected 120 crore population in 2010. India needs to produce 74.56 million tones of fruits by 2011 – 12. Therefore, Government of India is implementing a scheme for integrated development of fruits under macro management scheme and on an average 25% of the funds are allocated under the scheme during the Tenth Plan period for the development of horticulture sector in the country.

Golden Rice:-

To meet the demands of increasing population and maintain self sufficiency, the present rice production level of around 89 million tones need to be increased up to 120 million tones by the year 2020. This is a herculean task. However, with the discovery of “Dee Geo Woo Gen” gene in rice crop improvement and increasing yield was possible in the Green Revolution Era. That was followed by hybrid rice technology which further increased yield. Recent advances in cellular and molecular biology have equipped the scientists with two innovative tools for crop quality improvement, viz., recombinant DNA technology and DNA marker technology. Metabolic engineering for nutritional improvement in rice is another area which is receiving much focus now-a-days. Efforts are on towards bio-fortification of rice through conventional breeding and biotechnology to improve the lysine content of

rice, reduce the prolamin proteins to enhance iron bio-availability and improvement of nutritional quality of super hybrid rice thus giving rise to anti-anaemia rice. From a study it was observed that on an average 30% of the world’s population; mostly from underdeveloped countries suffer from iron deficiency. In India its prevalence is 40-50% in urban areas and 50-70% in rural areas. The victims are mostly children, women and pregnant women. Thus, development of this iron rich “ferritin rice” can alleviate anaemia problem through dietary intake.

In 2000, “golden rice”- a genetically modified rice crop was released which was claimed to boost yields of rice by 35% over the high yielding rice varieties of 20th century. The golden rice was rich in beta-carotene which the body converts to vitamin A. But, in the year 2005 British scientists developed a new strain of golden rice-2 that contains more than 20 times the amount of beta carotene than its predecessor, or enough to provide 100 per cent of dietary allowance of vitamin A from just 70g of rice, according to developers. The World Health Organization (WHO) estimated that vitamin A deficiency causes 5 lakh cases of child blindness a year and kills some 6000 people across South East Asia. This development will combat vitamin A deficiency in SE Asia.

Combined with this, marker assisted selection has been successfully deployed in rice for blast and BLB (bacterial leaf blight) disease resistance genes that will reduce huge loss in yield due to diseases. *Bacillus thuringiensis* (Bt) incorporated transgenic rice development in China has added insect resistance in rice varieties, besides traditional cross-breeding programmes by which number of insect and disease resistant rice have been developed in the past. Quality improvement in rice is not only confined to genetic

engineering but also through conventional breeding programme. Greatest achievement is improvement of Basmati rice. For this reason, since last five years India is exporting 0.5 / 0.7 million tones of high quality Basmati rice annually valued around Rs. 20,000 million.

Wheat:-

Wheat crop improvement started with the identification of "Norin 10" gene. In the last four decades plant breeders have developed number of high-yielding varieties with appreciable disease and insect-pests resistance. For that reason, India is presently one of the largest producers of wheat in the world with about 25 million hectare under cultivation and 60 million tones production. Of the total wheat 90% area is shown as bread wheat. But, now emphasis is on to increase area under durum wheat or macaroni wheat which presently accounts for about 8% of the area. Durum wheat has excellent resistance than bread wheat against karnal bunt – a serious disease of wheat limiting production in northern and north-west India. Its hard lustrous bold grains with good beta carotene content and resistance against brown rust will attract buyers in the domestic and foreign market.

Super Sweet Onion:-

Another breakthrough in quality improvement is the development of "Super Sweet Onion" developed in U.K. by Tisco fresh produce company. While cutting onion normally irritation of the eye occurs due to presence of pyruvic acid in it which mixes with the air and irritate the eye. As a result tears come out. But, the super sweet onion developed by the company bio-technically contain nearly half less pyruvic acid than normal and is grown in less sulphur containing soil. While cutting this onion no tear comes of the eye.

Golden Egg:-

During the year 1999 another stride has been taken in the field of animal science in creating a new type of transgenic egg with medicinal values. Ordinarily, eggs are viewed as detrimental to healthy hearts, because they are rich in cholesterol, which unduly damage their reputation as the most nutritive food ever created by nature. A raw egg contains about 500 milligrams of cholesterol in 100gram of its edible part, mostly the yolk, while a yolk in raw and dried form contains 1500mg and 3000mg per 100g of it, respectively. Therefore, consumption of egg raises its level in blood, thereby increasing the probability of coronary heart ailments. But, a team of scientists in Australia have developed "Golden Eggs" through genetic manipulation of hens which are heart friendly. In an experiment with a group of volunteers which were given one such egg per day were observed to have lower cholesterol level in their blood with no other side effects with this genetically modified egg.

Vegetables:-

Apart from fruits, vegetables play an important role in the balanced diet of human being by providing not only energy rich food but also premise supply of vital protective nutrients like vitamins and minerals. Micronutrient deficiencies have detrimental effects on human health. Nearly 2 billion people worldwide are iron deficient resulting in anaemia in 1.2 billion and more than 600 million people have iodine deficiency disorders. It is estimated that the requirement of vegetables per capita is 240g / day but, the availability is only 140g / day. Therefore, we shall have to produce more to meet the requirement. The improvements made over four decades of green revolution era in agriculture are selection of the indigenous varieties for higher yield and disease, insect pest resistance. Then came high

yielding cultivars and during last decade hybrid vegetables have dominated the market with much higher yield potential. Earlier, focus was on finding toxic properties of some chemicals present in vegetables towards human health, while recent research efforts are directed towards health promoting and chronic disease preventing properties. Frequent consumption of vegetables especially green and yellow vegetables is associated with decreased susceptibility to some forms of cancer. A diet rich in cruciferous vegetables (cabbage, cauliflower, broccoli, Brussels sprout, Chinese cabbage etc.) has been associated with inhibition of chemically induced carcinogenesis. About 100 different forms of glucosinolates have been identified in cruciferous

vegetables which break down to isothiocyanates that act as anticarcinogens in human body.

If we take an optimistic view on overall developments made in the field of agriculture regarding food and nutritional security to every individual on this earth there is nothing to panic apprehending shortage of food in quantity and quality for the upsurging human population on the earth.

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