Report

CONFERENCE ON PROCESSED FOODS FOR NUTRITION SECURITY

Friday, April 25, 2014

New Delhi

Sponsored By:

ILSI India

International Life Sciences Institute-India

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Report Of Conference On Processed Foods For Nutrition Security April 25, 2014, Hotel Le Meridien, New Delhi

ILSI-India organized a "Conference on Processed Foods For Nutrition Security" on April 25 in Hotel Le Meridian, New Delhi, on the occasion of its Annual Meeting.

The Conference was attended by more than 100 participants representing Food Processing Industries, Agribusiness, Universities, NIN, ICMR, AIIMS, Planning Commission, ICAR, Ministry of Food Processing Industries, Ministry of Women and Child Development and Food Safety and Standards Authority of India.

The welcome address at the Conference was delivered by Mr. D.H. Pai Panandiker, Chairman, ILSI-India and the opening address by Dr. Ajit Mishra, Vice Chancellor, NIFTEM (National Institute of Food Technology, Entrepreneurship and Management). The vote of thanks was proposed by Mr. N.M. Kejriwal, President, ILSI-India. The Conference was addressed by 16 speakers. Highlights of the presentations made by the speakers are included in this report.

OPENING SESSION

Welcome Address

While welcoming the participants Mr. Panandiker informedthem about the definition of Food and Nutrition Security given by UN system of High Level Task Force on Global Food Security. According to them "Food and Nutrition Security is a condition when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life".

Mr. Panandiker said that nutritious foods mean foods that have Vitamins, Minerals, Proteins, and Carbohydrates etc. that meetthe dietary needs for active and healthy life. According to IFPRI (International Food Policy Research Institute) Hunger Index 2013, 21% of Indian population suffers from hunger as against 5% in China, 10% in Indonesia and 19% in Bangladesh and Pakistan. The percentage of poor has come down from 45.3% in 1993 – 94 to 29.8% in 2009 – 10. However, between 1992 and 2010 per capita availability of cereals per day has come down from 431.5 grams to 407 grams; Pulses came down from 41% to 31.65; and food grains from 472.6% grams to 438.6 grams. Consumption of fruits and vegetables and animal products went up.

While talking about Food Security Act 2013 Mr. Panandiker mentioned that 75% of Rural and 50% of urban population are entitled to 5 kg. of food grain at subsidies prices. Free nutritious meals will be provided to pregnant women, lactating women and malnourished children. Total food subsidy at current prices will be $ 33 billion.

Mr. Panandiker mentioned that there has been slight improvement in the nutritional status of children and women. However, still about 40 % of children are underweight, 33% of women and 28% of men have less than normal BMI. While iron deficiency is most wide spread (50% -70%), the population also suffers from deficiency of Iodine, Vitamin A, Vitamin D, Calcium, B Vitamins, Zinc and Folic Acid. Cost of treating diseases occurring due to malnutrition is 27 times the cost of prevention.

While talking about role of food processing industry in providing food and nutrition security, Mr. Panandiker said that processing of fruits and vegetables by industry can reduce the current wastage of about 30% of fruits and vegetables. Industry can also increase the shelf life of the products and fortify foods with minerals and vitamins to address the issue of micronutrient deficiencies. There is tremendous scope for using food processing to enhance food and nutrition security in India as only 20% of agricultural production is processed in the country compared to 80% in Malaysia, 70% in Brasil and 40% in China. Mr. Panandiker also suggested that following steps should be taken to enhance Nutrition Security.

- FSSAI should encourage fortification of foods with Vitamins and Minerals by taking pro-active measures like adopting guidelines for fortification, supporting novel products while ensuring safety.
- The National Mission on Food Processing should give priority to food fortification and provide incentives to speed up fortification.

- Apart from fortification, Industry should produce specialty foods for different categories of consumer like NCD patients, foods for elderly etc.
- Industry should use agricultural products which are more nutritious e.g. millets for extruded foods.
- Industry should vigorously pursue marketing of processed foods in rural areas.

While concluding Mr. Panandiker said that while food security is within reach after the adoption of Food Security Act 2013, Nutrition Security is still far off and will require concerted efforts on the part of different stakeholders.

Opening Address

Dr. Ajit Kumar pointed out in his Opening Address that India has widest variety of climate, soil and plenty of sunshine. This enables the country to produce 600 million tons of farm produce. India is second largest producer of fruits and vegetables in the world, largest producer of milk and is leading producer of food grains, fish, meat etc. However, given the fact that India is a leading producer of agriculture commodities in the world, it has not yet realized the full potential for producing these commodities. There is a significant gap in productivity achieved in highest producing country and India.India is far behind even countries like Bhutan in farm and animal products. Steps have to be taken to bridge the gap.

Dr. Ajit Kumar also mentioned the following:

- People get food but not required nutrition.
- 70% of population is malnourished.
- 6000 children die due to malnutrition every year in the country.
- 57% of women and children have Vitamin A deficiency and there is a huge Vitamin D deficiency.
- Nearly 20% of people are obese.
- Underweight and undernourished children in the country are more than in Pakistan, Ghana and Nigeria.

Dr. Ajit Kumar said that there are a number of reasons for malnutrition such as:

- Access to food in weaker sections of the society is inadequate.
- There is a micronutrient deficiency in soil. Zinc is 48% and Sulphur is 14%.
- The present technology for food processing lead to loss of micronutrients e.g. in flour milling 55 – 60% of nutrients are lost. Polished rice also results in nutrient loss.

Dr. Ajit Kumar said that it is important to change the Nutrition Assessment Method and bio markers other than hemoglobin should be identified for assessing anemia.

Addressing the food processing industries Dr. Ajit Kumar urged them to undertake food fortification in a big way. In addition to fortifying foods with micronutrients, they should also look at traditional methods for food enrichment. They should also develop low cost technologies and reach fortified foods to remotest part of the country.

Talking about taboo on consuming certainfoods in India Dr. Kumar said that there is a need to create awareness that eating non – vegetarian products or certain other foods has nothing to do with religion and they can improve nutrition profile. Industry should also have long term vision and come together to develop long term research strategies. He also requested them to process some of the crops such as millets which can improve food and nutrition security.

Vote Of Thanks

While proposing Vote of Thanks to Dr. Ajit Kumar and speakers and participants. Mr.

Kejriwal said that one of the focus areas of ILSI India's work is"Sustainable Agriculture and Nutrition Security". He said that ILSI-India has been focusing on the role that food processing can play in improving public health, particularly through adoption of new technologies, for improving nutrition content of foods, making foods safe and through improving lifestyle.Food processing, according to him has an important role to play in ensuring food and nutrition security in two ways:

Firstly, with a vibrant food processing sector the demand for agricultural products increases and that is instrumental in checking colossal losses of food grains, fruits and vegetables and this is turn increases the supply of agriculture and horticulture raw materials and processed products. Further, food processing increases shelf life and makes products available during off season also.

Secondly, processed foods which are enriched with micronutrients or probiotic or prebiotic can be instrumental in meeting the challenges of malnutrition and other health issues.

Food Industry has to look at many health challenges facing the country particularly cardiovascular diseases, diabetes, hypertension etc. Efforts have to be made to ensure that healthy oils, less salt and sugar are used to ensure that healthy food is made available to the consumers.

Session 1: What is Food and Nutrition Security?

Chair: Dr. P.K. Seth, Former Director, ITRC, CEO, Biotech Park

Nutrition Security

Dr. Kamala Krishnaswamy, Former Director, National Institute Nutrition and Emeritus Medical Scientist (ICMR) made a presentation on "Food and Nutrition Security in the context of the National Food Security Act". While talking about what is meant by Food and Nutrition Security, Dr. Kamala Krishnaswamy said that Nutrition Security is broadly defined as physical, economic and social access and utilizationof, an appropriate balanced diet, safe drinking water, environmental hygiene and primary health care for all. Food security alone is not adequate for nutrition security .It is determined by several factors –Community and HH level distribution, poverty, literacy, potable water, sanitation and hygiene, cultural beliefs and practices. Nutrition security is a critical input which fuels economic growth, development and health.

Dr. Kamala Krishnaswamy said thatGreen Revolution was an important factor leading to increase in food grains production. However, after 2008 the rate of growth of food grains production decelerated to 1.2%, lower that the annual rate of growth of population at 1.9%. The achievement of food security at the national level has not also percolated down to the level of individual household and has not resulted in Nutritional Security. Proportion of underweight among children less than 5 years in age is 42.5%, and under 5 mortality rates (death per 100) is 7.4%. The Hunger Index score is 23.30%. The top 5 worst performing states in the country in terms of Hunger Index score are Madhya Pradesh, Jharkhand, Bihar, Chhattisgarh and Gujarat. Co-relating India State Hunger Index in relation to poverty,she pointed out that the State Hunger Index is positively co-related to percentage of population below poverty line and low per – capita income. Dr. Kamala Krishnaswamy said that the surveys by National Nutrition Monitoring Bureau (NNMB) have revealed thatbetween 1975 – 1977 and 2011 – 2012:

- There has been a decline in the average intake of food stuffs as percentage of Recommended Daily Intake (RDI) in cereals, pulses, vegetables, milk and milk products and sugar and jiggery.
- Improvement in consumption of green leafy vegetables, fats and oils and roots and tubers.
- There has been an increase in average intake of nutrients as percentage of RDI in Vitamin A and Vitamin C. There has been a decline in the intake of Protein Energy, Calcium, Iron, Thiamin, Riboflavin and Niacin.
- The percentage of calorie energy deficient (CED) population with less than 18.5 BMI increased from 36.2% to 56% of adult men. The overweight population of adult men increased from 2% to 9.6% at the same time. The percentage of CED adult women increased from 35.7%to 52%. The percentage of overweight women with BMI, greater than 25 increased from 3% to 12.9%.
- The prevalence of under nutrition among rural preschool children in 10 NNMB states in India also: increased, Underweight from 44.2% to 75.5%; stunting increased from 49% to 81.9%; Wasting from 47% to 27%. On an all India

basis faulty breast feeding practices and complimentary feeding are major factors contributing to under nutrition among children less than 5 years of age.

Dr. Kamala Krishnaswamy stressed on access to—

(a) Safe and adequate drinking water and sanitation.
(b) Health care.
(c) Nutritional, health and education support to adolescent girls.
(d) Adequate pensions for senior citizens, persons with disability and single women.

She said that revitalization of agriculture is important for providing food security: Towards this end it is necessary to undertake agrarian reforms,increase investments in agriculture,extend livelihood security to farmers,prohibit unwarranted diversion of land and water from food production, and promote adaptation to climate change and declining water resources.

Simultaneous efforts are required to promote the above.At community and HHlevels, ICDS/ MDM, community kitchens are needed.Nutrition education/awareness/exclusive breast feeding/ complimentary foods are important

In her concluding remarks Dr. Krishnaswamy stressed that:

- There is a need to lay down legislation to provide food for the needy. Water/ sanitation –equally essential.
- Skill development / livelihoods are essential.
- Food and nutrition security cannot be equated to food grains distribution.
- Holistic diets have other components as well.
- A lifecycle approach, education empowerment, awareness generations are essential to tackle malnutrition.
- Develop nutrition sensitive agriculture.

Food Security: Concerns and Approaches in Twelfth Plan

Dr. J.P. Mishra, Advisor, Agriculture, Planning Commission made a presentation on "Food Security: Concerns and Approaches in Twelfth Plan". He talked about the supply side of Food Security. He said that the challenges in ensuring Food Security to the masses include limited natural resources. India has 2.3% of global land, while it has 4% of global population. The net sown area is 140 million hectares and is largely rain fed. Competing demands for natural resources and Climate change pose further problems. Checking post-harvest losses of 20% of farm produce, meeting growing and diversified demand for agriculture products, making farming remunerated and targeted distribution pose further challenges.

Dr. Mishra also focused on the opportunities for improving Food security. These include 15 distinct agro climatic zones, huge untapped potential and current focus on agriculture PHM and rural development.

Dr. Mishra mentioned that during Eleventh Plan the agriculture growth was 4.1% and targets of production of food grains were exceeded.He said that dietary intakehas diversified.While there has been decline in cereal consumption affecting calorie intake, dietary intake of milk, meat, egg and fruits have increased. The total expenditure on food items has declined from 55% to 39% between 1993 – 94 and 2011 – 12 in urban areas and from 63% to 48% in rural areas.

Dr. Mishra opined that there is tremendous scope for improving agricultural production,

agricultural diversification and post – harvest management. He made the following observations:

- The demand for all food items are increasing. Annual increase in demand is at 1.3% for cereals, 3% for pulses, 3.5% for edible oils, 3.3% for vegetables and 5% for fruits.
- With current pace of increase in production, higher demand for cereals can be met. Meeting the requirement for pulses is difficult and will require technological breakthrough for plant types and also NRM.
- A higher investment is required for sustaining the turnaround in horticulture. Issues of quality, storage, cold chains, strong infrastructure, and marketing need to be addressed.
- Future growth in agriculture needs overall systemic changes in production to delivery services, health and disease control and management.

Dr. Mishra also informed the participants that following measures are envisaged during Twelfth Plan to improve supply stability:

- Promoting crops/livestock/fish in appropriate agro-ecology:
  - Focus on farming systems/cropping systems.
  - Rice based in eastern India.
  - Maize instead of rice in north western states.
  - Pulses and oilseeds in upland rice areas.
  - Agri-Horti-pastoral in arid regions.
- Emphasis on Rainfed/Dry land agriculture:
  - In-siturainwater harvesting and recycling.
  - Micro irrigation.
- Focus on eastern India in improving rice and wheat production through Mission on: Food grains, Horticulture, Oilseeds & Oil palm, Sustainable Agriculture, Livestock & dairy development, Fisheries Development, Mega Food Park, NMPH
- Focus on growing more pulses by decreasing 30% loss due to pest and disease and 20% yield gain. 1000 clusters of 1000 hectare each will be setup for 5 main pulses crops.
- Introduction of Nutri- farms schemes in hundred high malnutrition burden districts of 9 states. Bio fortified food crops enriched with critical micronutrients are being introduced. The produce will be procured by SFAC and supplied to Mid-Day Meal program and Integrated Child Development Scheme in identified districts. If the scheme is successful it will become a regular program.

Session 2: Food ForHealth And Well Being

Chair: Mr. D H Pai Panandiker, Chairman, ILSI-India

Bio – Fortification As A Strategy Of Genetic Enhancement Of Micro Nutrients In Staple Food Crops

Dr. Swapan Kumar Dutta, DDG, Crop Sciences, ICAR made a presentation on "Bio – Fortification as a Strategy of Genetic Enhancement of Micronutrients in Staple Food Crops". He underline that bio – fortification is the most economic and sustainable way of combating malnutrition. He was of the view that considering the fact that 42% of Indian population (mostly women and children) are malnourished, India should take a leading role in developing bio fortified food crops.

Dr. Dutta informed about how nutritional traits can be transferred to the target crops through use of transgenic technology, for example, rice can be fortified with iron, folic acid and tocopherol and folic acid. Wheat can be enriched with high iron and zinc. He also said that 7 institutes including NIN and NIANP and 36 associated centers are working on 5 major cereal crops (rice, wheat, maize, sorghum and pearl millets), 2 small millets (finger millets and foxtail millet) and potato.

Dr. Dutta also talked about next generation genetics in plants. He said that Natural variation presents one of the fundamental challenges of modern biology. Soon, the genome sequences of thousands of individuals will be known for each of several species. But how does the genotypic variation that will be observed among these individuals translate into phenotypic variation? Plants are in many ways ideal for addressing this question and resources that are unmatched, except in humans,have now been developed.

Dr. Dutta also provided details of the following:

- Development of Quality protein maize (QPM Hybrid 9).
- Biofortification: Provitamin A in Rice Endosperm.
- High iron/zinc GM Rice with X 2.5 more iron in polished seed.
- Increasing nutrition Bioavailability by reduction of Phytic acid level in rice seeds.

Research highlights:

- The nutritional composition of grains of high iron transgenic rice (FR-19-7, the transgenic IR68144 line developed,Vasconcelos et al, 2003) is comparable to that of non-transgenic counterpart.
- The nutritional components of transgenic ferritin seeds are well within the accepted range of reported values.
- Based on the substantial equivalence concept of OECD, the analyzed transgenic seeds are safe for human consumption.

Fortified Foods

Dr. Madhavan Nair, Scientist E, National Institute of Nutrition made a presentation on"Fortified Foods". He said that a healthy diet with essential micronutrients is the basis for a healthy life: 13 vitamins and 14 minerals are needed in small quantities only but are essential for healthy life. They cannot be produced by the body and have to come from the diet. He showed concern that the magnitude of hidden hunger or

micronutrient deficiency is alarmingly high in India. The NNMB technical report has revealed that the Indian population is suffering from deficiency of Iodine, Iron, Zinc, Vitamin A, Calcium, Vitamin D, Vitamin B12 and Folic acid. The dietary intake as against the Recommended Daily Allowance (RDA) is given in the following table.

Table 1

Nutrient	Median Intake	RDA
Iron	12 mg	17 mg
Vitamin A	124 µg/CU/d	600 µg
Riboflavin	0.8 mg/CU/d	1.4 mg
Vitamin C	29 mg/CU/d	40 mg
Dietary folate	118 µg/CU/d	200 µg

Dr. Nair recommended that food fortification is key approach to achieve adequate micronutrient intake. At the same time integrated approach is required to eliminate micronutrient deficiencies incorporating supplementation, public health measure, fortification and dietary improvement. Food Fortification is an innovative strategy and has not yet achieved its full potential by fostering convergence within and across sectors and levels of investment.

Dr. Nair said that three types of fortification are in place: Conventional fortification, Home fortification and Bio fortification. There has been a long history of safe use and successful control of deficiencies of Vitamin A, D, several B Vitamins, Iodine and Iron in many countries through fortification of foods with these micronutrients. The evidence for prevention and control of primary deficiency through food fortification is quite convincing. He quoted several examples of successful stories. He pointed out that experience in countries that are already fortifying show that fortified foods are:–

- Completely safe for consumers: as amount of vitamins and minerals added to a specific food is usually set at individuals daily requirements. It is usually less than one third of the total RDA.
- Benefits are enormous.
- Has negligible impact on the shelf life of the product.

Dr Nair recommended that Food Safety and Standards Authority of India should have focused deliberation among at the stakeholders with respect to:

- The micronutrients that need to be considered.
- Whether to consider single or multiple micronutrients.
- Levels and possible vehicles.
- Guidelines.

Processed Foods: Concerns ToMitigate NCDs

During her presentation on "Processed Foods: Concerns to Mitigate NCDs" Dr. Anupa Siddhu, Director, Lady Irwin College made the following points:

- There has been phenomenal increase in NCD in India. India has become the diabetes capital of the world.
- The World Health Assembly had chalked out 2008 – 2013 action plan for global strategy for the prevention and control of Non – Communicable diseases including cardiovascular diseases, diabetes, cancers and chronic respiratory diseases. The four shared risk factors are tobacco use, physical inactivity, unhealthy diets and the harmful use of alcohol.
- The Food Safety and Standards authority of India is working on regulations on labeling and claims to make consumers aware of qualityof food they are eating and to promote their safety. The labels will include nutrition facts and declaration on TFA and SFA. Claims may be permitted.

- Food Industry is now increasingly sensitive in selecting correct ingredients. An effort for sodium and sugar replacement is now evident in many processed foods.Many products carry as nutrient claims high fiber, low sodium. and zero trans. Producing low SFA products has been a major achievement. Fat replaced by FOS and using other innovations is in hands of food industry. Healthy foods should be produced with missionary zeal. Industry should be sensitive to health of the consumer and work towards disease reduction and food security and nutrition security. Food Industry should introduce innovations and develop technologies in reducing disease burden.
- A smart choice program has been developed for the US population to help guide smart food and beverage choices. This has been created by a diverse group of scientists, academicians, health and research organizations, food and beverage manufacturers and retailers. The program is based on the guiding principles of transparency, coalition based, comprehensive, voluntary application and flexibility.

Foods For Healthy – Ageing

Dr. Parmeet Kaur, Senior Dietician, AIIMS made a presentation on "Food for Healthy Ageing". She informed that in 2001, 7.4% of the Indian population was elderly and it will increase to 12.4% by 2026 She attributed this to better medical intervention, economic development, reduced birth rate, better hygiene and nutrition, improvement in lifestyle and general prevention care. She said that nutrition and physical inactivity are the leading factors for ill health, disability and early death. According to her the elements for healthy ageing are:diet, exercise, genes, social activity and productive pursuits.

Dr. Parmeet Kaur talked about different types of diets followed in different countries associated with healthy ageing, such as:

Eskimo Diet: Eskimos have high in takes of seal, walrus, marine animals and fish rich in PUFA (n-3). In spite of high consumption of fat and negligible vegetable consumption, Eskimos hardly suffer from CHD and DM and total cholesterol in low and HDL in high. Talking about role of diet in health she quoted an ancient Ayurvedic proverb: "When diet is wrong, Medicine is of no use. When diet is correct, medicine is of no need".

The Okinawa Diet: Low in calories yet nutritionally dense with phytonutrients in the form of antioxidants and flavonoids. Very high intake of vegetables and fruits (phytonutrient and antioxidant rich) but reduced in meat, refined grains, saturated fat, sugar, salt, and full-fat dairy products.

Mediterranean Diet: more vegetables, whole grains, fruit, legumes, nuts, fish, and MUFA/ PUFA; less red meat and SFAs; and some alcohol (wine).

Blue Zones: Countries falling in the Blue Zone i.e. having population with longer life span, share some common lifestyle characteristics including diet which are rich in plant based food (vegetables, beans, and soybean), low in meat and have longer life expectancy and lower rates of age related diseases. The following countries are in the Blue Zone:

- Okinawa, Japan – Females 70+ are world's longest-lived population.
- Nicoya, Costa Rica – World's lowest rates of middle-age mortality.

- Loma Linda, California – Community lives 10 years longer than North American counterparts.
- Sardinia, Italy – World's highest conc. of male centenarians.
- Ikaria, Greece – One of world's lowest rates of dementia.

(Source: The Blue Zones-NY Times, Dan Buettner, 2008)

Dr. Parmeet Kaur also quoted several studies related to mortality and life expectancy. She said that:

- Several independent studies show that a dietary pattern rich in plant based foods, fish and olive oil but low in whole fat dairy was associated with lower CVD or all-cause *mortality* in Italy, Spain, UK, Japan and USA.
- European Perspective Investigation into Cancer and Nutrition study showed that relationship between plant based diet and mortality in those aged 60+ may be country specific since there were relatively strong associations in Greece, Spain, Denmark and the Netherlands but *no* associations in the UK and Germany. (Bamiaet al, 2007).
- Studies from Japan and Netherlands found that a dietary pattern rich in dairy products led to lower mortality while in USA it showed higher all-cause mortalityin middle aged and older people.(Anderson et al,2011).
- High intakes of meat and sugar, increased risk of overall mortality in Germany, USA, Canada, Spain.
- Studies relate to Cardio Metabolic Disorders Data showed that men who consumed a typical "Western" diet were 60% more likely to develop diabetes than those whose diets were centered on the "Prudent" Diet.

Table 2

"Western" Diet Vs"Prudent" Diet	
Western Diet	Prudent Diet
Red Meat	Vegetables
Processed Meat	Fruit
French Fries	Fish
High Fat Dairy Products	Whole Grains
Refined Grains	Poultry
Sweets and Deserts	

(Adapted from Van Dam RM, Rimm EB, Willet WC, Stampfer MU, Hu FB. Ann Intern Med. 2002; 136: 201- 209)

- The Supplementation en Vitamins et Mineraux Antioxidant study in French participants aged 45 or older showed that adherence to Prudent diet was associated with better global cognitive function and verbal memory whereas no association was shown for cognitive outcomes with vegetable fat, meat and poultry.(Kesse-Guyot*et al,*2012)
- Guet al, 2010, found that high intake of nuts, tomatoes, poultry, vegetables, fruits and low intakes of high fat dairy, red meat, organ meat and butter associated with lower risk of dementia.

Based on the findings of the existing evidence of both posteriori and prioridietary patterns commonfood groups may be associated consistently with longevity and better cardio metabolic and cognitive health.

Dr. Parmeet Kaur informed that MD patterns, DASH (Dietary Approaches to Stop Hypertension) diet and the American Healthy Eating Index are becoming more widespread in promoting lifelong health.However, residual confounding by other lifestyle and socio-

economic factors before generalizability as these diets were specifically developed for the population under study. Foods intake is also related to local availability and cultural specific acceptability.More evidence is needed regionally and nationally for suggesting lifelong*changes* in eating behavior.In addition, there is a need for objective panel on outcome measures, to ascertain whether the interventions have been successful in enhancing healthy ageing. There is a need to change "onesize fits all" approach as adopted by most of the dietary guidelines since not all individuals within population share the same dietary risks & there is heterogeneity in food preferences.Future research should disentangle the interactions among genotype, diet, lifestyle andenvironment to understand the basis of different responses to dietary patterns.

Session 3: New Initiatives InFood Processing

Chair: Dr. A.S. Bawa, Vice President, Amity University, RBES and Former Director, Defence Food Research Laboratory &

Dr. Roger Bektash, Director, Scientific & Regulatory Affairs, Mars Asia Pacific

Extruded Snacks From Millets – The Grain Of The Future

Dr. Santosh Jain Passi, Public Health and Nutrition Expert and Former Director, Institute of Home Economics made a presentation on "Extruded Snacks from Millets –The Grains of the Future". She said that it is important to focus on millets and products made from them as millets are not only highly nutritious, but also water efficient and help in reducing the atmospheric Co2. She informed that Paddy is one of the major contributors to climate change due to methane emission (the greenhouse gas emanating from water-drenched rice fields).Wheat - a thermally sensitive crop, is liable to decreased cultivation with rising temperatures as part of climate change (With the projected 20 C rise in temperature, in due course, wheat might disappear from our farms). Though millets have been cultivated in the country for around 3000 years, during the last five decades the area under millet production has been shrinking and more so ever since the green revolution in the 1960s. Between 1966 and 2006, 44% of area under millet cultivation was shifted to other crops. Keeping in view the following specific benefits associated with millets, it is important to increase the production and make it more popular among consumers:

- Millets are amazing in their nutritive content; these are nearly 3 – 5 times nutritionally superior to rice and wheat - be it in terms of minerals, vitamins, dietary fibre (water soluble/ insoluble) or other nutrients.
- Finger millet is very rich in calcium; and pearl, foxtail and little millet are rich in iron. Sorghum is potentially an important source of nutraceuticals such as antioxidants, polyphenols and cholesterol-lowering waxes.
- Millets contain appreciable amounts of â-Carotene, niacin, vitamin B_6, folic acid, potassium, magnesium, zinc and dietary fibre. Therefore, these can help in overcoming malnutrition among vast majority of the Indian population. These also contain high amounts of lecithin and help in strengthening the nervous system.
- Millets are good for people suffering from celiac disease (gluten intolerance).
- Due to their high dietary fibre and low glycaemic index, millets can help in curbing overweight/obesity and reducing the risk of hypertension, CVDs, T2DM, various types of cancers including colon cancer as well as preventing constipation.
- Regular consumption of millets is highly beneficial for post-menopausal women suffering from hypertension and hypercholesterolemia (Millet Network of India).

Dr. Passi mentioned that many ready to eat;extruded products can be made using millets either in isolationor in combination with wheat flour or rice flour. These include breakfast cereals, noodles, chapatti, bakery products, snack foods, papads, extruded RTE/ instant foods, chips etc.

Millets being drought resistant crops requiring fewer external inputs,can be grownunder harsh

circumstances of the arid/semi-arid regions and poor soil conditions. Hence, these are also termed as the 'miracle grains' or 'crops of the future'. Dr. Passi suggested that millets should be accorded highest priority under the national food security policy. The Government should allocate at least 40% of the food security budget to millet based farming and food systems using millets as the major food component.

Case Study on Products From Millets

Dr. Prashant Parameswaran, Managing Director, Kottaram Agro Foods presented the case study on products that can be made from millets, benefits of millets and consumer acceptability. He said that consumers are open to changing the dietary habits and include millet based products in their diet as they havemany health benefits. There is large interest in foods which have high protein, complex carbohydrates and high fiber content and are free from glutton. Millets provide all thesetraits; however, industry will have to take steps to ensure that the tasty products with good shelf life are developed. His company is producing traditional Indian foods such as instant dosa mixes and instant idli mixes as also western foods like ragi flakes and chocolate vanilla filled ragi bites. The products are doing well in the domestic and export markets. More products are being developed. These include additional range of breakfast cereals and minor millets.

Dr. Prashant Parameswaran suggested that the following steps should be taken to popularize millet based products:

- Product should be designed to have minimum 9 months of shelf life for creating a larger market Problem of oxidative rancidity should be tackled and anti-oxidants should be designed specifically for millets.
- Suitable packaging material should be developed to give the required shelf life to the products.
- Evidence on health benefits of millets should be generated.
- Abundant good quality raw materials should be made available to the industry in a sustainable fashion.
- Industry should build confidence in consumers about millet based products.
- The Government has announced a number of farmer based millet promotion schemes but focus needs to be on consumer market creation for the farmer to benefit.
- There is a large potential in US, Europe and Japan for millets. Government support here would enable Indian millets to potentially be the next revolutionary grain.
- Varieties of Millets and Ragi should be identified which can be grown in large sustainable quantities by farmers. Processing technologies should be developed to reduce the cooking time for millets without losing nutritional qualities so that they can be incorporated in daily meals.

The Sodium Reduction Journey

Ms. Devishree Murthy, Nutrition and Health Leader, South Asia, Hindustan Unilever Research Centre emphasized the need to reduce sodium from 9 – 12 g/day to 5 – 6 g/day as over consumption of salt is a major contributor to heart and vascular diseases as it raises blood pressure. She said that to meet the targets, all stakeholders i.e. Food Industry both large and small, Health Authorities, Health Scientist, Consumers, Retailers and Restaurants have to work together.

The key elements to be addressed include consumer acceptance, taste, technology, setting

up of realistic bench mark and partnerships for implementation. Ms. Murthy informed that lowering the intake of saltrequires behavioral change. Most of the salt comes from added salt Following is the breakup.

Table 3

Restaurant, ready to eat meals & street food	9%
Salt rich foods	32%
Salt added at table	10%
Salt added during preparation	49%

It will be quite challenging to bring about behavioral change in consumer as they are used to particular taste which they do not want to give up. Their knowledge on nutrition benefits is low and they have the perception that natural is healthy. It will be necessary to educate consumers to read label, incorporate compelling and motivating claims and lead them towards gradual adaptation and produce low salt but tastier products.

Ms. Murthy informed that use of salt substitutes, optimizing receptor stimulation, using salt boosters and use of aroma, herbs and spices have a good scope for reducing salt. She said that while adaptation to low salt can lead to 15% reduction, salt boosters can lead to reduction by 50%. Ms. Murthy informed that there are government programs for reduction in salt in a number of countries in Europe, Canada, USA, China, Australia and New Zealand and Sri Lanka.

Ms. Murthy underlined that as salt plays a crucial role in taste, preservation and texture, there are no simple solutions to salt reduction. Each type of food requires different approach and adaptation will be effective only when implemented industry wide. Further seduction beyond 20%-30% will require more breakthrough technologies.

Enzyme Applications in Food Industry

Dr. Aindrila Dasgupta, Senior Manager, Application Technology, Novozymes give a presentation on Enzyme Applications in Food Industry. She said that there is a very good scope for using enzymes in processed foods to improve food safety and nutrition. Use of enzymes is also climate friendly. She pointed out the following:

- Enzymes can be produced through fermentation, recovery and finally granulation.
- Enzymes help in food preservation; reduction in salt, improving shelf life of bread and cakes, promoting better viscosity and fruit firming.
- Milk can be tolerated by lactose intolerant consumers using the enzyme lactase.
- Enzymes have diverse applications in dairy industry, for example: It improves cheese yield, heat stability of beta- lactoglobulin, emulsion stability and milk powder/ concentrated condensed milk production and its properties.
- Enzymes can be used by fruit juice processing industry as also processed foods containing fruits and vegetables to strengthen the structure.
- Use of enzymes in bakery industry can improve many properties such as increased volume, well pronounced bloom, improved crust color, improved softness, and final crumb structure and to reduce acrylamide.
- Enzyme can reduce acrylamide in food without affecting taste, flavor and appearance. Acrylamide is a contaminant naturally formed in many foods as a byproduct during frying or baking at temperatures in excess of 250®F/ 120®C and at low moisture.

Dr. Dasgupta said that food enzymes and other white bio – technologies products have already

made a big impact and will help the food industry meet consumers demand for change. However, the regulatory approvals in India should be stream lined to enable enzyme industry to offer sustainable solutions.

New Packaging Technologies- Food Safety & Quality

Dr. Tanveer Alam, Joint Director and Regional Head, Indian Institute of Packaging made a presentation on "New Packaging Technologies- Food Safety and Quality". He said that packaging plays a very important role in protection, preservation and promotion of food products. He provided details of different types of active packaging systems. Active packaging system facilitates interaction between products, package and environment in a positive way to extend the shelf life. The active packaging system is capable of carrying out intelligent functions:

1) Extend: Prolong the shelf life of food products.
2) Interact: Give consumers more product quality information.

Active Packaging prevent microbial contamination prolongs shelf life of foods, and decrease the risk of food borne illness. They changes the condition of the packed food to extend the shelf-life or/and to improve safety or sensory properties, while maintaining the quality of the food.

Dr. Tanweer Alam said that in future the following developments will take place in packaging.

- Biosensors will be introduced. They are compact analytical devices that detect record and transmit information pertaining to biological reactions.
- A specific-pathogen antibody will be attached to a membrane-forming part of the barcode.
- The presence of contaminating bacteria will cause the formation of a localized dark bar, rendering the barcode unreadable upon scanning.

Facilitating Introduction of Innovative Foods

Mr. K.B. Subramanian, Dy. Secretary, Ministry of Food Processing Industries presented the scheme for assisting R & D in foods by Ministry of Food Processing industries. He made the following observations:

- Research and Development in the processed food sector is an important area where focused attention is required as it is related with improvement of production, quality, trade, consumer safety and public health.

- There is a need for up-gradation of processing, handling, packaging, storage and distribution technologies for all major processed food products so as to meet domestic and international standards.The main areas in which R&D is required are:-
  a) Developing innovative products,
  b) Developing technology for processing of food products
  c) Developing efficient technology for preservation and packaging of food products includingdesign and building of proto-type equipment and pilot plants.

Mr. K.B. Subramanian informed that The Ministry of Food Processing Industries under its scheme for "Research and Development in Processed Food Sector" is providing financial assistance to promote and undertake demand driven R&D work leading to innovative products and processes with commercial value. The

scheme is now being implemented through Science and Engineering Research Board (SERB), Department of Science and Technology w.e.f. April 2014. The deliverables of the Scheme are:

- Creation of a shelf of technologies and innovative products, which will be available to industry for commercialization.
- Entry of new products in the market with increased safety and higher nutritional status.
- Enabling scientific community to understand and work with the issues in the food science area with a view to evolving technological solutions and new products and processes.

All Universities, IITs, Central/State Government Institutions, Public Funded Organizations, R&D laboratories and CSIR recognized R&D units in private sector can apply for assistance.

The Food Processing Ministry has supported 16 projects for development of various food products. During 2013-14, 34 projects were assisted through SERB (Science & Engineering Research Board of Department of Science and Technology).

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