

Invited Article

Food Technology for Food, Nutrition, Health and Livelihood Security

Food Technology can directly contribute to food security through enhancement of nutrient density establishment of tiny cottage scale for processing industry in rural areas would help to empower a rural woman which contributes livelihood security. Value addition/processing are need of the hour. Post harvest management will save the food.

Rural employment opportunities should be increased by promoting post harvest opportunities and value addition, entrepreneurship at the village level and this will increase the net income of the farmers. The promotion of agriculture, small scale rural industry, the rural economy gets a big boost and also corrects the rural- urban imbalance and prevents migration.

Food processing has huge potential to dramatically improve rural livelihoods by raising farm incomes through value addition in agricultural produce. "India is home to a wide-range of raw material suited for the food processing industry because of its diverse agro-climatic conditions. A very small percentage of these are processed into value added products at present. So, the scope, potential and opportunities are huge in this industry.

In the 21st century, climate changes, water scarcity, increasing world population, rising food prices, and other socioeconomic impacts are expected to generate a great threat to agriculture and food security worldwide, especially for the poorest people who live in arid and sub arid regions. These impacts present a challenge to scientists and nutritionists to investigate the possibilities of producing, processing, and utilizing other potential food sources to end hunger and poverty. Cereal grains are the most important source of the world's food and have a significant role in the human diet throughout the world. As one of the most important drought-resistant crops, millet is widely grown in the semiarid tropics of Africa and Asia and constitutes a major source of carbohydrates and proteins for people living in these areas. In addition, because of their important contribution to national food security and potential health benefits, millet grain is now receiving increasing interest from food scientists, technologists, and nutritionists.

India is 3rd largest producer of fruits after Brazil and USA and 2nd in vegetables after China. It produces about 65% of world mangoes and bananas, 12% of World's onions. India has a potential



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Prof. (Mrs.) Vijaya Khader, Former Dean, Acharya N. G. Ranga Agricultural University has been actively engaged in nutrition research and teaching for over thirty three years. Worked as First Principal at College of Home Science, Bapatla and also at college of Home Science, Hyderabad. Completed 22 independent research projects on Socio Economic empowerment of rural, Farm, Fisher & Tribal Women, received two patents and licensed the technology. Written 4 university level text books. She worked as Dean P.G Studies, Director of Extension and Dean of Student affairs.

Dr. Vijaya Khader visited various countries i.e U.S.A, Four universities in U.K., Seoul, Malaysia , Singapore, Egypt, Netherlands , Italy, Beijing , Kunming, Shanghai , Australia , Bangladesh, Taiwan, Cairo, Kuala Lumpur, Sri Lanka and Bangkok, Thailand for academic purpose.

She received State Best Teacher Award; Appreciation Certificate from ICAR; Women of the year; Fellow of Association of Food Scientists and Technologists, FAO Fellow; Outstanding Woman Professional Award (FICCI); Eminent Women Scientist Award (WISE ,India) , 3rd Dr. Rajammal P. Devdas Memorial award and Women Leadership in Science & Technology (Vigyan Prasara Department of Science & Technology) .

She served as Member Board of Management of A.N.G.R.A.U. Involved in developing portal on Rice in Human Nutrition namely <http://www.rkmp.co.in/general-domain/rice-in-human-nutritio>. Work on fisher women through the global website, <http://genderaquafish.org>, run by the Asian Fisheries Society. Chair Person of the Task Force Committee, E.C. member of Indian Women Scientist Association (IWSA).

production of mushrooms after China. India is center for biodiversity in plants, animals, insects, micro organisms and account for 17% animal, 12% plant and 10% fish generic resources in the world. In spite of these vast natural resources and abundant agricultural produce, India ranks below 10th in the export of food products. Conservative estimates put the processing levels in the fruits and vegetables sector at 2%, meat and poultry at 2%, by way of modern dairies at 14%, bulk meat de-boning of tuna at 21%. The food processing industry has an important role to play in linking the famers to final consumers in domestic as well as international market. Food processing combined with marketing has the potential to solve the basis problems of agricultural surplus, wastage, rural jobs and better remuneration to the growers. In the next ten years, the food production is expected to be doubled. These produce, if processed and marketed smartly can make India to become a leading food supplier to the world.

Food loss and wastage: One third of the food produced for human consumption is lost are wasted globally which amount about 1.3 billion per year. In developing nations 40% losses taking place during post harvesting and processing and 25% during pre harvest process. In Industrial countries more than 40% losses occur at the retail and consumer level. The annual wastage of agriculture produce in India is almost 30% ad equivalent to Rs.580 crores due to inadequate storage and processing facilities. The wasted food can feed almost 232 million people. Food losses represents a waste of resource used in production such as land, water, energy and inputs, increasing green gas emission.

Economic growth in India has failed nutrition: India has not met the millennium development goals not as planned for 2015. China has already met its 2015 target, has reduced child under nutrition by more than half (from 25% to 8%). Brazil has reduced child under nutrition by 60% (from 18% to 7%). Thailand has reduced child under nutrition by more than half (from 50% to 25%) Vietnam has reduced child under nutrition by 40% (from 45% to 27%). Reducing malnutrition is not just about health, agriculture and economics but it also accounts for politics, Governance and power.

Several Welfare Programs

National Nutrition Policy (1993); National Nutrition Plan of Action (1995); National Nutrition Mission (2001) not at achieved nutrition goals. Reasons: Nutrition is a poor cousin even in health and agriculture planning and execution, Nutrition improvement is not a stated goal with measurable parameters in National Food Security Mission,

National Horticulture Mission and National Rural Health Mission.

The Most important National Nutrition Programs in India

Integrated child Development services program (ICDS), The targeted public distribution system (TPDS), Food for work, The National Mid, Day meals program (NMMP), Micro nutrient (Iron folate; Vitamin A; Iodized salt) schemes.

Research carried out by Prof. (Mrs.) Vijaya khader on the role of Food Tehnology on Food, Nutrition, Health & Livelihood Security is summarized below

Experimental methodology used starting from Surveys, Chemical analysis, Biochemical estimations, bio-availability studies on rats as well as human subjects; clinical observations and histological studies were used as per the study design. Product development, value addition, Technology transfer, Entrepreneur skills development, income generation activities and creating awareness through Nutrition Education were also used.

Home based low cost energy protein rich preparations using Horse gram for vulnerable groups (Vijaya khader & P.Ashlesh, 1998)

The horse gram which is commonly used for cattle feed can be diversified for human consumption with less investment. Processed horse gram flour was prepared using Puffing and Roasting, Processed Soybean flour was prepared by Dehulling and Roasting. The low cost energy protein rich products namely RAGINA and EPRF were prepared using the simple home scale processing methods like germination, roasting and puffing, to improve the nutritional status. Product development can be taken as income generating activity in the rural areas by the illiterate women. Products can be included in supplementary feeding programs in order to improve the nutritional status of the vulnerable groups of the population.

Effect of feeding malted food on the nutritional status of vulnerable groups (Vijaya khader & Umamaheswari, 2012)

Amylase Rich Malted Mixes (ARMM) two types were formulated using Ragi / Wheat and suitable products namely *Laddu, Roti, Kheer, and Porridge* were prepared using formulated malted mix. The ARMM's found to be nutritional dense. For the supplementation of malted mixes 8 villages of Lepakshi Mandal, Ananthapur District was selected. Preschool children (400), pregnant women (100) and Lactating women (100) were selected and fed with

two types of malted mixes (Ragi / Wheat) for a period of 3 months. Promotion of malt based small scale food industry not only provides opportunity for rural women to develop entrepreneurship and employment but also provided Food and Nutritional Security through income generation.

Therapeutic food supplementation in ICDS projects of Andhra Pradesh (Yasoda Devi & Vijaya khader, 2004)

Total 2267 children of age range of 1-3 years were selected (892 children from rural ICDS project, Saravakota; 507 children from new ICDS project, Kottam; and 778 children from tribal ICDS project, Seethapeta) for a period of 1 year. The three types of supplements were prepared and distributed by A.P. Foods, Hyderabad. The supplements were distributed either in the form of Laddu or as in the form of powder. Nutritive value of 100g of supplements provides 400 to 480 Kcal 12.5 to 13.8 g proteins. It was very encouraging to note that 92% of grade III children showed improvement in their weight and height; 80% of moderately malnourished; 42% of mildly malnourished and 44% with normal grade showed improvement. It was also observed that there was positive correlation between the calorie and protein intake and also improvement in weight and height. All of mothers as well as Anganwadi workers preferred these supplementary foods better as compared to earlier supplied food i.e. ready to eat food.

Studies on Fisher Women in the Coastal Eco System of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu (Vijaya Khader *et al.*, 2004 ; Vijayakhader, J. Lakshmi and K. Dhanapal, 2013)

Two Equipments I) Low Cost Ice Cream Freezer II) Fresh Fish Vending and Display Table have been fabricated and the patents were received on 13th October, 2003. The technology has been licensed to Smt.G.Varalakshmi, W/o. Sri G.Satya Kiran, M/s. Yogi Industries, and Secunderabad for manufacturing these two equipments for a period of two years. She is the sole authority to manufacture in the country. After expiry of two years the technology on low cost ice cream freezer was licensed second time to another women entrepreneur namely Mrs. Lakshmi Bhuvanewari W/o Devi Hariprasad, D.No.23/321, Bachupeta, Hindu College Road, Machilipatnam – 527 001 on 16th September, 2006 for a period of 6 years ,up to 2012 . These equipments were fabricated mainly to improve the Health Security.

Role of Women in Fisheries in Coastal Eco-System of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. (Vijaya Khader *et al.*, 2005).

Fish eaters in the study area comprise 47 per cent of the total population ranging from 37 per cent in Tamil Nadu to 85 per cent in Kerala. Though the position of Tamil Nadu in terms of number of coastal districts and possession of coast line including the number of landing centers is envious, the number of fish eaters in the state is minimal. Andhra Pradesh employs 32 per cent of its fisherwomen in fish curing/drying/net making and 27 per cent in processing plant works.

Tribal mother's attitude towards lactation performance (Vijaya khader *et. al.*, 1996)

Tribal women are mostly involved in food preparation (25%) where as men are involved in occupational activities. Majority (85%) of tribal women do not think lactation is a necessity to take special care about food because they were lactating. Majority of mothers (66%) were aware of the reason for decrease in lactation performance. Only a small number of mothers (5%) knew that sickness and insufficient food (2%) played a role in decreasing the lactation performance. As nursing mothers, they do not receive any special attention from the family members regarding the additional intake of food. A positive change was observed in lactating mothers through Nutrition Education.

Health Status of Tribal's of Chinthapalli Block (Vijaya khader, *et. al.*, 1996)

Health problems of the tribal's are related to number of factors which include illiteracy, ignorance the disease and its prevention, poverty, poor nutritional status Poor environmental sanitation and poor personal hygiene, non availability of safe drinking water, which make people more vulnerable to infections. Superstitions and beliefs add to the health problems and complicate the situation. Malnutrition leading to tuberculosis and goitre are major disease in tribal's. Vomiting; diarrhoea and consequent dehydration are causes for death among infants and children. Skin diseases especially scabies and heat boils are common.

Effect of Jawahar Rojgar Yojana Programme during lean season on the Nutritional Status of Women in Landless Labour Families of Drought prone areas (Uma Maheswari and Vijaya Khader, 2001)

The study was conducted in eight villages of four interior Mandals having low rainfall (500-750mm) in Ananthapur a drought prone district of Andhra Pradesh. A household survey was conducted to screen the families having at least one women of child bearing age from the eight selected villages of the four Mandals. A total of 120 families were selected

for the study of which 60 families were JRY beneficiary families' where at least one member of the family was being employed under JRY scheme and 60 families were non-JRY beneficiary families. The study showed that the additional income gained by the landless labourer families during the lean season from Jawahar Rojgar Yojana (JRY) programme had beneficial effect on the nutritional status as assessed by the anthropometric measurements as well as clinical observations. The results indicated the past malnutrition status of the population in Ananthapur district because of the repeated and prolonged droughts

Effect of Jawahar Rojgar Yojana scheme during lean season on the Expenditure (Uma Maheswari and Vijaya Khader, 2001a)

A significant positive trend towards improvement in the quality of food taken by the landless labour families with the additional income generated through welfare programe i.e., Jawahar Rojgar Yojana in lean season as evinced by better food and non-food expenditure pattern of the JRY beneficiary families over the counterpart non JRY families in dry land and drought prone areas of Ananthapur district, Andhra Pradesh.

Coping mechanisms adapted for food security at household level in drought prone areas of Ananthapur, Andhra Pradesh (Uma Maheswari & Vijaya Khader, 2003)

Two rounds of survey were conducted to understand the difference in coping mechanisms operating between peak and lean seasons. The study centered on the empirical examination of eight major groups of coping mechanisms comprising of land, livestock, economic, food procurement and production, food consumption and distribution, food storage, social and health based mechanisms adapted by the families. The various economic activities under taken by the women in the study area included Agriculture, Agriculture labour, basket making, Beedee making, brick making, broom making, cattle rearing, firewood collection, flour mill, fodder collection, forest produce collection, goat / sheep rearing, laundering, mat weaving, non-agricultural labour, petty trade, pottery, poultry rearing, ring making, sericulture, tailoring, tamarind peeling, vegetable vending and weaving clothes etc. Most often children especially girls were involved in home based trades like groundnut shelling, beedi making, tamarind peeling etc. A few of the mechanisms were found to be beneficial and can be encouraged.

Rural Women as Entrepreneurs in Mushroom Cultivation (Vijaya Khader, 1994)

Every woman is an entrepreneur as she manages, organizes and assures responsibility for running her house. It has been increasingly realized that women possess entrepreneurial talent which can be harnessed to create employment opportunities. In the rural areas a woman can easily manage 4-10 beds depending on the space available, helping them to earn Rs.180 to Rs.450 per month. The results of the studies revealed that spawn multiplication can be done by women as a co-operative venture and mushroom cultivation can be undertaken at household level as an income-generating activity.

Supplementary income and nutritional status of pre-scholars' in rural areas of Tenali division (Vijaya khader & Kavitha, 1993)

The increase in the annual per capita income of the family increased slightly the nutritional status of pre-scholars .The results also reveal that no significant difference was observed between the body weight of children and income of the parents in all the age groups. In spite of having high purchasing power, lower educational status of the mothers and also low nutritional awareness, majority of the children are in Grade 1 degree malnutrition.

Transfer of home level preservative techniques of selective fruits and vegetables to rural women in Guntur district (Vijaya Khader and Bharathi, 1994)

There was a significant, negative correlation between age of the respondents and gain in knowledge .There was a significant positive correlation of socio economic variables such as educational status, family income, and land holding on gain in knowledge.

Operational feasibility of RPO supplementation to pre-school children in Anganwadi centers of ICDS Project (Vijaya khader and Aruna, 2008)

Vitamin A deficiency causes many health problems especially among children. A study was undertaken to screen the effect of supplementation of Red Palm Oil (RPO) obtained from the fruits of tree *Leis guineensis Jac*.The oil is rich in B-carotene, a precursor of Vitamin A.Supplementation of crude RPO to Anganwadi Children increased the attendance of children, increase in heights and weights of children. Decrease in Grade 11 and Grade 111 malnutrition was observed in respect of sex.

Impact of women's supplementary income on families' nutritional status (Vijaya Khader, 1999)

The Study was carried in 4 villages of Rajendranagar Mandal and Ranga Reddy District (Vegetable venders, Agarbathi labourers, Shopkeepers,

Washers, Fruit vendors, Tea and Snack workers .The results reveal that the supplementary income of women has a positive impact on socio-economic status of the family. This impact as felt on food and nutrition intake of the family.

Impact of dairy programme on the nutritional status of women and preschool children in Vihiga District, Kenya Africa (Mary Khakoni Walingo & Vijayakhader, 2000)

The dairy programme in Kenya has a significant impact on the overall improvement of the family in specific to improving production, consumption and marketed surplus of milk. Food and nutrient intake and nutritional status of women and preschool children from participant households improved. The prevalence of under nutrition in preschool children in participant households was lower (1.7%) than that of children in non participant households(2.9%). Stunting was 8.7 % and 21.4% in preschool children from participant and non- participant households respectively. Less percent (6.7%) of women in participant households had body mass index less than 18.5, whereas 7.3% of women from non- participant households fell below this cut-off point.

Success Stories

The National Agricultural Technology Project entitled Studies on Fisherwomen in coastal ecosystem of Andhra Pradesh, Karnataka, Tamilnadu and Kerala explored the socio-economic status of fisherwomen and found the families wherein women are actively involved in one or other occupation has flourished and achieved all round development. Seven Fisherwomen (3 from Kerala ;2 from Karnataka and 2 from A.P) have attained the Training and Awareness from National Agricultural Technology Project, implemented in their places and enhanced their socio-economic status through various skill oriented training programmes and continuous day-to-day discussions with the Scientists.

Technologies Developed

Entrepreureship Technologies

Sorghum Food Enterprise/ Geriatric Foods/ Malted Infant foods/Hifiber vermicelli/ Preservation of Palmyra Fruit/ Mushroom Cultivation / Spawn preparation

Knowledge Empowerment Technologies

Multipurpose Fresh fish Vending & Display Table / Low Cost Ice Cream Freezer

Value addition technologies

Value addition to Fruits/Value addition to Red Palm Oil/ Fruit Powders / Horse gram products / Soya Products

Impact of Research / Summary

Based on Vijayakhader work, Commissioner of Horticulture has issued the G.O. on unit cost for Oyster Mushrooms cultivation Rs. 70,000/- by NABARD and implemented from 1st August 1994 onwards (many people have availed the benefit) . 41 families have established mushroom cultivation in Guntur, Prakasham and Krishna Districts of Andhra Pradesh;10 families have taken fruit and vegetable processing at village level ;3 families have adopted the technology of Dehulling jowar and preparing value added products ;10 self help groups have been organized at Karnataka and Kerala are mainly involved in various income generating activities. Mrs Laura Bush, the First Lady of USA had discussions with Mrs Khader , 3rd March 2006 focusing mainly on food processing, income generating activities and gender issues.

Recommendations / Suggestions

- ◆ Improve the Productivity & Profitability of Small holdings through appropriate technologies and market linkages
- ◆ Encourage the scope for the growth of Agro Processing, Agro Industries and Agri Business
- ◆ Promote opportunities for the services sector to expand in a manner that will trigger the technological and economic up gradation of farm operations
- ◆ Start agri-clinics and agri business centers
- ◆ The home science / Community Science graduates can pay particular attention to nutrition and food safety and processing, and help a group of farm women to start food processing and health food parks
- ◆ Young Entrepreneurs for initiating programe in the phase of soil health enhancement, Plant and Animal Health Care, Seed Technology & Hybrid Seed production are several.
- ◆ Operate climate Risk Management Centers, are the path way to sustainable agriculture and food security as well as agrarian prosperity.

Transfer the technology for country's proper growth and development.

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