POLICY
PAPER
112

Gender and Nutrition based Extension in Agriculture

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
October 2022

Gender and Nutrition based Extension in Agriculture

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI

October 2022

CONVENER : Dr Ashok K Singh, DDG (Extn.) ICAR, New Delhi

CO-CONVENER : Dr Randhir Singh, ADG, ICAR, New Delhi

EDITORS : Dr Pratap Singh Birthal
Dr Malavika Dadlani

REVIEWERS : Dr Mruthyunjaya, former National Director, NAIP, ICAR, New Delhi
Dr Madhavan Nair, former Deputy Director, NIN, Hyderabad
Dr Ranjitha Puskur, IRRI Representative – India, New Delhi

CITATION : NAAS 2022. Gender and Nutrition based Extension in Agriculture. Policy Paper No. 112, National Academy of Agricultural Sciences, New Delhi pp 16.

Published by Dr Sanjeev Saxena, Executive Director on behalf of
NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
NASC, Dev Prakash Shastry Marg, New Delhi - 110 012
Tel: (011) 25846051-52; Fax: (011) 25846054
Email: naas-mail@naas.org.in; Website: www.naas.org.in

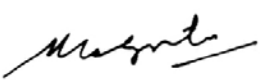
Preface

Agricultural growth is critical to reducing poverty, hunger and malnutrition. Over the past five decades, India's agricultural productivity and food supply have grown significantly, securing enough food for over 1.3 billion people in the country. Yet, ensuring nutritional security remains a distant dream. Approximately one-third of the country's population remains undernourished, probably due to a lack of awareness and access to quality diets.

A brainstorming session on 'Gender and Nutrition based Extension in Agriculture' was held on June 28, 2021 to critically examine the available option to focus agriculture nutrition programe on gender and nutrition.

This paper explores pathways for making agriculture nutrition-sensitive through research and institutional mechanisms and for making nutrient-rich foods available and accessible to the nutritionally insecure segments of society. It advocates for the empowerment of women, the custodian of household food and nutrition security, through the dissemination of information on improved technologies, good agricultural practices, dietary diversification and nutrition literacy through formal and informal means. Essentially, there is a need to mainstream the gender in agri-food systems and policies to improve the nutritional outcomes for the individuals, households, communities and society.

On behalf of the Academy, I thank Dr A. K. Singh for organizing the brainstorming session to discuss technological, institutional, and policy options to strengthen the interface of gender, agriculture and nutrition. This document is an outcome of the deliberations in this session. I sincerely thank all who participated in the brainstorming session and provided valuable input and suggestions. My thanks are also due to the reviewers for their critical comments and to Drs P.S. Birthal and Malavika Dadlani for their editorial support in bringing the document into its present shape.



October 2022
New Delhi

(Trilochan Mohapatra)
President

Gender and Nutrition based Extension in Agriculture

1. INTRODUCTION

“For every child and young person everywhere, food is life – a fundamental right and a foundation of healthy nutrition and sound physical and mental development” (UNICEF 2019).

Malnutrition is a significant threat to India’s economic, social, and human development. Close to 36% of children below five years of age are underweight, 38% are stunted, and 21% are wasted (GoI, 2015-16). Besides, every second child is anemic. The problem of malnutrition is equally severe among women, the custodian of household food and nutrition security. More than half of the women aged between 15-49 years suffer from anemia, and 22.9% from chronic energy deficiency.

Food production and processing technologies have considerable potential to overcome malnutrition and associated health problems. In the past five decades, fueled by technological change and massive investment in irrigation, infrastructure and institutions, food production in India increased tremendously, making it self-sufficient and even an exporter of several food commodities, including rice and wheat. In 2019-20, India produced 290 million tons of food grains, 192 million tons of vegetables, 188 million tonnes of fruits and 103 billion eggs, raising their per capita availability to their nutritionally-recommended dietary allowances. Despite such a massive increase in food supplies, the prevalence of malnutrition on such a large scale is a grave concern for policymakers.

Several factors can explain the prevalence of malnutrition amidst plenty of foods, but the inter- and intra-household distribution of food, differences in food preferences, and capacity to absorb nutrients merit greater attention. Food distribution may be unequal within a community due to the differences in income levels, purchasing power, and nutritional literacy. Eating too little or too much food, especially during the critical life stages of infancy, childhood, adolescence, pregnancy, and lactation, can cause harm to health and reduce labor productivity. Hence, an adequate and nutritious diet is needed throughout life (NIN, 2011).

Brinda et al. (2015) have shown that dietary diversity is positively associated with (i) higher incomes, more wealth, and larger farms; (ii) access to better diets resulting from crop and income diversification, and ownership of cows and buffaloes; (iii) awareness among households due to the presence of an educated adult member. For example, affecting an improvement in the body mass index (BMI) of adult women, dietary diversity and better surrounding environment (i.e., availability of the quality of drinking water, good sanitation, smoke-free cooking area and better access to healthcare facilities) are equally important.

Gender plays a catalytic role in ensuring the nutrition and health of the household members, especially children. The socially-differentiated roles of men and women interact with their respective biological functions and influence the nutrition of their own and their families and communities. Because of their productive, reproductive, economic and social functions, women have less time to attend to their own needs, including food and nutritional needs. Nonetheless, there are pieces of evidence that when women have control over resources and incomes, they contribute more to agricultural productivity and the nutritional outcomes of the children. Poor nutrition in early life reduces learning potential, increases reproductive and maternal health risks, and lowers work productivity and efficiency.

2. CONCEPTUAL FRAMEWORK

In food-insecure households, children and women are at greater risk of malnutrition. Malnutrition during pregnancy and breastfeeding triggers a cycle of deprivation, which results in low birth weight, child mortality, poor cognitive performance and low labor productivity (Anonymous, 2014). It is, thus, essential to gain insights into nutrition and health from a gender perspective. Women often suffer more from malnutrition and nutrient deficiencies, especially during menstruation and pregnancy. They cannot afford healthy diets and dietary practices to manage their nutrient requirements with limited resources.

Literature shows that family members have different food preferences, income levels and access to resources, and often along the gender line (Haddad et al. 1997; Quisumbing and Maluccio 2003). Such differences are more significant in agriculture. The men and women have different roles in managing natural resources, local organizations and external links. Several studies (e.g., McGuire and Popkin 1990; Levine et al. 2001) have highlighted the greater involvement of women in domestic chores and production agriculture. A review of the time allocation studies indicates that women and girls are more involved in time-intensive activities such as fetching fuel and water (World Bank, 2001).

Moreover, women's responsibilities for childcare and domestic chores create work pressures, affecting the proper use of resources at their disposal. Peterman et al. (2011) show lower agricultural productivity on female-owned plots and for female-headed households. This could be attributed to their having lower quality land, less access to fertilizer and other inputs, and less credit and extension support inputs. The men and women also have differential access to different types of assets. Dillon and Quiñones (2010) have noted that assets owned by women grow at a slower rate than the assets owned by men. In a recent review by FAO (2011a) it is stated that 'If women had the same access to productive resources as men, they could increase yields on their farms by 20–30%, raising total agricultural output in developing countries by 2.5–4%, which in turn can reduce the number of hungry people in the world by 12–17%'. Further, men and women farmers' crop choices may differ depending on whether they produce for home consumption or market. When producing partly or entirely for home consumption, they value different traits of the same crop (e.g., nutrient contents, tastes and cooking quality).

It is also seen that within the household — even if the family budget remains unchanged, women's ownership of assets may strengthen their negotiating ability in decisions, leading to a change in intra-household spending patterns (Agarwal 1994; Pitt et al., 2006; Deere and Twyman 2012). Although improvements in the household assets benefit all members, the resources in the hands of women can contribute to higher spending on children's health and nutrition (Lundberg and Pollak, 1993). Jumrani and Birthal (2015) report that although both men and women participate in animal husbandry, the addition of an illiterate female worker in the household leads to 7% more income. They also find a strong association between ownership of large ruminants and child nutrition status.

The discriminatory social institutions and their formal and informal laws and social norms and practices restrict women and girls from claiming their rights and access to empowerment opportunities and resources (OECD, 2014). Despite their vulnerability to malnutrition, women are in a unique position to contribute to improving the nutrition status of their families. They are responsible for the growing, purchasing, processing and preparing food for their families. However,

they have limited access to nutritional information and the ownership of resources such as land and equipment and finances essential for improving food production and nutritional outcomes. The gender matters, because the initiatives aimed at improving the nutritional outcomes are likely to meet limited success if they do not consider the socio-economic and biological differences between men and women. There is evidence that the projects which promote gender equality and empowerment of women significantly improve the nutrition and well-being of the households (Anonymous, 2014).

2.1 Nutrition: The Panacea for a Healthy Life

The availability and access to safe food are the cornerstones of nutritional security. Given the high burden of foodborne diseases, under-nutrition, micronutrient deficiencies, obesity, and non-communicable diseases (NCDs) like hypertension, diabetes and heart-related diseases, the importane of safe and diversified diets for a healthy life cannot be undermined. As high as196 million people in India are undernourished (FAO 2018), and 135 million are overweight or obese (Ahirwar and Mondal, 2019), making them vulnerable to several non-communicable diseases like high blood pressure, pulmonary malfunctions and diabetes. The number of cases of foodborne illnesses is projected to rise to between 150 – 177 million by 2030 (Anonymous, 2017), meaning that these would have a direct impact on individuals' capacity to absorb nutrients and fight against diseases.

Biofortified and fortified foods can alleviate malnutrition problems. The cost-benefit analysis of food fortification by Hoddinott, Rosegrant and Torero (2012) showed that iodizing salt costs as little as US$ 0.05 and the fortification of wheat and maize with iron and folic acid US$ 0.12 per annum per person. The lifetime cost for such fortified commodities is less than US$ 15 per person, and it can generate hefty returns of more than US$ 26 in terms of increased labor productivity and health care savings. Every dollar spent on fortification returns US$ 9 to the economy. In the case of biofortification, the benefits are even more significant —US$ 17 for every US$ spent (Spohrer et al., 2013).

In addition, the current food production and consumption practices threaten the environment and the future of the planet. Food production is responsible for 30% of the global greenhouse gas emissions and food waste for 6.7% (FAO 2011b).

Figure 1. Unsafe food and India's public health burden

Source: World Health Organization (2019), Wageningen University & Research and ILRI (2017)

2.2 Agriculture and Nutrition

Making agriculture nutrition-sensitive is considered the best option to ensure nutritional security and overcome health problems due to nutrient deficiencies. The nutrition-sensitive agriculture (NSA) is

a food-based approach putting nutritionally rich foods, dietary diversity, and food fortification at the centre of agricultural development (FAO, 2014).

Kadiyala et al. (2014) have systematically demonstrated an agriculture-nutrition pathway envisaging that agriculture does not provide nutrition alone; it is a source of income for expending on food and non-food items. At the same time, the involvement of women in agricultural and intra-household decisions, their responsibilities of childcare and domestic upkeep, and maternal health and nutrition are intricately linked. Ruel and Alderman (2013) have reported that women's empowerment through participation in agriculture is an important pathway through which agricultural interventions can impact the nutritional status of their own and their families.

Often, the agricultural schemes emphasize ensuring food security ignoring its nutritional aspects (Holla and Ittyerah, 2018). Nonetheless, such projects have a significant impact on the nutritional status of farm families, whose nutritional status is already weak. On the other hand, rising food prices may compel families to reduce their protein consumption and micronutrients from fresh foods, pulses, eggs, milk, vegetables, and fruits.

3. POTENTIAL PATHWAYS FOR NUTRITION-SMART INDIA

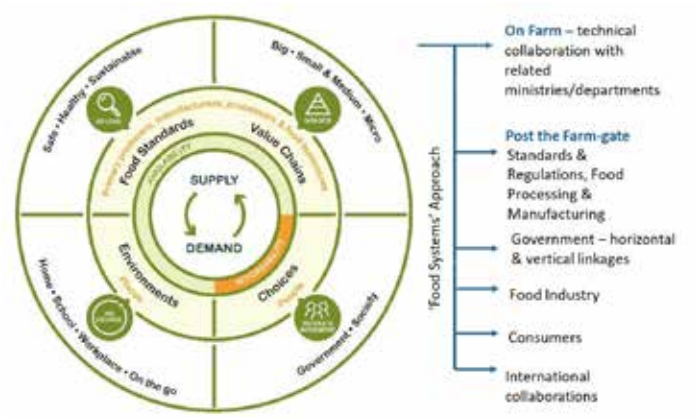
3.1 Food Systems Approach: A holistic approach is required to address the challenges of unsafe foods and poor diets. The food systems approach encompasses the production, storage, transport, processing and sale of foods and consumer preferences.

The issues of food safety, nutrition, and food security are inextricably linked and connected with the overall food ecosystem comprising food supplies, transportation and retail marketing and consumption and demand. It also involves trade, subsidies, price volatility, technological innovations, food safety and food waste. These are linked directly or indirectly to the sustainable development goals (SDGs), especially those related to ending hunger and poverty and promoting good health and well-being.

The determinants of safe food and healthy diets need a systematic investigation and need to be understood to ensure that the food system serves its prime function of promoting dietary diversity through crop diversification and deploying environmentally safe production techniques. As climate change threatens crop production and its quality, there is a need to develop food system resilience through climate-smart agriculture.

3.2 Eat Right India Movement: Inspired by the objectives of preventive and promotive healthcare of the National Health Policy 2017 and the flagship programs like *Ayushman Bharat*, *POSHAN Abhiyaan* and *Swachh Bharat Mission*, the Food Safety and Standards Authority of India (FSSAI) has embarked on transforming the food system to provide safe and healthy food via the 'Eat Right India Movement'. The movement is based on three pillars: (i) *Eat safe:* ensuring personal and surrounding hygiene, hygienic and sanitary practices through the food supply chain, combating adulteration, reducing toxins and contaminants in food and controlling food hazards in processing and manufacturing processes; (ii) *Eat healthy:* promoting diet diversity and balanced diets, eliminating toxic industrial trans-fats from food, reducing consumption of salt, sugar and saturated fats and promoting large-scale fortification of staples; and (iii) *Eat sustainable:* promote local and seasonal foods, prevent food loss and food waste, conserve water along food value chains, reduce the use of chemicals and use of safe and sustainable packaging.

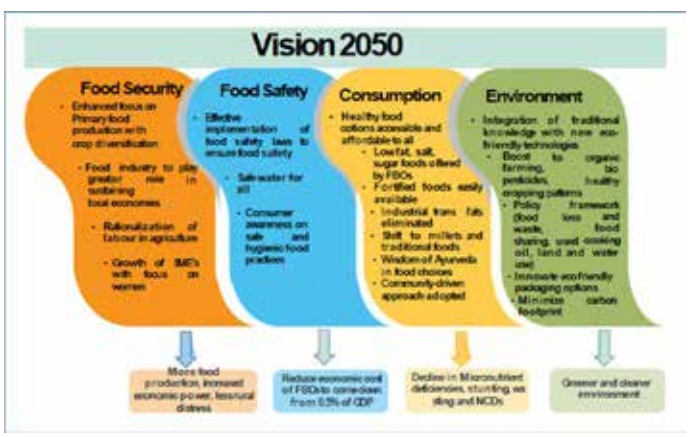
Figure 2. Food system approach



Source: FAO (2018)

3.3 *Whole of Government Approach*: A 'Whole of Government' approach is essential to realize the vision of a nutrition-smart India. Many of the actions required depend on the synergies in developing programs and their implementation by different Ministries, for example, the Ministry of Women and Child Development, the Ministry of Food Processing Industries, and the Ministry of Agriculture. There is a need for strong leadership, shared multi-stakeholder spaces and value chains focusing on delivering nutritious foods. (AESA, 2020). To align the agenda of different Ministries to achieving health, wellbeing, social and economic development for all, all such Ministries must come on a common platform, determine common goals and strategies and synergize the actions accordingly.

Figure 3. Futuristic vision: A roadmap



Source: Ministry of Health & Family Welfare, GoI

4. ROLE OF EXTENSION IN ADDRESSING MALNUTRITION

A multi-agency extension approach can address the problems of hunger and malnutrition by enhancing the capacities of the public and private sectors in marketing extension through extensive use of the media, internet and IT in the dissemination of information and technologies

to farmers, especially women farmers. The farmer-to-farmer extension is an important means for disseminating knowledge, technologies, and innovations. The potential of such social networks needs to be harnessed to improve linkages between agriculture and nutrition.

Essential steps to building up a knowledge base include investments in research, education and extension. The National Commission on Farmers (2007) mentioned that the yield and knowledge gaps in the prevailing technology could be bridged through extension. The scope of extension becomes broader, covering all aspects of farming, from seed to market and beyond, including processing, marketing and storage.

4.1 Extension Approaches

Farmer-led extension: Women play a crucial role in agriculture. However, women farmers lack a voice in research and extension priorities. Farmer-led extension by organizing farm women into Self Help Groups (SHGs), Farmer Interest Groups (FIGs), Commodity Associations (CAs) and Farmer Organizations (FOs) may help them raise their concerns regarding technology and information needs.

Women empowerment and education: More than three-fourths of rural women are engaged in agriculture and allied activities, and they are more efficient in raising agricultural productivity than men. There is evidence that women's employment does have a beneficial effect on household nutrition. Strengthening women's roles in agriculture and household decisions can significantly improve the nutritional and health outcomes.

Use of information and communication technology (ICT): Creating awareness about nutrition, nutrition-related health problems, and the need for a diversified diet is essential for effecting changes in the dietary habits of individuals and, accordingly, the awareness of crop choices and production practices. Towards this, ICT can play an important role.

***Farming systems approach*:** A farming system approach considers farms, households and off-farm activities in a manner that helps farmers to achieve the multiple goals of food and nutrition security, sustainability of agriculture, risk management, higher income and employment. Often, the integrated farms are more remunerative, engage more labor, provide an adequate and diversified diet, and are more resilient to climatic shocks than individual agricultural enterprises.

Extension services can motivate farmers to diversify their product portfolio towards livestock, poultry, fishery, fruits and vegetables that generate more income and are also rich in several micronutrients essential for a healthy life.

Collective approach: To protect small and marginal farmers from market and price risks, collective marketing through SHGs, cooperatives and contracts can be relied upon. Through collective actions, farmers can increase their bargaining power, realize economies of scale, and reduce transaction costs, resulting in higher profits and better nutritional outcomes.

Promoting nutrition as a development priority among a wide range of stakeholders creates openings for action and sustained attention to nutrition (Garret and Natalicchio, 2011). The extension system should respond to the technological needs of both men and women and disseminate gender-appropriate and nutrition-enhancing technologies. There is a need to scale the proven mechanisms for delivering improved extension advisory services to women farmers. Conservation and sustainable use of biodiversity and harnessing ecosystem services are also crucial for improving nutrients in food. A toolkit of nutrition knowledge and technologies should be designed specifically for women.

Extension advisory services can be complemented by other delivery channels at the local level.

Extension professionals need to acquaint themselves with the local organizations and knowledge systems regarding crop choices, nutrition-sensitive agricultural practices, dietary diversity (e.g. through home gardens, small-scale livestock, or promotion of high-nutrient varieties) and social safety nets.

The role of extension should not only limit to the dissemination of technologies and information. It must go beyond to sensitize the people regarding the nutritional benefits of diverse dietary practices and healthy lifestyles and introduce social and behavioural changes among communities. This means reskilling and retooling the extension services and engaging youth and women to act as change agents.

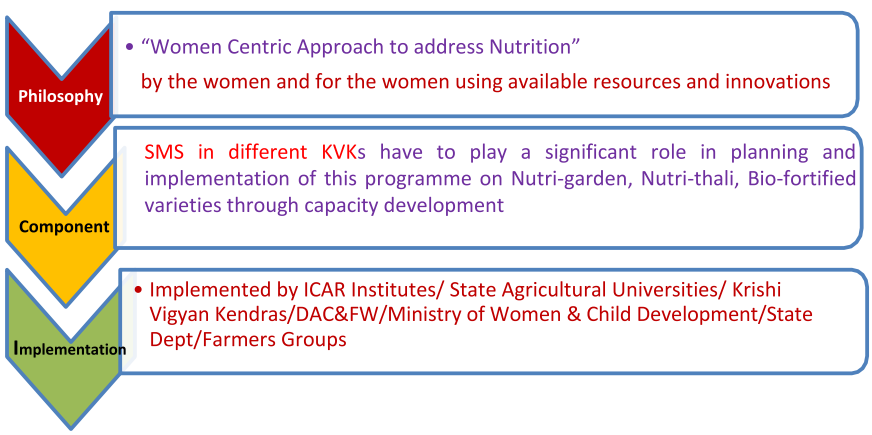
4.2 ICAR Initiatives

The Indian Council of Agricultural Research has been addressing the issues of women's nutrition through a systematically planned program called 'Nutri-sensitive Agricultural Resources and Innovation (NARI)'. This program follows a food-based approach that puts the nutrition-rich food crops, dietary diversity and food fortification at the centre of agricultural development. The main objectives of the NARI are:

- To promote Nutri-sensitive agriculture, create awareness among farm women and youth about Nutri-sensitive agriculture, Nutri-gardens, Nutri-thalis, etc.
- To impart training to Anganwadi workers (mostly women) on Nutri-gardens, cultivation of biofortified crop varieties and millets, and preparation of recipes for Nutri-thalis.
- To establish Nutri-gardens, including on the terrace, especially in urban areas.
- To conduct demonstrations on farmers' fields on biofortified crop varieties and millets.
- To map nutritional status at the district level and finalize district-specific Nutri-thalis.

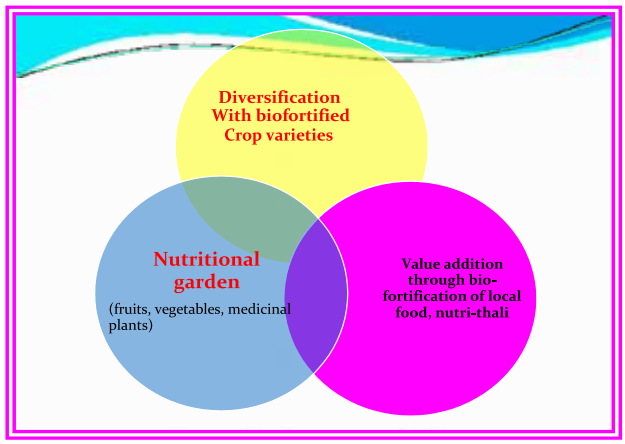
NARI aims to promote family farms for family nutrition through the need-based skill development of women and youth, including school students, creating awareness about fortification of local foods and dietary diversity, designing Nutri-thalis and establishing Nutri-smart villages. Krishi Vigyan Kendras (KVKs) have evolved location-specific Nutri-garden models to ensure access to healthy and diversified diets. Peri-urban terrace gardening is also promoted but to a limited extent. The emphasis is given to popularising biofortified varieties of cereals, millets, pulses and oilseeds.

Figure 4: Conceptual framework of NARI



NARI is implemented through 724 KVKs. A nutrition campaign involving 60000 Anganwadi workers and farm women was organized in 2020, and the *Poshan Maah* was observed in September 2020.

Figure 5: Operational paradigm of nutri-sensitive extension approach



5. INTEGRATING NUTRITION-RICH TECHNOLOGIES WITH GOVERNMENT SCHEMES

Several government schemes are in vogue, aiming to alleviate the problems of nutritional insecurity or improve women and children's nutritional status. These schemes can be integrated with extension education. Given that gender participation in farming is skewed toward women, ICAR has been addressing issues of nutrition through the NARI, as discussed previously. Some state governments have been addressing these issues by implementing such schemes. The Participatory Learning and Action – Linking Agriculture to Nutrition and Natural Resources (PLA-LANN) in Odisha and 'Reliance Nutrition Gardens' (RNGs) in Maharashtra are notable schemes that aim at improving dietary diversity and nutritional outcomes through innovative strategies including community meetings, group counselling, individual home visits to target groups, and supply of garden inputs (seeds). The 'Half Acre Model' of Telangana aims to help women farmers to meet their nutritional requirements from vegetables. This model follows a staggered production design and handling to ensure round the year availability of vegetables for home consumption and market.

Extension education is an important factor in agricultural development. The extension efforts ought to be bottom-up, emphasizing two-way communication and feedback. However, the current extension system is the opposite of this. Using ICT and digital platforms in extension education can save time and resources. ICT is inevitable for exploiting food and culinary diversity and promoting nutritious and biofortified foods.

From a nutrition perspective, the women deserve greater attention as it is they who plan, cook, and serve food to family members according to the seasons and situations. Moreover, they are the custodian of traditional nutritional diversity who know what, how and when to have the most appropriate food systems.

Milk: Milk is one of the best foods to address malnutrition among marginalized populations. The per capita milk availability is currently 427 gm/day against the ICMR recommended 280 gm/person/day intake.

Details of Nutritional Programs in India

Nutritional program	Main objectives
POSHAN Abhiyan	Reduce the prevalence of malnutrition among children under six years of age, adolescent girls and pregnant and lactating women by 2022
Integrated Child Development Service Scheme (ICDS)	Supplementary nutrition, immunization, health check-ups, referral services, treatment of minor illnesses, preschool education to children aged 3-6 years
Mid-day Meal Scheme (MDM)	Supply free lunches on working days for children in primary and upper primary classes in government and government-aided schools.
Supplementary Nutrition Programs (SNP)	Provide supplementary nutrition and health care services, including supply of vitamin A solution and iron and folic acid tablets to preschool children, and pregnant and lactating mothers of poor groups in urban slums and tribal areas
Applied Nutrition Programs (ANP)	Strive to make people conscious of their nutritional needs and to provide supplementary nutrition to children aged between 3-6 years and to pregnant and lactating mothers
Balwadi Nutritional Programs (BNP)	Supply about one-third of the calorie and half of the protein requirements of preschool children between the age of 3-5 years to improve their nutritional status
National Goiter Control Programme (NGCP)	In 1982, the government made a policy decision to iodate edible salt in India by 1992
Public Distribution System (PDS)	Offers food and non-food items like wheat, rice, salt, pulses, spices, and kerosene oil to the poor at a subsidized prices

- Consumption of milk during the first 1000 days of a child from conception is essential for proper nutrition and to minimize the risk of syndrome X diseases (diabetes, hypertension, and dyslipidemia).
- There should be proper education of village adolescent girls through awareness campaigns in schools/colleges.
- There should be proper communication, especially among uneducated and folk mothers and pregnant women. There is a direct correlation between a mother's education and children's nutrition outcomes.
- The Central and State Governments are implementing about 15 programs to address the nutritional security of pregnant and lactating mothers and children from 0-6 years of age.

Biofortified crops: As many as 72 biofortified varieties of different crops are available for cultivation. The experiences of ICAR-IARI, New Delhi in Baghpat (Uttar Pradesh) confirm the readiness of farmers and farm women to adopt biofortified crop varieties and millets. The technology for isolating gluten from wheat and mixing it with *bajra* flour to make it more palatable and easier to prepare *bajra chapatti* needs attention. Farmers growing biofortified crop varieties should receive incentives to trigger their wider adoption.

Preferential clustering: Regarding millets, there is a need for preferential clustering and predictive mapping so that these can be integrated and mainstreamed into the food systems. The following options need attention:

- Mapping clusters for different millets and ensuring their procurement by the government agencies.
- Capacity development of SHGs for processing and value addition of millets and millets-based products.
- Panchayat can play a role in mobilizing stakeholders for such interventions.

Fish farming: Aquatic products are the future sources of nutrition. Experiences have shown that the inclusion of fortified fish products in the diets improves the nutritional status of the target populations. The following options may be considered:

- Engage SHGs to take up entrepreneurship through business incubation programs to promote fish-based processed food products.
- Besides fish meat, other fish parts should be used to produce processed products.
- Seaweeds are a good source of nutrition for vegetarians.

The Village Knowledge Centre Model and Plant Clinic Doctors Program of the MSSRF have successfully created awareness among the rural population about nutritious foods and healthy diets. There is a need to develop a pathway for growing nutrient-dense food crops. Nutrition concerns should guide the selection of crops for different farming systems at a location. Further, address the training needs of the communities in good nutrition practices.

6. GENDER-NEUTRAL EXTENSION

Gender is an outcome of the social environment embedded in the food systems. The term 'gender' is often viewed in a narrow sense. It is rather a connotation of social attribution instead of biological features and is often interchangeably used for man and woman.

Food and nutrition security has four pillars: availability, accessibility, utilization, and stability. From a nutritional perspective, the utilization of food is the most important. While, most government schemes focus on food availability and accessibility, ignoring its utilization.

Concerns on gender and nutrition: Do women have less access to food? The answer could be affirmative. Undernourishment and over-nutrition can be addressed by judiciously combining vegetables, pulses, millets, fruits etc., in foods. The traditional processing protocols need to be women-centric nutritional education involving ANM, *Aanganwadi*, ASHA and other frontline workers. ICT can prove a handy tool in spreading nutritional information at a larger scale with little time and cost. However, it is important to acknowledge the digital divide. Impoverished women have little access to gadgets and lack digital literacy. Mass media involving radio and television can still play an important role.

Gender-neutral extension: Compared to men, women have less access to resources, finances, information, technologies and food safety nets, while they are more efficient in improving agricultural productivity. It is, therefore, essential to revisit agricultural development, social safety and extension programs and restructure these to reduce gender disparity.

The Central Institute for Women in Agriculture at Bhubneshwar, Odisha, through its grassroots level studies, has pointed out that despite women's significant role in farming, the perceptible gender disparity, segregation and biases remain; hence the agricultural development efforts have not been translated into food and nutritional security for women. The missing link between agriculture and nutrition envisages identifying critical gender gaps in nutrition and accordingly designing and

developing gender-appropriate and gender-responsive programs. The strategy should include (i) a food-based approach for promoting the cultivation of nutrient-rich crops and evolving value chains from farm to fork and (ii) a non-food based approach addressing gender issues and social dimensions. The women members of SHGs may be persuaded to cultivate seasonal vegetables in their homesteads or gardens. Over 59 lakhs of such Nutri-gardens have been established.

Government programs: Targeting women through collectives can be an effective mechanism to address women's empowerment issues. A collective approach should be at the centre of the strategy; for example, the Ministry of Rural Development aims to empower women by creating 69 lakh SHGs involving 7.5 crore households.

There are many other success stories. Supporting smallholder farmers with Rs 1-2 lakh/family for developing nutrition gardens at the village level in Himachal Pradesh offers considerable scope for replication in other states. Likewise, establishing 56 Nutri-smart villages in Madhya Pradesh and Chhattisgarh through the partnership of state governments and KVKs is another way of scaling up nutri-sensitive agriculture. The innovative concept of 'ÄpniKyari, ApniThali' in Bihar through small kitchen gardens merits attention for its replication and scaling up.

7. RECOMMENDATIONS

Nutrition-sensitive agriculture and extension services play an essential role in producing diverse, safe and nutrient-rich foods; sustainable intensification of agriculture, output handling, storage and processing; and nutrition education for gender equality. The main recommendations that emerged from the deliberation in the brainstorming session are as follows:

Invest in crop biofortification: Biofortification is one of the most appropriate means of combating malnutrition naturally and cost-effectively. The potential for plant breeding for nutrients, including micronutrients in cereals, legumes and tubers through biofortification, has already been established. There is a need for scaling up investment in biofortification research.

Strengthen traditional food system and indigenous recipes: The conventional food system identifies all foods grown using local natural resources and encompasses their acquisition, processing, and utilization. However, due to the delocalization of the food supply, indigenous food processing and distribution technologies are disappearing. There is a need to strengthen traditional food systems and indigenous recipes targeting improve nutritional outcomes.

Promote gender inclusive agriculture: The sustainable development goals aim at promoting gender equality and empowering women. Inclusivity in agriculture can be achieved by embedding gender dimensions in agricultural development programs. For example, Bill & Melinda Gates Foundation's inclusive agricultural strategy lists the goals for the gains in men and women smallholder farmers' productivity and incomes and the goals for nutrition and women's empowerment.

Encourage dietary diversity: Dietary diversity has been identified as a key element of high-quality diets. Educating rural people, especially farm women and mothers, about dietary diversity, nutrition requirements, and culinary methods will ensure better nutrition, including integrating all three major food groups.

Evolve a food pyramid: The "Food Guide Pyramid" or "Eating Right Pyramid" was recognized by the USDA in 1992 to suggest that a person eat more foods from the bottom of the pyramid and fewer foods and beverages from the top. It was updated in 2005 to "MyPyramid" and then replaced by "MyPlate" in 2011 to include more products, especially milk and eggs, in the food pyramid.

Similarly, the Asian Food Guide Pyramid was developed in 2000 by Oldways Preservation and Exchange Trust. A vegetarian Food Guide Pyramid was developed by Loma Linda University in 2016, followed by a vegetarian MyPlate and a vegetarian version of the MyPyramid. There is a need to evolve such a food map or guide for the Indian population.

Improve nutrition literacy: Creating awareness about nutritional and health outcomes of the balanced and dietary diversification, especially among women and school children, should comprise the core of the nutritional programs. A child can significantly influence the food preferences of the family members. Hence, there is a need for an aggressive awareness campaign on the importance of nutrition, dietary diversification, cleanliness and sanitation and the nutrient-rich crops and their cultivation practices. These issues must be included in the school curriculum.

Likewise, existing nutritional programs such as Anganwadi should be utilized to create awareness among women about the importance of nutrition. Anganwadi and ASHA workers need to be trained in nutrition and health through a regular interface with them, and they should be utilized to disseminate nutritional knowledge (including on Nutri gardens and Nutri thali) to others in the society. Nutrition literacy, thus, can have a multiplier effect on the nutritional outcomes.

Capacity building of extension workers: Extension workers need to understand the relationship between agriculture and nutrition. They should be able to (i) define a food system; (ii) describe their role in the food system; (iii) understand how nutrition is influenced by the food system functions; (iv) under gender issues; (v) identify value chains; (vi) address how the proposed actions may limit or facilitate nutrition-sensitive extension, and understand the extension requirements of women.

Enhance partnerships and collaborations: Besides the extension system, several government, non-government and civil society organizations food industry and financial institutions are engaged in addressing nutritional issues. The agricultural extension system must work together with these organizations to achieve the desired objectives of improving human health and livelihood. There is a need for a multi-sectoral project realigning agriculture to improve nutrition through coordination committees at different administrative levels.

> "If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."
>
> —Hippocrates (Greek physician, 460 –370 BC.

REFERENCES

AESA. (2020) Consultative Workshop on learning needs assessment for nutrition-sensitive agriculture in India: Integrating Nutrition Objectives into Agricultural Extension Programmes and Policies 3 January 2020, Hyderabad, Telangana, India (September 2020)https://www.aesanetwork.org/wp-content/uploads/2020/10/learning-needs-assessment-for-nutrition-sensitive-agriculture-in-india.pdf

Agarwal B. (1994). A field of one's own: Gender and land rights in south Asia. Cambridge: Cambridge University Press.

Ahirwar R. & Mondal P.R. (2019) Prevalence of obesity in India: A systematic review. Diabetes & Metabolic Syndrome, 13 (1), 318-321.

Anonymous. (2014) http://www.fao.org/gender.

Brinda V., David G., Vepa P. & Bhavani R.V. (2015) Dietary Diversity and Women's BMI among Farm Households in Rural India. LANSA Working Paper Series 03, p.35.

Dillon A. & Quiñones E. (2010) Asset Dynamics in Northern Nigeria, Discussion Paper 1049. International Food Policy Research Institute, Washington, DC.

FAO . (2000) The State of Food Insecurity in the World. FAO, Rome, Italy.

FAO . (2011a). *State of Food and Agriculture. Women and Agriculture: Closing the Gender Gap for Development*. Rome: Food and Agriculture Organization of the United Nations.

FAO. (2011b) Food Wastage Footprint & Climate Change, FAO, Rome, Italy.

FAO. (2014) Second International Conference on Nutrition (ICN2). 19-21 November. FAO, Rome, Italy.

FAO. (2018) Chronic Hungry: State of Food Security and Nutrition in the World. FAO, Rome, Italy.

Garrett J., & Natalicchio M. (2011) Working Multisectorally in Nutrition: Principles, Practices and Case Studies. International Food Policy Research Institute, Washington DC.

GFRAS (2018). Nutrition-Sensitive Extension. Global Forum for Rural Advisory Services, Lindau, Switzerland.

Haddad L., Hoddinott J., & Alderman H. (1997) Intrahousehold Resource Allocation in Developing Countries: Methods, Models, and Policy. Johns Hopkins University Press for the International Food Policy Research Institute, Baltimore.

Hoddinott, J., Rosegrant, M., & Torero, M. (2012) Investments to Reduce Hunger and Undernutrition. Working Paper, Copenhagen Consensus Center, Copenhagen, Denmark.

Holla R. & Ittyerah A. C. (2018) Agricultural crisis in India and its impact on nutrition. World Nutrition 9(3):292-313.

Jumrani, J. & Birthal, P.S. (2015) Livestock, women, and child nutrition in rural India. Agricultural Economics Research Review 28(2): 223-246.

Levine J.A., Weisell R., Chevassus S., Martinez C.D., Burlingame B., & Coward W.A. (2001) The work burden of women. Science 294:812.

Lundberg S., & Pollak, R. (1993) Separate spheres bargaining and the marriage market. Journal of Political Economy 101(6):988-1010.

McGuire J., & Popkin B. (1990) Helping Women Improve Nutrition in the Developing World: Beating the Zero Sum Game. World Bank Technical Paper No. 114., World Bank, Washington, DC.

NIN. (2011) https://www.nin.res.in/downloads/DietaryGuidelinesforNINwebsite.pdf.

OECD. (2014) Gender, Institutions and Development Database. OECD Publishing, Paris, http://stats.oecd.org .

Peterman A., Quisumbing A.R., Behrman J. & Nkonya E. (2011) Understanding the complexities surrounding gender differences in agricultural productivity in Nigeria and Uganda. Journal of Development Studies 47(10):1482–1509.

Pitt M., Khandker S., & Cartwright J. (2006). Empowering women with micro finance: Evidence from Bangladesh. Economic Development and Cultural Change 54(4):791- 831.

Quisumbing A.R. & Maluccio J. (2003) Resources at marriage and intrahousehold allocation: evidence from Bangladesh, Ethiopia, Indonesia, and South Africa. Oxford Bulletin of Economics and Statistics 65(3):283–328.

Kadiyala S., Harris J., Headey D., Yosef S., & Gillespie S. (2014) Agriculture and nutrition in India: mapping evidence to pathways. Annals of New York Academy of Science 1331: 43–56.

Verma S. & Kumar A. (2019) Biofortified Staples May Hold the Key to India's Rural Malnutrition. IFPRI Issue Post.

World Bank. (2001) Engendering Development through Gender Equality in Rights, Resources, and Voice . World Bank Policy Research Report No. 36546-MW. World Bank, Washington, DC.

LIST OF PARTICIPANTS

1. Dr Trilochan Mohapatra, President, National Academy of Agricultural Sciences, New Delhi
2. Dr Jagdish Katyal, Vice President, National Academy of Agricultural Sciences, New Delhi
3. Dr P.K. Joshi, Secretary, National Academy of Agricultural Sciences, New Delhi
4. Dr Malavika Dadlani, Editor, National Academy of Agricultural Sciences, New Delhi
5. Dr Ashok K. Singh, Deputy Director General (AE), Indian Council of Agricultural Research, New Delhi
6. Prof. (Dr) A. K. Srivastava, Member, Agricultural Scientists Recruitment Board, New Delhi
7. Dr Muzna Alvi, Research Fellow, International Food Policy Research Institute, New Delhi
8. Dr Anuradha, Senior Research Fellow, ICAR-Agricultural Technology Application Research Institute, Zone-II, Jodhpur
9. Dr Deepali Bajpai, Scientist, JNKVV, Directorate of Extension Services, Krishinagar
10. Dr Jaya Bangale, Professor (CAS), Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani
11. Dr Debabrata Basu, Professor, Bidhan Chandra Krishi Viswavidyalaya, West Bengal
12. Dr Rakesh Bhardwaj, Principal Scientist, National Bureau of Plant Genetic Resources, Karnal
13. Dr Venkatesh Bhat, Principal Scientist, ICAR-Indian Institute of Millets Research, Hyderabad
14. Dr Rajarshi Roy Burman, Principal Scientist, ICAR-Indian Agricultural Research Institute, New Delhi
15. Dr Lipi Das, Principal Scientist (Agril. Extension), ICAR-Central Institute for Women in Agriculture, Bhubaneswar
16. Dr P. Das, Former DDG Ag Extension, Indian Council of Agricultural Research, New Delhi
17. Dr Pranati Das, HOD and Professor, Assam Agricultural University, Jorhat
18. Dr S. Sucharitha Devi, Associate Professor, PJTSAU, Hyderabad
19. Dr Chitrotpala Devidarshini, Assistant Professor, OUAT, Bhubaneswar
20. Dr Ravinder Kaur Dhaliwal, Director Students' Welfare, Punjab Agricultural University, Ludhiana
21. Manjula D. Ghoora, Nutrihub, ICAR-Indian Institute of Millets Research, Hyderabad
22. Dr Shantanu Kumar Dubey, Principal Scientist (Agril.Extn.), ICAR-Agricultural Technology Application Research Institute, Kanpur
23. Dr Anuradha Dutta, Professor, GBPUAT, Pantnagar
24. Dr Naresh Girdhar, Principal Scientist, Indian Council of Agricultural Research HQ, New Delhi
25. Dr R. Gopinath, Senior Scientist, MS Swaminathan Research Foundation, Chennai
26. Dr M.J. Chandre Gowda, Director, ICAR-Agricultural Technology Application Research Institute, Zone-XI, Bengaluru
27. Dr Jiju P., Director of Extension, Kerala Agricultural University, Kerala
28. Dr B.L. Jangid, Principal Scientist (AE), ICAR-Agricultural Technology Application Research Institute, Zone-II, Jodhpur
29. Dr Diptimayee Jena, Associate Professor, OUAT, Bhubaneswar
30. Dr Kandeeban M, ICAR-Indian Institute of Millets Research, Hyderabad

31. Dr Kiran Kokate, Former Deputy Director General (Agril. Extn), Indian Council of Agricultural Research, New Delhi
32. Dr Anjani Kumar, Director, ICAR-Agricultural Technology Application Research Institute, Patna
33. Dr Keshav Kumar, Principal Scientist (AE), Indian Council of Agricultural Research HQ, New Delhi
34. Dr Preeti Mamgai, Principal Scientist, ICAR-Agricultural Technology Application Research Institute, Ludhiana
35. Dr M.S. Meena, Principal Scientist (Agricultural Extension), ICAR-Agricultural Technology Application Research Institute, Zone-II, Jodhpur
36. Dr Purnima Menon, Senior Research Fellow, International Food Policy Research Institute, New Delhi
37. Dr Sabita Mishra, Principal Scientist, ICAR-Central Institute for Women in Agriculture, Bhubaneswar
38. Dr Dipak Nath, Senior Scientist cum Head I/C, Krishi Vigyan Kendra, Khowai
39. Dr Jyoti Nayak, Principal Scientist, ICAR-Central Institute for Women in Agriculture, Bhubaneswar
40. Dr Archana Pandey, Senior Scientist, JNKVV, Jabalpur
41. Dr Adhiguru Poovaragavalu, Principal Scientist(Agricultural Extension), ICAR-Indian Agricultural Research Institute, KAB-I, New Delhi
42. Dr J.V. Prasad, Pr. Scientist, ICAR-Agricultural Technology Application Research Institute, Hyderabad
43. Dr Kalyani Raghunathan, Research Fellow, International Food Policy Research Institute, New Delhi
44. Dr Rita Singh Raghuvanshi, Professor & Dean, GBPUAT, Pantnagar
45. Dr Prema Ramachanan, Director, Nutrition Foundation of India, New Delhi
46. Dr Dayakar Rao, Principal Scientist, ICAR-Indian Institute of Millets Research, Hyderabad
47. Dr Ved Ratan, Dean Home Science, CSAUA&T, Kanpur
48. Dr C.N. Ravishankar, Director, ICAR-Central Institute of Fisheries Technology, Cochin
49. Dr Subrata Kumar Roy, Principal Scientist, ICAR-Agricultural Technology Application Research Institute, Zone-V, Kolkata
50. Dr V.V. Sadamate, Former Adviser, Agriculture, Planning Commission and Member NCCSD
51. Dr Uma Sah, Principal Scientist (A.E.), ICAR-Indian Institute of Pulses Research, Kanpur
52. Dr Shalini Sehgal, Associate Professor, Department of Food Technology, Bhaskaracharya College of Applied Sciences, New Delhi
53. Dr A.K. Singh, Director, ICAR-Indian Agricultural Research Institute, New Delhi
54. Dr Archana Singh, Assistant Professor, CSAUA&T, Kanpur
55. Dr Atar Singh, Director, ICAR-Agricultural Technology Application Research Institute, Zone-IV, Kanpur
56. Dr Charanjit Singh, Principal Scientist (Agril.Extn.), ICAR-Agricultural Technology Application Research Institute, Zone-III, Umiam
57. Dr Lakhan Singh, Director, ICAR-Agricultural Technology Application Research Institute, Zone-VIII, Pune

58. Dr Raghwendra Singh, Principal Scientist, ICAR-Agricultural Technology Application Research Institute, Kanpur
59. Dr Rajbir Singh, Director, ICAR-Agricultural Technology Application Research Institute, Zone-I, Ludhiana
60. Dr Randhir Singh, ADG (AE), Indian Council of Agricultural Research, New Delhi
61. Dr Ranjay K Singh, Principal Scientist, National Bureau of Plant Genetic Resources, Karnal
62. Dr Rashmi Singh, Assistant Professor, CSAUA&T, Kanpur
63. Dr S.R.K. Singh, Director, ICAR-Agricultural Technology Application Research Institute, Jabalpur
64. Dr Usha Singh, Professor, Deptt. of Food & Nutrition, Deptt. of Food & Nutrition, Dr. Rajendra Prasad Central Agricultural University, Samastipur
65. Dr Vinita Singh, SMS, Krishi Vigyan Kendra, Sagar
66. Dr A.K. Singha, Principal Scientist (AE), ICAR-Agricultural Technology Application Research Institute, Zone-VII, Umiam
67. Dr Jyoti Sinha, Programme Co-ordinator, Krishi Vigyan Kendra, Nalanda
68. Dr Ravindra Kumar Sohane, Director Education Extension, Bihar Agricultural University, Sabour
69. Dr Seema Sonkar, Co-PI, Post-Harvest Plus Component, CSAUA&T, Kanpur
70. Dr T. Supraja, Scientist, PJTSAU, Rajendranagar, Hyderabad
71. Dr Pratibha Tiwari, Head, Division of Transfer of Technology and Training, ICAR-Central Arid Zone Research Institute, Jodhpur
72. Dr Prof. Mamta Tiwari, Director, PM&E, Agricultural University Kota,
73. Dr Vilas A. Tonapi, Director, Indian Institute of Millets Research, Hyderabad
74. Dr A.K. Tripathi, Director, ICAR-Agricultural Technology Application Research Institute, Umiam
75. Dr Anil Kumar Tripathi, Director, ICAR-Agricultural Technology Application Research Institute, Zone-VI, Guwahati
76. Dr Priya Vashishtha, Scientist, Krishi Vigyan Kendra, Hardoi
77. Dr Sangeetha Vellaichamy, Scientist, ICAR-Indian Agricultural Research Institute, New Delhi
78. Dr Neelu Vishwakarma, Scientist, Krishi Vigyan Kendra, Jabalpur
79. Dr. Veeresh Wali, ICAR-Indian Institute of Millets Research, Hyderabad

Note: The designations and affiliations of the participants are as on date of BSS

65.	Climate Resilient Agriculture in India	2014
66.	Role of Millets in Nutritional Security of India	2014
67.	Urban and Peri-urban Agriculture	2014
68.	Efficient Utilization of Phosphorus	2014
69.	Carbon Economy in Indian Agriculture	2014
70.	MOOC for Capacity Building in Indian Agriculture: Opportunities and Challenges	2014
71.	Role of Root Endophytes in Agricultural Productivity	2014
72.	Bioinformatics in Agriculture: Way Forward	2014
73.	Monitoring and Evaluation of Agricultural Research, Education and Extension for Development (AREE4D)	2014
74.	Biodrainage: An Eco-friendly Tool for Combating Waterlogging	2015
75.	Linking Farmers with Markets for Inclusive Growth in Indian Agriculture	2015
76.	Bio-fuels to Power Indian Agriculture	2015
77.	Aquaculture Certification in India: Criteria and Implementation Plan	2015
78.	Reservoir Fisheries Development in India: Management and Policy Options	2016
79.	Integration of Medicinal and Aromatic Crop Cultivation and value Chain Management for Small Farmers	2016
80.	Augmenting forage Resources in Rural India: Policy Issues and Strategies	2016
81.	Climate Resilient Livestock Production	2016
82.	Breeding Policy for Cattle and Buffalo in India	2016
83.	Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context	2016
84.	Practical and Affordable Approaches for Precision in Farm Equipment and Machinery	2016
85.	Hydroponic Fodder Production in India	2017
86.	Mismatch between Policies and Development Priorities in Agriculture	2017
87.	Abiotic Stress Management with Focus on Drought, Food and Hailstorm	2017
88.	Mitigation Land Degradation due to Water Erosion	2017
89.	Vertical Farming	2019
90.	Zero Budget Natural Farming – Myth or Reality	2019
91.	Loan Waiving versus Income Support Schemes: Challenges and Way Forward	2019
92.	Tropical Wilt Race-4 Affecting Banana Cultivation	2019
93.	Enhancing Science Culture in Agricultural Research Institutions	2020
94.	Payment for Ecosystem Services in Agriculture	2020
95.	Food-borne Zoonotic Diseases	2020
96.	Livestock Improvement through Artificial Insemination	2020
97.	Potential of Non-Bovine Milk	2021
98.	Agriculture and Food Policy for the Five Trillion Dollar Economy	2021
99.	New Agricultural Policy for Reshaping India	2021
100.	Strategies for Enhancing Soil Organic Carbon for Food Security and Climate Action	2021
101.	Big Data Analytics in Agriculture	2021
102.	WTO and Indian Agriculture: Concern and Possible Solutions	2022
103.	Antimicrobial Resistance	2022
104.	One World, One Health	2022
105.	Sugarcane-based Ethanol Production for Sustainable Fuel Ethanol Blending Programme	2022
106.	Utilization of Wastewaters in Urban and Peri-urban Agriculture	2022
107.	Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Agricultural Diversification	2022
108.	Agri-startups in India: Opportunities, Challenges and Way Forward	2022
109.	Emergency Preparedness for Prevention of Transboundary Infectious Diseases in Indian Livestock and Poultry	2022
110.	Strategies and Approaches for Promotion of Sustainable Bivoltine Sericulture in India	2022
111.	Food Fortification : Issues and Way Forward	2022

Status /Strategy Papers

1.	Role of Social Scientists in National Agricultural Research System (NARS)	2015
2.	Towards Pulses Self-sufficiency in India	2016
3.	Strategy for Transformation of Indian Agriculture for Improving Farmers Welfare	2016
4.	Sustaining Soybean Productivity and Production in India	2017
5.	Strengthening Agricultural Extension Research and Education – The Way Forward	2017
6.	Strategy on Utilization of Glauconite Mineral as Source of Potassium	2017
7.	Vegetable Oil Economy and Production Problems in India	2017
8.	Conservation Policies for Hilsa and Mahseer	2018
9.	Accelerating Seed Delivery Systems for Priming Indian Farm Productivity Enhancement: A Strategic View Point	2018
10.	Renewable Energy: A New Paradism for Growth in Agriculture	2018
11.	Rumen Microbiome an Amelloration of Methane Production	2019
12.	Harnessing Full Potential of A1 and A2 Milk in India: An Update	2019
13.	Development and Adoption of Novel Fertilizer Materials	2019
14.	Innovations in Potato Seed Production	2021
15.	Potential of Transgenic Poultry for Biopharming	2022
16.	Need for Breeding Tomatoes Suitable for Processing	2022

Policy Brief

1.	To Accelerate Utilization of GE Technology for Food and Nutrition Security and Improving Farmers' Income	2016
2.	Innovative Viable Solution to Rice Residue Burning in Rice-Wheat Cropping System through Concurrent Use of Super Straw Management System-fitted Combines and Turbo Happy Seeder	2017
3.	Soil Health: New Policy Initiative for Farmers Welfare	2018
4.	Uniform Policy for Fish Disease Diagnosis and Quarantine	2019
5.	Saving the Harvest: Reducing the Food Loss and Waste	2019
6.	Better Management of Pesticides in India : Policy Perspective	2019
7.	Regulatory Framework for Genome Edited Plants: Accelerating the Pace and Precision of Plant Breeding	2020
8.	Covid-19 Pandemic: Impact and New Normal in Agriculture	2020
9.	Direct Benefit Transfer of Fertilizer Subsidy: Policy Perspective	2020
10.	Harmonization of Seed Regulations for Sustainable Food Security of India	2020
11.	Towards Revision of Biological Diversity Act 2002	2021

NAAS DOCUMENTS ON POLICY ISSUES

1	Agricultural Scientists' Perceptions on National Water Policy	1995
2	Fertilizer Policy Issues (2000-2025)	1997
3	Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region	1998
4	Conservation, Management and use of Agrobiodiversity	1998
5	Sustainable Agricultural Export	1999
6	Reorienting Land Grant System of Agricultural Education in India	1999
7	Diversification of Agriculture for Human Nutrition	2001
8	Sustainable Fisheries and Aquaculture for Nutritional Security	2001
9	Strategies for Agricultural Research in the North-East	2001
10	Globalization of Agriculture: R & D in India	2001
11	Empowerment of Women in Agriculture	2001
12	Sanitary and Phytosanitary Agreement of the World Trade Organization–Advantage India	2001
13	Hi-Tech Horticulture in India	2001
14	Conservation and Management of Genetic Resources of Livestock	2001
15	Prioritization of Agricultural Research	2001
16	Agriculture-Industry Interface: Value Added Farm Products	2002
17	Scientists' Views on Good Governance of An Agricultural Research Organization	2002
18	Agricultural Policy: Redesigning R & D to Achieve It's Objectives	2002
19	Intellectual Property Rights in Agriculture	2003
20	Dichotomy Between Grain Surplus and Widespread Endemic Hunger	2003
21	Priorities of Research and Human Resource Development in Fisheries Biotechnology	2003
22	Seaweed Cultivation and Utilization	2003
23	Export Potential of Dairy Products	2003
24	Biosafety of Transgenic Rice	2003
25	Stakeholders' Perceptions On Employment Oriented Agricultural Education	2004
26	Peri-Urban Vegetable Cultivation in the NCR Delhi	2004
27	Disaster Management in Agriculture	2004
28	Impact of Inter River Basin Linkages on Fisheries	2004
29	Transgenic Crops and Biosafety Issues Related to Their Commercialization In India	2004
30	Organic Farming: Approaches and Possibilities in the Context of Indian Agriculture	2005
31	Redefining Agricultural Education and Extension System in Changed Scenario	2005
32	Emerging Issues in Water Management – The Question of Ownership	2005
33	Policy Options for Efficient Nitrogen Use	2005
34	Guidelines for Improving the Quality of Indian Journals & Professional Societies in Agriculture and Allied Sciences	2006
35	Low and Declining Crop Response to Fertilizers	2006
36	Belowground Biodiversity in Relation to Cropping Systems	2006
37	Employment Opportunities in Farm and Non-Farm Sectors Through Technological Interventions with Emphasis on Primary Value Addition	2006
38	WTO and Indian Agriculture: Implications for Policy and R&D	2006
39.	Innovations in Rural Institutions: Driver for Agricultural Prosperity	2007
40.	High Value Agriculture in India: Prospects and Policies	2008
41.	Sustainable Energy for Rural India	2008
42.	Crop Response and Nutrient Ratio	2009
43.	Antibiotics in Manure and Soil – A Grave Threat to Human and Animal Health	2010
44.	Plant Quarantine including Internal Quarantine Strategies in View of Onslaught of Diseases and Insect Pests	2010
45.	Agrichemicals Management: Issues and Strategies	2010
46.	Veterinary Vaccines and Diagnostics	2010
47.	Protected Agriculture in North-West Himalayas	2010
48.	Exploring Untapped Potential of Acid Soils of India	2010
49.	Agricultural Waste Management	2010
50.	Drought Preparedness and Mitigation	2011
51.	Carrying Capacity of Indian Agriculture	2011
52.	Biosafety Assurance for GM Food Crops in India	2011
53.	Ecolabelling and Certification in Capture Fisheries and Aquaculture	2012
54.	Integration of Millets in Fortified Foods	2012
55.	Fighting Child Malnutrition	2012
56.	Sustaining Agricultural Productivity through Integrated Soil Management	2012
57.	Value Added Fertilizers and Site Specific Nutrient Management (SSNM)	2012
58.	Management of Crop Residues in the Context of Conservation Agriculture	2012
59.	Livestock Infertility and its Management	2013
60.	Water Use Potential of Flood-Affected and Drought-prone Areas of Eastern India	2013
61.	Mastitis Management in Dairy Animals	2013
62.	Biopesticides – Quality Assurance	2014
63.	Nanotechnology in Agriculture: Scope and Current Relevance	2014
64.	Improving Productivity of Rice Fallows	2014

For detail visit web site: http://naas.org.in

Continued on inside cover