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**Redesigning our farming systems**

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AGRICULTURE as in crop and animal husbandry, fisheries and agro-forestry is a recognized source of food and a direct pathway for the food, nutrition and health security of humankind. A majority of people in the developing countries of the world depend on agriculture and allied activities for their livelihoods. These countries also house a large proportion of undernourished people in the world.

According to a recent United Nations report on global food and nutrition security, there were an estimated 820 million people without enough food to eat in 2018, and the number had been increasing over three consecutive years.1 In the aftermath of the COVID crisis, we can only expect a further gloomy scenario especially in countries where economic growth is lagging and nutrition status of the population is poor.

Undernutrition affects productivity and its economic costs are well established. Leveraging agriculture for nutrition and health seems to be the logical and economic pathway to take. The focus of agriculture has largely been on increasing production and productivity. Accompanied by globalization and interlinking of markets, this has been accompanied by loss in both plant and animal biodiversity.

Anil Kumar and Vedavalli elaborate: ‘…emphasis on high-yielding and broadly-adapted varieties has greatly led to the loss of crop diversity and genetic variability in crop plants. Although historically, families of artisans, pastoralists, gatherers, small peasants and indigenous communities have discovered some 50,000 varieties of edible plants, modern urban society has adapted to only a few crops like wheat, rice, maize and potato, because of the relative advantage of buying such varieties from supermarkets and due to various other factors. The demand for only market-driven farm produce has resulted in a decline in farmland biodiversity and simplification of agro-ecosystems in various spatial scales.’2

**T**oday, only 30 crops are reported to be providing 95% of human food-energy needs, with 60% of this being accounted for by just five of them – rice, wheat, maize, millet and sorghum. Five animal species – cattle, sheep, goats, pigs and chicken – reportedly account for about a third of average daily protein consumed. This narrowing down of the food basket increases the vulnerability of agriculture and food systems and puts food security and nutrition at risk, as the natural resource base and ecosystem services are the foundation of food and agricultural systems.3

It was only towards the end of the last century that the role of agriculture in promoting better nutrition outcomes and health started getting discussed in international discourse. The discourse has gained momentum in recent years with research on the pathways that link agriculture to nutrition, conceptual frameworks being developed, donor supported pilots and research initiatives and efforts to integrate nutrition sensitive agriculture by governments in their country plans.4

The link of agriculture to nutrition and health has been recognized and is enshrined in the UN Sustainable Development Goals (SDG). Three of the targets under SDG2 of Zero Hunger (end hunger, achieve food security and improved nutrition and promote sustainable agriculture practices) pertain to the leveraging of agriculture policy and strategy for improved nutrition outcomes to ensure the ultimate goal of ending hunger and malnutrition in all its forms. Realization of SDG 3 of good health and well-being and SDG 1 of no poverty, are closely linked to SDG 2. Breaking out of the vicious of poverty requires a healthy population free from malnutrition. All of these call for agriculture policies, programmes and interventions that are nutrition sensitive.

**N**utrition sensitive agriculture (NSA) interventions typically aim to improve the various underlying determinants of nutrition outcomes through influencing dietary quality, household food security, income and women’s empowerment.5 Traditionally, farming systems practiced by small farmers across the globe integrated different crops, livestock and where feasible fish, to meet the food requirements of the household. This contributes to household diet diversity; on-farm production diversity nurtures soil health and biodiversity conservation. Indigenous crop varieties and animal breeds that may be highly nutritious or stress tolerant are also nurtured in the process.

Cultivation for the market has to a great extent affected this cycle, eroded diversity in plant and animal resources and led to overexploitation of natural resources like soil and water. We are today facing challenges like increasing soil salinization, groundwater depletion and climate change. The Covid-19 pandemic is the latest to get added to this list.

**T**here is evidence of focused interventions like promoting home gardens of fruits and vegetables, poultry, livestock interventions leading to greater availability of nutritious food and household dietary diversity, as shown by a review of 44 papers based on nutrition sensitive agriculture programmes (NSAP) published since 2014, to examine the evidence of nutrition sensitive agriculture interventions. The analysis concluded that research is needed on how and where to scale up or implement NSAP programmes as well as presenting evidence of the key factors for success, the cost implication of scaling up for achieving impacts at scale and characterizing how agricultural development programs can fit within or complement the scale-up of larger agricultural and food systems investments.6

While there is need for strong evidence of its impact on nutrition status, the studies point to an improvement of dietary diversity as an intermediate outcome that could lead to better nutrition outcomes.

Taking into consideration the challenges of linking agriculture to nutrition, an innovative ‘Farming System for Nutrition (FSN)’ approach of mainstreaming the nutrition dimension in the farming system was conceptualized by M. S. Swaminathan. FSN is defined as, ‘The introduction of agricultural remedies to the nutritional maladies prevailing in an area through mainstreaming nutritional criteria in the selection of the components of a farming system involving crops, farm animals and wherever feasible, fish.’7

**T**he FSN approach comprises a combination of location specific measures including advanced crop production practices, bio-fortification, and promotion of kitchen (nutrition) gardens of fruits and vegetables, livestock and poultry development, setting up of small-scale fisheries, combined with nutrition awareness. It is inclusive, based on the resource endowments and specific environment, to address the nutritional needs of families.

FSN is a flexible model that takes into account the nature of resource endowment, specificities in environment and nutritional problems; ideally a farmer can decide on the possible combinations of different components of FSN depending on his/her location and resource base. The approach essentially calls for the promotion of location specific farming systems that integrate arable farming, horticulture, backyard farming and animal farming to sustainably improve household availability of nutrition while also mitigating risk and conserving natural resources. In developing a design for the farming system, feasible agricultural interventions to address the nutrition deficiencies of the household or community or location need to be taken into consideration.

In this context, ‘the design of the farming system [can] include specific crop varieties that can address the identified deficiencies. Sweet potato might provide vitamin A; drumstick tree (*Moringa olifera*) and *Amaranthus sp.*could address the lack of iron.’8 In addition, the FSN approach recognizes the need for related interventions such as improving production and establishing market linkages for nutritious crops, indirect inputs that would positively impact women’s empowerment, nutrition education, water, sanitation and hygiene (WASH) practices, and strengthening natural resource management, along the pathway from agriculture to nutrition.

**A** feasibility study of the FSN approach discussed above was undertaken in resource poor villages of Wardha and Koraput districts in the states of Maharashtra and Odisha from 2013 to 2017, to investigate how location specific FSN interventions could potentially improve the diversity of household diets and nutrition outcomes. A detailed baseline study was undertaken to identify the existing disconnect between agriculture-nutrition linkages.9

Given the resource availability, the FSN design in these two districts focused primarily on crop based interventions and nutrition awareness to improve household dietary diversity of small and marginal farm households. The focus of the FSN design was on the following aspects:

1. Increase the on-farm crop diversity and increase availability of nutrient dense crops (viz. millets and pulses) for household consumption by enhancing production of diversified crops at the farm level with improved seed varieties and improved package of practices.

2. Promote vegetable cultivation through household and community level nutrition gardens with naturally fortified fruits and vegetables species and nutrient-dense varieties especially green leafy vegetables to address micronutrient malnutrition.

3. Promote availability and consumption of animal source foods – poultry meat and eggs, and fish.

4. Generate nutrition awareness around balanced diet, nutrient content in different foods and leveraging agriculture for nutrition. The nutrition awareness component was a key element of the FSN design. The activities ranged from individual and household level interaction and advice, focus group discussions on issues like anaemia and young child feeding, observance of important days (e.g. World Toilet Day, Handwashing Day), as well as building capacity of selected men and women to work effectively as Community Hunger Fighters (CHF). The CHFs were trained through a participatory learner-centred adult nutrition literacy approach and positioned as the conduit to reach out to a larger population.

**A**n endline survey of the FSN study conducted in late 2017 among households, who were stakeholders of one or more interventions, revealed the FSN interventions had the following impact:10

\* Increase in intake of finger millet and pulses by households. This was attributed to their production on-farm and consequent availability for household consumption. Baseline had reported that prior to the FSN intervention, the sourcing of finger millet in Koraput district was largely from the market. At endline, there was 13% increase in number of households cultivating the crop and 14% increase in per capita average intake. Likewise, in Wardha, there was a twofold increase in average intake of pigeon pea; consumption of Bengal gram increased by 1.3 times and sorghum by 64%.

\* The percentage of households consuming more than 70% of recommended allowances of all food groups was seen to have increased in both the project locations.

\* There was an improvement in household dietary diversity with marked improvement in frequency of consumption of different food groups recorded in both the study locations.

**T**he adoption of recommended scientific practices and use of improved seed varieties resulted in increasing the yield, an aspect which is important for farmers continuing to adopt and sustain the practice. For example, it was observed in Koraput district that the net return from the cultivation of an improved variety of finger millet with use of appropriate recommended practices was 1.6 times higher than the traditional variety using farmers practice.11 Other crops also showed similar positive results.

The FSN approach is an example of mainstreaming the nutrition dimension in agriculture. Besides undernutrition, we are also seeing an increase in levels of overnutrition (the other side of malnutrition) in the population in developing countries as well as in developed countries of the world. Overnutrition and obesity arise from consumption of unhealthy and ultra-processed foods and lead to rise of non-communicable diseases like hypertension and cardiovascular diseases. Addressing this requires a better understanding of nutrition and health, the nutrient content in the foods we consume, and their source. There are issues of food safety to be kept in mind; and of cooking and value addition with minimum loss of nutrients. There are several indigenous crop varieties, fruits and vegetables that are nutrient rich and suited to different agro-climatic regions. These need to be understood, brought back into the production system and local value chains built around them to ensure availability for consumption. Our food systems are in a critical situation today.

**T**he relevance of nutrition sensitive agriculture becomes even more important in the current context of the Covid-19 pandemic and its impact on lives and livelihoods of people across the globe. Environmentalists have been repeatedly drawing attention to the erosion of our agro-biodiversity, the overexploitation of natural resources, changes in climate and their consequent impact on human health. The current pandemic is an opportune time for us to reflect on these issues, shift gears and take measures to nurture, healthy agriculture and food systems, and nutrition sensitive agri-food value chains, to ensure that the food we eat is safe and nutritious.

Production diversity for consumption diversity has to become the hallmark of the food system if we wish to nurture a well nourished and healthy population on the planet. It calls for commitment at the highest levels cutting across politics, business and social strata, for a change in our approach from production for profit to production for nutrition and health. If not forthcoming, the SDGs will remain a mirage.

**Footnotes:**

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