

Subject III

Agriculture and Allied Sectors in Nutritional Security

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A total of 32 papers were received out of which 22 were accepted for discussion and 2 were withdrawn. The papers could be categorized as covering the broad themes as under:

- Crop sector responses and adoption patterns resulting in dietary diversity, role of bio-fortification of crops and its implications for policy (4).
- Differentials in nutritional intake, household food insecurity and consequences (7).
- Allied sectors and nutritional security (4).
- Impact of schemes and programmes on improving food availability and nutritional security (5).

Amongst the accepted papers, 16 paper writers presented their research during the technical session. The analysis in the papers was largely based on primary surveys, supplemented by the unit level household data generated by the NSSO. A large number of them had undertaken quantitative analysis by taking recourse to sophisticated econometric tools in order to substantiate their hypotheses and arrive at policy prescriptions. In their presentations the paper writers highlighted variegated aspects of nutritional security and the role of agriculture and allied sectors in mitigating hidden hunger.

One of the papers had assessed the magnitude of household food insecurity and its consequences on the nutritional status of children among indigenous Garo tribe of Meghalaya. Food consumption score (FCS) was selected to estimate the household food security - a composite score including information on the household dietary diversity. The consumption frequency of each food group was multiplied by an assigned weight based on the nutrient content and the summation led to a composite FCS. After comparing the household score with pre-established thresholds a significantly positive correlation was observed between the household FCS and BMI of children. Essentially, it was stressed that effective policies and programmatic activities for improving the dietary diversity need to be initiated, including policies for revitalizing the local food systems. In another presentation, the shift in nutrient intake amongst income groups comprising of four expenditure classes for Himachal

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Pradesh were examined. The analysis used the unit level data on consumer expenditures collected by the National Sample Survey organization (NSSO). Protein and fat intake was estimated by converting the quantities of food consumed. The nutritional security status of the households was examined through the security ratio computed as a ratio of the energy intake to the Recommended Dietary Allowance (RDA). While the poor households' major sources of nutrients were cereals and pulses, the high-income households had diversified in favour of milk, egg, fish, meat, fruits and vegetables. Low-income households were moderately nutrition insecure, and around 50 per cent of the rich households were nutritionally secure. The direct link of nutrition to the income of the households necessitates access of food at subsidized rates to enhance the nutrient status. The food consumption pattern and dietary diversity of households in Kanyakumari and Perambalur districts of Tamil Nadu along with the relation of food quality with agricultural production portfolio was discussed. The Simpson Index of Dietary Diversity (SIDDD) was estimated and its variation across groups of households was explained through multiple regression models. Farm incomes and education status of households emerged as principally influencing the dietary patterns and nutritional status. Food habits depicted regional variations and a significant reduction was observed in dietary diversity.

Besides an attempt was made to identify the role of food security programmes and policies in the changing pattern of food commodities and impact on undernourished population in India. In a very informative paper, consumption pattern of major food commodities was analysed temporally and spatially at household level in states of eastern region of India using secondary data published by National Sample Survey. The discussion included assessment of policies and the public distribution system in providing food and the effect on poverty and malnutrition. One of the presentations introduced the concept of vulnerability to expected nutrient deficiency (VEND), highlighting population groups who might become nutrient deficient in the absence of appropriate policies. Using the unit level data from NSS the authors adopted the three stages Feasible Generalized Least Square technique to estimate VEND for the 'BIMARU' states. The analysis identified the determinants of VEND, extent of nutritional deficiency, status of nutritional deficiency and vulnerability across districts and different household characteristics. The research highlighted that social stratification and landholdings impacted vulnerability. The authors rightly pointed out that ignorance is likely to deepen malnourishment underscoring focus on vulnerability based policies for targeted areas, in addition to awareness programmes and better management of the public distribution system.

In one of the presentations the trends in the area, production and yield of major food grains was analysed for the state of Odisha. In addition, malnutrition status of Odisha was examined to ascertain the link between the above two by way of initiatives undertaken by the Government of Odisha to eradicate malnutrition and hunger. The authors opined that in order to ensure availability of food in adequate quantities, agricultural production needs to be stepped up along with food access.

However, considering the high nutritional value of maize, it was suggested that it could be introduced as a food item provided through the nutritional security programmes such as MDM, PDS, and ICDS in Odisha. Moreover, farmers in the state should be encouraged to increase acreage and output of maize. Another presentation focused on historical production trends in 'nutri-cereals' and other crop groups-growth rates were estimated using kinked-exponential model of Boyce (1986). The secular decline in area and output under millets and other coarse cereals – a group of climate resilient crops is detrimental for nutritional security. Their replacement by rice, sugarcane and cotton – considerably more water intensive crops has led to groundwater depletion that could in turn adversely affect production of staple cereals. It was observed that the decline in nutri-cereals was on account of greater emphasis on other cereals like rice and wheat, and policy initiatives to revive nutri-cereals were the need of the hour. One of the papers purposively selected Public Distribution system under the umbrella of National Food Security Act (NFSA), 2013 and the Mahatma Gandhi National Employment Guarantee Act, 2005 to study their contributions to combat the different issues related to food insecurity in Meghalaya. Performance of PDS at leveraging food availability across beneficiary households was assessed through paired t-tests, and the impact of MGNREGA was studied through Gini coefficient and Lorenz curves to assess distribution of income among the beneficiaries. Additionally, a difference in difference method was estimated to understand the impact of MGNREGA on the outcome of interest. It was reported that the state had been benefiting through the food subsidy scheme and from the cash for work scheme, although the schemes needed some tweaking for better distribution of commodities as well as to improve the target days to boost income of the beneficiaries.

Steering the discussion away from the main theme, another paper presented the findings from a study examining the link between consumption of micronutrients and productivity. The premise stemmed from efficiency wage hypothesis formulated by Leibenstein (1957) that postulates that nutrition influences labour productivity. Implications of the theory for labour intensive, developing economies is that people get stuck in a low nutrition- low productivity trap. A two-way causality between nutrient intake and wages was hinted at and hence focus was towards the consequences of micronutrient intake and deficiencies. The paper attempted to quantify the impact that consumption of micronutrients has on productivity measured in terms of wages by using NSSO data for two rounds. To establish the hypotheses a wage equation using the instrumental variable approach (food prices, seasons predict nutrient consumption) was used. In the selection equation sex, age, square of age, religion, caste, education, land ownership, dependence of family members and season were used that are likely to influence probability of an individual being employed.

In addition, the consumption pattern and expenditure proportion of younger Indians who are the major share of the demographic dividend through a primary study was explored. Consumption pattern of food groups/items was ascertained for

different expenditure groups of respondents. The authors observed that the young Indians food intake pattern was leading to unhealthy lifestyles. Another presentation undertook a detailed review of important nutrition interventions and the current status of consumption at various levels, groups and income levels. This led the authors to conclude that there is a need for multi-faceted strategy for nutrition improvements, as malnutrition, poverty and inequalities, education, water and sanitation, food production, gender concerns, and health were interconnected issues. Policy tools encompassing short-term direct, indirect, long-term structural and institutional actions were required to address these issues.

Another paper though digressed from the regular theme, yet enriched the deliberations immensely with their specific technical insights. This paper attempted to provide to researchers interested in bio fortification with clear insights on the current priorities and the future direction for research. To attain this objective, the authors mapped the global research on bio fortification using bibliometric analysis. Bibliometric details of the literature published under the theme of bio fortification for the period 2000 to 2021 were extracted from the ISI Web of Science. The analysis and visualisation were done using the VOS viewer and adopting tools such as biblioshiny. Analysis identified that bio fortification along with maize, vitamin A and carotenoids were the major research themes worldwide. Furthermore, the most influential authors based on the number of citations as well as the top institutes working on bio fortification were identified.

Moving away from the theme of dietary diversification and nutritional security through crop sector responses, three papers in the session addressed allied activities, notably the livestock sector. Adoption of crossbred cattle significantly influences nutritional support through increase in net dairy incomes together with enhanced milk and meat consumption for farming communities. One of the papers examined the constraints of adoption of crossbred cattle along with its contribution to nutritional security in the state of Assam. The thrust of the paper lay in addressing the challenges of low productivity of the indigenous cattle population and declining feed and fodder resources. Farmers perceive several underlying constraints hindering their adoption of crossbreeding technology. Factors influencing adoption of crossbred cattle were ascertained, along with constraints of adoption of crossbreeding technology through the use of estimation techniques with appropriate checks (probit regressions, rank based quotient technique). Based on the results, the authors advocated the expansion of extension services, strengthening of dairy co-operative society (DCS) network and raising milk price for diffusion of crossbred cattle. In a similar vein, another presentation investigated the relation between land and bovine animals, as well as determinants of ownership such as access to credit, technology, inputs, information and markets. After a detailed overview of the distribution of animal holdings by land size and socio-economic categories, that highlighted unequal livestock ownership across economic classes and social groups, its determinants were examined statistically using a log linear regression function. The number of bovine animals

owned by a household depended positively on operated land, number of adult females in the household and caste group to which the household belonged. The results underline the fact that opportunities for a large number of rural households to improve their income and employment in the dairy sector are compromised and focus of policy should be on how a larger share of rural households may be able to reap the benefits of an increasing demand for milk and dairy products.

Risk aversion and the role of livestock policy was the subject of the presentation made by another paper. Although not directly related to the theme, the subject was of import for the livestock sector. The results were drawn from a micro study that indicated low coverage and renewal of livestock insurance, raising doubts on its feasibility. While diversification of insurance products suited to the needs of farmers cannot be over emphasised, state has to offer much by way of improving awareness, infrastructure and address the critical staff deficit related to livestock support. Further to increase coverage, essential steps were reduction of premium, quick settlement of claims, door step delivery of insurance services awareness creation.

The following points were raised during the course of discussion:

- Choice of econometric models for analysis (profit vs logit). It was suggested that use of tools had to be explored further in order to identify better estimators.
- Inclusion of socio-economic dimensions and determinants was essential in adoption of insurance, implementation of schemes, in ascertaining nutritional intake of income groups etc. and to reduce the burden of undernutrition.
- Theoretical underpinnings were often poorly articulated by the authors, for instance in establishing linkages between labour productivity, or crop diversification and nutritional intake.
- The relationship of agricultural growth and production instability was not explored adequately. Instability and decline in output from nutri-cereals needed to be correlated with health and nutritional outcomes; including by using the NFHS data at disaggregated levels.
- What is the role of policy in tackling vulnerability, which affected even high income households and well-endowed regions? How could nutritional security of people with poor resource base be tackled?
- How was nutritional status of regions/households linked to agricultural productivity and other social parameters. Can this be ascertained through economic analysis in order to arrive at more robust results that can help in policy design and implementation especially for low income groups and regions?
- How could cropping patterns respond and adjust to provide access to nutritionally rich food? What were the constraints in implementation of government programmes to tackle nutritional insecurity, e.g. availability of bio-fortified varieties under the PDS and also constraints in uptake-where underlying socio-economic dimensions were important?

The papers addressed the crucial issues related to malnutrition and nutritional security and how agriculture and allied sectors can contribute to sustainable production systems and the role of programmes aimed at mitigating hidden hunger. Most of the papers were based on primary surveys and NSSO household data. The data made available through the National Family Health Surveys was largely ignored. Some of the papers (summaries) suffered from inadequate problem identification and rigorous analysis. The contributions to the session largely ignored the themes related to the threatened agro-biodiversity- that is the basis of sustainability and generation of rural livelihoods. The other neglected aspect was the gender dimension, as well as role of property rights in enhancing women's involvement in allied sectors and food production. Lastly, the role of institutional mechanisms such as primary producers' organisations and value chains (FPOs, co-operatives, SHGs) in mitigating nutritional security would also have further enriched the discussion.