

Checking rural migration

through enhancing farmers income and improving their living conditions

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Migration is a part of the process of development as people search for better employment opportunities within and across countries. However, it should be a choice not necessity. To meet the basic necessities of life such as food, cloth and shelter of the growing population from the dwindling and degrading natural resources, and to provide remunerative price and thereby additional income to the farmers, an integrated and intensified farming system with on-farm processing, along with fixation of Realistic Support Price (RSP) and procurement policy; not only for cereals but also for pulses, oilseeds and horticultural produces are needed. Crops like groundnut, soybean, sorghum, sunflower, cluster bean, castor and pigeon pea are the potential crops which can be promoted under diversification to maintain and enhance soil fertility, agricultural productivity and mitigate the effect of climate change. Food commodities having lower water and carbon footprints and efficient in capturing and transforming solar energy into food and fibre, need to be grown, processed and utilized. Empowerment of women is quite important for both, agricultural growth and nutritional security. Rural youth could be retained in agriculture by involving them in secondary and specialty agriculture and giving them proper incentive for their involvement in agricultural activities. Rural youth need to be engaged in multifarious activities around, plough to plate, so as to make farming both, attractive as well as lucrative profession.

Key words: Farmer, Income, Rural migration

MIGRATION is a sign of socio-economic development, the world over; and it should be a choice, not a necessity. In 2015, there were 244 million international migrants, 40% more than what was in 2000. People who move within national borders were estimated at 763 millions in 2013, meaning that there are more internal migrants (rural to urban areas) than international migrants. About 35% of all international migrants are aged between 15 and 35 years, nearly half are women. In 2015, migrants sent over US\$ 600 billion in remittance to their countries of birth. Of that, developing countries received about US\$ 441 billion, nearly three times the amount of official development

assistance. A large share of migrants come from rural areas where more than 75% of the world's poor and food insecure depend on agriculture and natural resource-based livelihood. Most migrants, whether international or internal, originate in the Middle-East and North Africa, Central Asia, Latin America and Eastern Europe. In 2015, 65.3 million people around the world were forcibly displaced by conflict and persecution, including over 21 million refugees, 3 million asylum-seekers and over 40 million IDPs. About 19 million people were internally displaced because of natural disasters. Between 2008 and 2015, an average of 26.4 million people were displaced annually by climate or weather related disasters.

An analysis of Indian population (1.3 billion) showed that it is a country of young people that largely lives in villages and there are more men (51%) than women (49%). About 69% of population live in villages and 31% in urban areas. Age-wise population distribution is 15 years of age or less (33%), 16-30 years of age (28%), 31-60 years of age (32%) and 61 years and above (7%). India will be the most populous country by 2024 and thereafter, its population will eventually shrink by 2100 and the population may decline to 1.52 billion.

Indian agriculture

The performance of Indian



agriculture in transforming India from a begging bowl status in the mid-1960s to self-sufficiency during 1990s is remarkable but the food self-sufficiency has not reached at the house-hold level in several parts of the country. Malnutrition in women and children continues to remain high, farms are shrinking in size and natural resources are depleting and degrading in quality. Another notable feature of agricultural transformation is the growing regional disparity in development. Disadvantaged region did not gain much from the development efforts. Hence, a balanced regional development assumes special significance in the planning and development process. Agriculture has remained an integral part of the socio-economic fabric of rural India since time immemorial and also occupies centre stage in Indian economy as it sustains livelihood of over 70% of the rural household and provides employment to over 60% of the population. Despite wide variations in growth performance during the last seven decades after independence (1947-2017), which is primarily due to the subsistence nature of farming in India and the sector heavy dependence on monsoon, the country has witnessed several innovations in agriculture and livestock sectors, such as green, yellow, white, blue, golden and pink revolutions. These have been possible due to science-led synergistic extension approach capitalizing genetic potential, irrigation, fertilizer, crop commodity specific production and post-production mechanization, appropriate policies and hard work of farmers. All these took the agriculture sector to an unprecedented transformation in the development of the country. The increased agricultural productivity, rapid industrial growth and expansion of the non-formal rural economy resulted in higher per caput Gross Domestic Product (GDP), ensuring food security of the nation. However, as of now, continuing to secure such gains is becoming a major challenge especially in the context of growing Indian population which is touching 1,300 millions, declining factor productivity, deteriorating natural

resources, impact of global climate change and above all a fatigue in the existing research and extension system that largely operate in the public sector.

Farmer income

India, an agrarian country, with about 140 million farmers of which around 80% are small and marginal. Average farmer income is 30-40% of per caput income of their urban counter part with an over widening gap. Though agricultural production has increased many folds as compared to 1950-51 but the agricultural production is witnessing diminishing returns. Farmers are aware of that infusion of more labour and capital, year-by-year will not increase the return per unit. Demography of Indian agriculture is changing. economic growth and improved urban infrastructure are making rural dwellers to shift to better pay jobs outside agriculture, in turn leading to increase in agricultural wages. Natural calamities and pest attacks aggravate the problem, pushing farmers to indebtedness. There is, therefore, a need for pragmatic reforms and policy initiative to sustain Indian agriculture and improve economic condition of farmers. Income of farmers could be enhanced substantially by allied activities such as horticultural, medicinal and aromatic crops cultivation, dairying and fisheries, value addition to harvested biomass of plant and livestock origin in the production catchment and using crop residues and processing byproducts for feed and manures to enhance livestock and soil-health and thereby better productivity with good quality produce, which in turn will fetch more income to farmers and improve the health of the consumers.

The Government of India has taken a number of initiatives to increase farm productivity and farmers income. Some of these are *Pradhan Mantri Krishi Yojana*, *Fasal Bima Yojana*, e-National Agricultural Market (e-NAM), providing social wealth cards to farmers etc. Extending high support price to pulses and other commodities is a right step for crop diversification.

Cluster-based facilities consisting of collection centres, grading and sorting centre, infrastructures such as cold storage, packaging unit and quality control facility will minimize post-harvest losses and reduce transport cost of agro-produce, price-discovery through agro – commodity exchanges, thereby acting as incentive for increasing productivity and enhance farm income. Contract/ co-operative farming and direct purchase of farm produces at an appropriate price remunerative to the farmers would support realization of higher income. For an effective outcome, all these measures need to be supported by appropriate fund allocations and implementation strategies with realistic goals. All stakeholders such as central and state governments, cooperatives, industry and farmers need to work together to realize higher farm income and better quality produces benefiting the humanity.

Solar energy and agriculture

Solar energy received by 1 ha of land over a period of one year is about 14×10^9 kcal. However, during an average period of four months in summer, crop growing season in the temperate region, nearly 7×10^9 kcal of energy reaches to 1 ha land area and this energy is converted by plants into food and fibre energy using soil moisture and nutrients. The highest average energy productivity is 7.13 kg/MJ for vegetables, followed by sugarcane (1.04 kg/MJ), oilseeds (0.68 kg/MJ), fruits (0.45 kg/MJ), cereals (0.22 kg/MJ), pulses (0.18 kg/MJ), tobacco (0.01 kg/MJ) and cotton (0.094 kg/MJ). The need is to enhance energy productivity of various agricultural commodities using improved seeds and saplings that have higher photosynthetic efficiencies and energy efficient agricultural production tools and technology. The average energy consumption in the production of some of the crops grown in Punjab and Madhya Pradesh showed that specific energy consumption in the production of most of the crops in Punjab and Madhya Pradesh are more or less the same except in mustard and cotton where variation is slightly



Table 1. Average energy consumption in production of some of the crops in Punjab and Madhya Pradesh

Crops	Specific energy consumption in production, (MJ/kg)	
	Punjab	Madhya Pradesh
Paddy	4.72	3.96
Wheat	5.03	4.99
Sugarcane	1.21	1.08
Mustard	10.00	8.92
Cotton	9.74	13.50

more (Table 1).

Water footprint

The amount of fresh water used in the production or supply of goods and services used by a person or group is known as water footprint and for a human-being it is the amount of water he/she consumes in his/her daily life, including the water used to grow his/her foods, produce energy and other products used in his/her daily life, such as gadgets, clothing, houses, car, furniture etc. The understanding of water consumption can help to optimize the water use so that there is enough water to sustain life on the beautiful and dynamic planet earth. On an average, as of now, each person on the earth consumes about 5,000 litres of water a day and the range is from 1,500 to 10,000 litres/day/person depending upon where he/she lives and what foods he/she eats in daily life and how is his/her living standard. Maximum water is needed to produce 1 kg of beef (15,145 l/kg) and minimum for the production of vegetables (332 l/kg). As of now, agriculture in India consumes about 88% of overall water but in coming years, the shares of industry and households water use would increase substantially and it therefore demands prioritization and efficient water use strategies. The Indian industries are the biggest polluters of India's water system with over 70% of all industrial wastes being dumped untreated into water-bodies. This is a frightening scenario but the industry people claim confidence that their water saving efforts will bear fruit. Apart from power, cement, steel and paper, the textile sector is also a water-intensive industry along with various foods and other related

commodities. For example, to produce 100 g of soybean, it takes about 275 litres of water and to produce a cotton T-shirt (250 g), it takes 2,495 litres of water. It, therefore, requires making more efficient use of water in all sectors, such as agriculture, industry, households etc. Depending upon the type of diet, food can have a huge water footprint. Fruits and vegetables are the least thirsty kind of food, requiring far less water to produce than various kind of meat. People can vary their diet and eat foods that have lower water footprints.

Carbon footprint

What heats up the planet earth more, eating of daily bread or driving to work in a small car? The foods, people eat have a bigger role in global warming. The carbon dioxide (CO₂) emissions of some of the food items are given in Table 2. While calculating the carbon footprint of milk, methane emissions from cows and buffaloes have also been considered. For example, a moderately active male on a 2000 kilo calorie diet, and all he eat in a day is plain bread (untoasted and no butter), his food has produced 1 kg of CO₂ by the time it reaches to his plate. What if he got half of his calories (1000 kcal) from egg? The number would jump to about 5 kg of CO₂. If eggs are replaced with meat, CO₂ footprint would still be 3 kg.

Zero-hunger programme

The Government of India has identified three districts, namely Gorakhpur in Uttar Pradesh, Koraput in Odisha, and Thane in Maharashtra to launch India's ambitious, Zero Hunger Programme (ZHP) through appropriate

interventions in farm sector on 16 October 2017, the World Food Day. This will be followed by an expansion of the ZHP to cover more districts and it will work in synchronized manner with United Nations mandated Sustainable Development Goals (SDGs) to end hunger by 2030. This will serve as the model for an integrated approach to deal with hunger and malnutrition by adopting sustainable agricultural and horticultural practices coupled with livestock farming/husbandry (Fig. 1).

The pilot programme on zero-hunger will be initiated by the Indian Council of Agricultural Research in association with the Indian Council of Medical Research, MS Swaminathan Research Foundation and the Biotechnology Industry Research Assistance Council. Also, the concerned state government will be involved in the programme which will consist of organizing farming systems for nutrition; setting up genetic gardens for bio fortified plants/crops; post-harvest management and value addition in the production catchment; remunerative procurement price for agriculture and livestock produces; and training and financial incentives to farmers for integrated farming systems and to small agri-entrepreneurs for post-production management. A genetic garden for bio-fortified plants/crops contains the germplasm of naturally biofortified crops or such crops through plant breeding. It has plants and crops that help supplement micro-nutrient deficiencies, including iron, iodine, vitamin A and zinc among others. It is hoped that such an integrated programme will help farmers to enhance their income and achieve the zero hunger district goal surely and

Table 2. The cost of 100 kilocalories of metabolic energy from various food items in CO₂ emissions

Food items	CO ₂ emissions per 100 kcal of energy, g	Remarks
Bread	50	An appropriate combination of food items to have a nutritional/energy wise balanced diet and minimum CO ₂ emission, need to used
Chocolate	59	
Cake	81	
Meat	250	
Milk	350	
Eggs	440	
Tinned vegetables	790	

A small compact car would generate about 98 g of CO₂/km





Fig. 1. Sprouted grains, horticultural and livestock produces would help to achieve better nutritional security through an appropriate combination, to form a nutritionally balanced and healthy diet.

speedily. The Zero-Hunger Programme planned in three districts, Gorakhpur, Koraput and Thane will focus on agriculture including livestock, nutrition and health in a symbiotic manner and serve as a pilot project on zero-hunger to be adopted countrywide in the near future to achieve the goal of Zero-Hunger by 2030 A.D.

Challenges ahead

The challenges ahead are to meet the food and nutritional requirements of the ever increasing Indian population that too under multiple constraints like depleting water resources, diversion of human capital from agriculture, shrinking farm size, soil-degradation, indiscriminate and imbalanced use of chemical inputs and overarching effects of changing climate. A consistently low investment over the last two decades in agricultural research for development (0.3% of agricultural GDP) further complicates the problem. Therefore, ensuring the availability of and economic access to food, in both quantity and quality (nutrition), for the poorest of the poor in the country remains a daunting challenge. The way forward is to reorient agricultural research for development by addressing the needs of resource-poor small holder farmers and consumers. It also envisages a major paradigm shift towards an integrated farming system's research with greater thrust on innovations for greater impacts on small-farm holders requiring partnerships among stakeholders.

Empowering women

It is well recognized that women empowerment is quite important for

both agricultural growth and household nutrition security. Globally, about 43% women are engaged in agriculture. In India, 60% of farming operations are performed by women. Therefore, agriculture can be a primary driver for the empowerment of women. Innovations improve their work efficiency but would also ensure overall household development and nutrition security. However, women in agriculture are invariably deprived of access to agricultural knowledge, credit, technology to overcome their drudgery and market related services.

As a consequence, it is expected that engendering agriculture would lead to reduction of undernourished people globally by 12-17%. Hence, technology generation relevant to women farmers and its adoption should become an important agenda for future agricultural growth.

Retaining youth in agriculture

The ageing population of farmers and declining interest among rural youth to take up agriculture as a profession are challenges for agricultural sustainability not only in India but also in other countries of the world. A large section of youth invariably prefers to migrate to cities to seek employment, especially the government jobs. Hence, a major challenge today is how to retain youth in agriculture, which certainly cannot be left unaddressed. The declining interest of rural youth in agriculture is directly related to existing poor physical amenities, socio-economic conditions and lack of enabling environment. Economic factors such as low paid employment, inadequate credit facilities, low profit

margins, and lack of insurance against crop failure are also discouraging youth to get engaged in agriculture. Social factors include public perception about farming, especially the parental desire that their children should opt out of agriculture are also the reasons for choosing occupation other than agriculture. Environmental issues include poor soil-health, non-availability of water for irrigation and climate change. Concerted efforts are thus needed to stimulate their interest further by expanding their horizon and understanding of secondary and speciality agriculture for enhanced income and avoidance of risk factor in agriculture. Proper incentives for their involvement in agricultural education, research and extension and by linking them to the expanding markets will, therefore, have positive effects in attracting youth in agriculture. Earlier seed, pesticide, fertilizer and farm machinery were the only potential sectors to employ agricultural graduates/rural youth. Now new opportunities are emerging in IT linked agri-extension, seed technology, biotechnology, food processing, cold storage, packaging, supply chain management, insurance and farm credit. Private sector and NGOs are also engaging the rural youth now. In this context, greater thrust on vocational training of youth (including female) is urgently needed for relevant skill acquisition, greater confidence building and to serve as 'Technology Agents' to provide efficient knowledge/service on custom hire basis. It is high time that all out efforts are made at all levels to engage youth in multifarious activities around 'Plough to Plate' so

as to make farming both attractive as well as lucrative profession. Knowledge-based agriculture around secondary and speciality agriculture can obviously enhance opportunities for additional income for the youth. Peri-urban agriculture, contract farming, protected cultivation, establishment of self-help groups or producer companies offer additional opportunities for youth to remain in agriculture.

Role of private sector, especially through involvement of youth and gender in agriculture, becomes most relevant in the present situation. Hence, empowering youth (both men and women) through vocational training and building a cadre of 'Technology Agents' to provide technical backstopping as well as customer hire services to the smallholder farmers will go a long way in linking research with extension for accelerating agricultural growth. In other words, we need to link now 'land with lab', 'village with institute' and 'scientists with society' to ensure faster adoption of resource saving technologies that would benefit both producers and consumers. In the process, the Agriculture Technology Agents will become 'job creators and not job seekers' and provide on farmers doorsteps the best technologies as well as quality inputs. Another strategy could be to create 'Agri-clinics', where technology agents could join hands to ensure single window system of advisory services so that farmers need not run from pillar to post. In fact, a good farmer is more knowledge hungry and not so

much dependent on government subsidy. Once convinced, the farmer is willing to take risk and invest in adopting new innovations.

The way forward

Agriculture in India must liberate the region from twin scourges of hunger and poverty and that of malnutrition of children and women. The nation must continue to feed the increasing population with adequate food supply. Accelerated science and innovation-led agricultural growth must be inclusive and should address the needs and aspirations of resource-poor small holder farmers in the country. Under the growing challenges of resource degradation, escalating input crisis and costs with overarching effects of global climate change, the major gains in food production would largely depend in future on a paradigm shift from integrated germplasm improvement to that of integrated natural resource management. The future agricultural research for development efforts by National Agricultural Research and Extension System (NARES) must now be reoriented towards farming system's approach, ensuring farmers participation. Also we need to employ more innovative ways for an effective dissemination of knowledge and lay greater emphasis on out scaling innovations for needed impact on livelihood of smallholder farmers. Henceforth, 'Farmer First' is our goal so as to bridge the income divide between farmers and non-farmers and benefit equally the producers and consumers. To ensure this, the developing countries like India must

enhance their investments (almost triple) in agricultural research for development to address effectively the emerging challenges and ensure food, nutrition and environmental security.

SUMMARY

To summarize, it may be said that follow an integrated and intensive farming system to have higher and sustainable agricultural and livestock production and productivity; process the produces in the production catchment to minimize post-harvest losses and get better quality fresh and processed products for consumers; have an economic utilization of agricultural residues, wastes and processing by-products for feed and/or compost to enhance animal health and soil fertility for better productivity; do the marketing of fresh and value-added products through designated cooperative bulk and/or retail markets with minimum possible number of middlemen/intermediaries; have more employment for rural men and women and thereby more income to farmers/producers of raw materials. All these when planned and implemented successfully, the rural/urban gap in prosperity and living comforts would be minimized and people may start reverse migration from urban to rural areas in search of better food, environment, health, happiness and longevity.

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Jai Kisan, Jai Vigyan

- A total of ₹ 788.33 crores have been sanctioned for opening six new agricultural colleges for eastern India under Central Agricultural University, Imphal, and a new Central Agricultural University in Meghalaya.
- For the establishment of two new agricultural research institutes in Asom and Jharkhand, a sum ₹ 100 crores is allocated.
- First academic session of the Rani Lakshmbai Central Agricultural University has been allocated for four new agricultural colleges in Datiya and Jhansi.
- An Memorandum of Understanding was signed for transforming the Rajendra Central Agricultural University, Pusa, Samstipur, Bihar. A proposal of ₹ 400 crores is submitted in EFC.
- Post-Graduate Institute of Horticulture is being established in Amritsar, Punjab.
- Foundation stone of the Indian Institute of Agricultural Biotechnology is laid at Ranchi for promoting agricultural biotechnology.

