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Agriculture and Food Policy for the Five Trillion Dollar Economy

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
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Preface

Agricultural growth is influenced by natural resource endowment, investment and policy interventions by the government. The vision of Hon'ble Prime Minister of making India a five trillion dollar economy by 2024-25 underscores the need for acceleration of growth in different sectors of the economy and achieving global competitiveness. Agriculture being the major source of livelihood to millions of people, assumes significance to help achieve the target and it needs to contribute about one trillion dollar value to the national economy. The focus of the Government on farmers' income has already resulted in greater convergence of the schemes for agriculture. This new goal would further accelerate agricultural growth and contribute to overall economic development. However, there is a need to outline the key issues and prepare a roadmap for the future. The strategy should unleash the potential of innovations and institutions with a proactive policy support. In this context, the National Academy of Agricultural Sciences organized a brainstorming session on October 14, 2020 to focus on agriculture and food policy.

This paper presents the outcome of the discussion on the important policy issues, and identifies the potential sources of agricultural growth. The paper also highlights the implications of higher income for changes in food consumption. I am grateful to all the participants for sharing their experiences and insights. I, on behalf of the Academy, thank Dr Suresh Pal, convener, and his colleagues for organizing the brainstorming session. My sincere thanks to Dr Pratap S. Birthal for useful comments on an earlier draft of this paper.

(Trilochan Mohapatra)
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June 2021
New Delhi

Agriculture and Food Policy for the Five Trillion Dollar Economy

1. BACKGROUND

On August 15, 2019, Hon'ble Prime Minister of India shared his vision for making the country third largest economy in the world by setting a target of five trillion dollar by 2024-25. This requires 84% increase in the gross value added (GVA) at current prices, from 2.71 trillion[1] dollar in 2019-20, i.e. an annual growth of 13.2%. The growth in GVA, even though higher than the growth achieved (10.3%) during 2014-15 to 2019-20, would not have been difficult to attain in a normal situation. The Economic Survey 2019-20 indicated that India's aspiration for this target can be achieved through fostering wealth creation. Based on the sectoral composition of the economy, a working group tasked to prepare the roadmap, has recommended a target of three trillion dollars for the services sector, and one trillion dollar each for the manufacturing and agricultural sectors (GoI, 2019a).

Agriculture engages 44.5% of the total workforce and contributes 17.5% to the gross domestic product (GoI, 2019b; 2020a). This heavy dependence of the workforce makes agriculture a critical sector to foster inclusive economic growth. Reflections in the past reveal that agriculture sector has transformed the country from a food-deficit to food self-sufficient economy with a net exporter of several agricultural commodities. Agricultural trade has emerged as a major revenue source with a net foreign earnings of about one trillion Rupees annually. Lately, Indian agriculture is moving towards commercialization and can strengthen direct and indirect linkages between farm and non-farm sectors. Such linkages would generate income and employment opportunities within and outside agriculture, and would lead to a fillip in the overall economic growth.

Development of agro-based industries would foster structural transformation and accelerate commercialization. Value-added and processed food products, textiles, apparel and leather products constitute 22.7% of the gross value added from the manufacturing sector. Agriculture, as the source of raw-material, immensely contributes to the growth of agro-based industrial products. This indicates a huge potential for value-addition and processing of farm products, which may lead to many opportunities for investment (both domestic and foreign investment) and growth. Further, increased use of purchased inputs (seed, fertilizers, pesticides, farm machinery and farm services) can make agro-input market an attractive investment venture for business sector. Unleashing the potential of agriculture, therefore, assumes priority in realizing the target of five trillion dollar economy. This paper summarizes the growth potential and policy reforms in agriculture, so as to help achieve the target of five trillion dollar economy.

[1] At an exchange rate of Rupees 75 per US dollar.

2. AGRICULTURE AND FOOD CONSUMPTION

2.1. Trends and patterns of agricultural growth

While agricultural sector as a whole grew at an annual rate of 3.2% during 2011-12 to 2018-19, livestock and fisheries grew at 7.5% and 9.6%, respectively, which is higher than the overall economic growth (7%) during this period. In the crop sector, horticultural sector has done comparatively better. The growth during the last two years has been quite impressive in agriculture despite the pandemic. The growth status is very interesting at the state level. In terms of land productivity[2] (defined as the ratio of the value of agriculture and allied activities to the net area sown), four states Madhya Pradesh (including Chhattisgarh), Andhra Pradesh (including Telangana), Tamil Nadu and Odisha have registered an annual growth rate of more than 5%, and seven states (Gujarat, Haryana, Jammu and Kashmir, Bihar (including Jharkhand), Maharashtra, Rajasthan and West Bengal) grew at 3-4%. Most of the states performed considerably well; especially the ones with low productivity, which grew faster, characterizing inclusiveness of the growth.

Figure 1. Trend in GVA from agricultural sector and its components, 2011-12 to 2018-19.
Source: GoI (2020a); GVA (Crops) is on the secondary axis

2.2. Export performance

Agriculture has emerged as a major source of foreign exchange earnings through export of raw materials and processed foods. However, India still depends on imports for meeting its domestic demand for some of the food commodities, mainly edible oil. During the past three decades, value of exports has remained higher than imports, showing a rising trend in the net exports (Figure 2). In 2017-18, the trade surplus was Rs 0.9 trillion. The value of the net export in the long-run attained a peak in 2013-14. Subsequently, export growth was lower than the imports, reflected in the declining trend in the export to import ratio (Figure 3). This strongly points out for developing strategies for stable export promotion.

[2] Measured in real terms (2011-12=100).

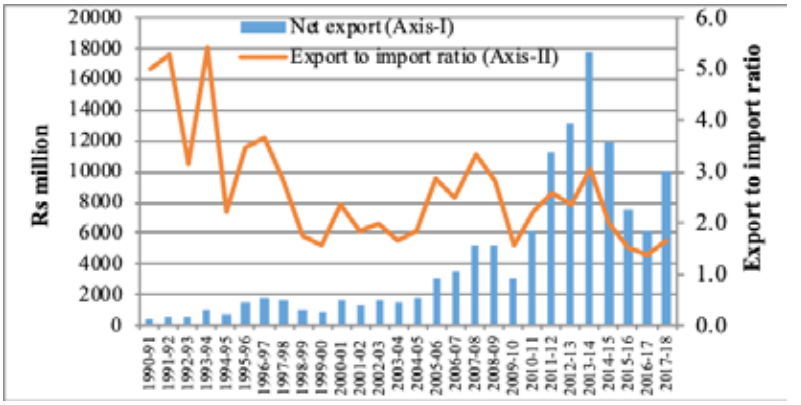

Figure 2. Trend in net agricultural export and export to import ratio
Source: GoI (2020b)

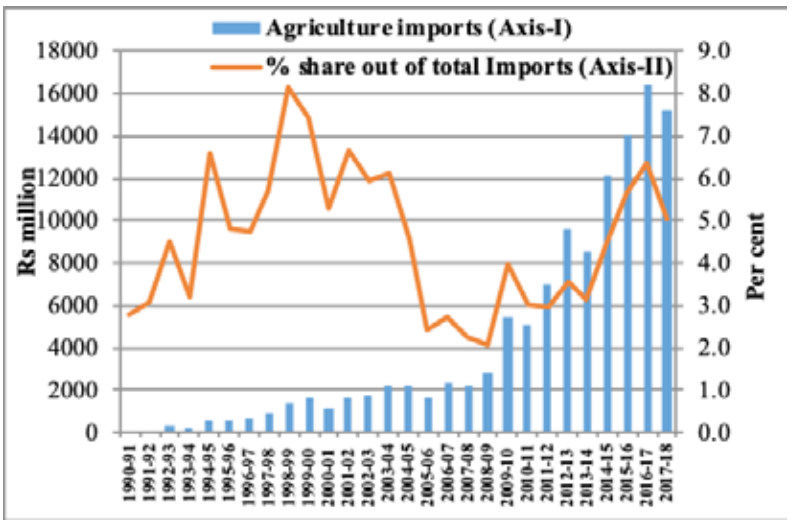

Figure 3. Trend in agricultural import and its share in total import
Source: GoI (2020b)

The share of agricultural imports in the total imports started reversing since 2008-09, i.e. it increased from 2.1% to 5.1%. Edible oils constitute half of the agricultural imports. Other major imported food items are pulses (14.92%), fresh fruits (7.52%), cashew nuts (5.73%), sugar (4.07%), cotton (3.99%), spices (3.83%) and wheat (3.43%). Acceleration in the production of major imported food items, mainly edible oils and pulses, should be the main focus of import substitution strategy. The success has been achieved in case of pulses, but self-sufficiency in edible oils is still a challenge. The strategy should take into consideration the principle of comparative advantage in terms of natural resource endowments.

2.3. Natural resources use in agriculture

Over the years, average land holding size has declined in India, reaching 1.08 hectares. About 68.5% of the operational holdings are marginal (<1 hectare) with an average size of 0.4 hectare. The marginal and small holdings (<2 hectares) together constitute 86.2% of the total holdings. In many parts of the country, this shrinking size of holding is accompanied with land degradation and deterioration of soil health. According to the Report of the Committee on Doubling Farmers' Income (GoI, 2017a), 120 million hectares of the arable land suffers from one or the other types of land degradation, and 29.4 million hectares has shown lower fertility with an annual negative balance of 8-10 tonnes of nutrients. In most of the soils, the organic matter content (SOC), essential for maintaining their physical, chemical and biological properties is low (about 0.5%). The above facts indicate an urgent need to reorient existing land management practices towards preservation and enhancement of soil fertility.

Per capita water availability in India has declined from 5178 m^3/year in 1951 to 1441 m^3/year in 2015, lower than the water-stressed norm of 1700 m^3/year (GoI, 2019c). Agriculture is a predominant consumer of water (about 84%), and inefficient use of freshwater in agriculture is a major cause of water scarcity. The actual consumptive use—the portion that is actually used for the net evapotranspiration of crops—is only 41% at the national level (IWMI, 2009). The difference between consumptive use and actual water withdrawal shows a considerable scope for improvement in water-use efficiency and saving of irrigation water.

Although irrigation infrastructure has significantly improved over years, the existing irrigation cover is only 48.8%, with wide regional variations (Srivastava *et al.,* 2014). Owing to rising dependence on groundwater for irrigation, water table is declining rapidly. Of the 6881 assessment units (Blocks/Mandals/Talukas/Firkas), 17%, 5% and 14% have been reported to be over-exploited, critical, and semi-critical, respectively (GoI, 2019d). Depleting groundwater resources are in a way disturbing ecological balance besides creating heavy financial burden on farmers. The surface (canal) irrigation system suffers with unreliable water supply, poor maintenance and high inefficiency. It is estimated that with a 10% increase in water-use efficiency of irrigation projects, an additional 14 million hectares can be brought under irrigation. The estimates indicate the potential to increase water-use efficiency up to 60% from the existing level of 35-40% (GoI, 2019c). Even a moderate 20% improvement in water-use efficiency may result in huge saving of water. The National Water Mission has developed a framework to optimize water-use efficiency by 20%. Water-use efficiency can be improved through modernization of distribution channels, institutional innovations like participatory irrigation management, and water-efficient technologies (Srivastava and Pal, 2020).

2.4. Consumption pattern and nutrition status

According to the Consumption Expenditure Survey of the National Sample Survey Office (NSSO-CES), 2011-12, Indian households spend on an average 44.3% of the total expenditure on food, mainly on cereals and dairy products (Table 1). The share of cereals, pulses, edible oils and vegetables in the total food expenditure is higher among the lower income groups, and

the share of milk, fruits, non-vegetarian products and other foods (including processed foods, dry fruits, beverages, etc.) is higher among the higher income classes. This indicates that with the increased income, households diversify their food basket with high value food commodities (HVFCs). Food consumption pattern at USD five trillion economy level may be more diversified towards HVFCs, and would affect resource use in agriculture.

The level and composition of food consumption determine nutritional status of the households. The NSSO surveys show a decline in per capita intake of calories and protein, and an increase in fat intake beyond desirable limits. Income appears to be a major factor influencing access to food and thus the nutritional status of the household. Srivastava *et al.* (2016) observed positive marginal improvement in calories intake with the change in household income. The response observed was higher among rural and poor households as compared to urban and rich households.

Table 1. Decile class-wise consumption pattern in India in 2011-12

Items	Decile classes										
	1	2	3	4	5	6	7	8	9	10	All
Total expenditure (Rs/capita/month)	533	711	839	959	1098	1260	1470	1774	2311	5033	1599
% share											
Non-Food	38.7	40.4	42.0	43.3	45.4	46.9	49.3	52.6	56.9	71.3	55.7
Food	61.3	59.6	58.0	56.7	54.6	53.1	50.7	47.4	43.1	28.7	44.3
Cereals	34.6	31.7	29.1	27.4	25.7	24.2	22.9	20.9	19.1	14.8	22.7
Pulses	8.0	7.5	7.5	7.3	6.9	6.8	6.7	6.4	6.0	4.9	6.4
Edible oils	9.3	9.1	8.7	8.4	8.1	8.0	7.8	7.3	6.8	5.5	7.4
Milk	8.1	11.5	14.0	15.9	18.1	19.5	20.2	22.3	23.4	22.2	19.2
Fruits	1.0	1.4	1.6	2.0	2.1	2.5	2.8	3.2	3.8	4.8	3.0
Vegetables	12.9	11.7	11.2	10.7	10.1	9.8	9.7	9.2	8.8	7.4	9.5
Non-veg	5.2	6.5	6.7	7.0	7.3	7.5	7.6	7.8	7.9	7.4	7.3
Other foods#	21.0	20.6	21.1	21.4	21.7	21.6	22.3	22.8	24.2	33.0	24.4

Note: Decile classes are based on monthly per capita consumption expenditure (MPCE); Other foods include dry fruits, beverages, snacks and processed items, cooked meals taken outside home, spices, sugar and salt

Source: Conveners' estimate

3. STRATEGIES FOR ACHIEVING FIVE TRILLION DOLLAR ECONOMY

The Department of Industrial Policy and Promotion (DIPP) formed a working group to prepare a roadmap to achieve the target by 2024-25. Based on the sectorial composition of the economy, the group recommended services sector to contribute three trillion dollar, and manufacturing and agriculture each to contribute one trillion dollar. In the following sections, strategies have been discussed for realizing the growth target for agricultural sector.

3.1. Sources, and their potential for agricultural growth

The gross valued added (at the current prices) from agriculture and allied activities was 0.39 trillion dollar in 2018-19. To reach one trillion dollar by 2024-25, the sector must grow annually at 17%. During 2011-12 to 2018-19, agricultural growth (at current prices) was 10.5%[3]. This is a herculean task in a business-as-usual scenario, and it indicates the need for a paradigm shift in the existing institutional and policy framework to address agricultural challenges. This implies identifying regions with higher growth potential and devising appropriate strategies to direct the states towards the targeted growth.

Most states in the recent past have performed reasonably well. A significant achievement has been of the poorer states. In fact, the poor states surpassed the growth of high productivity states -- West Bengal, Kerala and Punjab, whose annual land productivity was more than Rs 0.18 million per hectare in real terms (2011-12=100) in 2011-12. In the same year, productivity in Madhya Pradesh (including Chhattisgarh) was only Rs 56,000 per hectare. While Kerala registered a negative growth and Punjab showed a rate of 2% during 2011-12 to 2018-19; Madhya Pradesh (including Chhattisgarh) had an impressive growth of 7.4%.

During the period, Madhya Pradesh (including Chhattisgarh) and Odisha recorded an annual growth of more than 5%; while Rajasthan and Maharashtra had growth above 3%. In 2011-12, these states were at the bottom of productivity pyramid, but since then their productivity increased between 1.2 and 1.7 times. The higher growth has essentially been due to higher returns to investments. They had grown faster even earlier (Balaji and Pal, 2014); and it is presumed that they would continue to do so in the near future. This compulsively indicates for further investment in these states, and given the changes in the composition in agricultural outputs in favour of high value food commodities, the returns on the investment can be even higher in future.

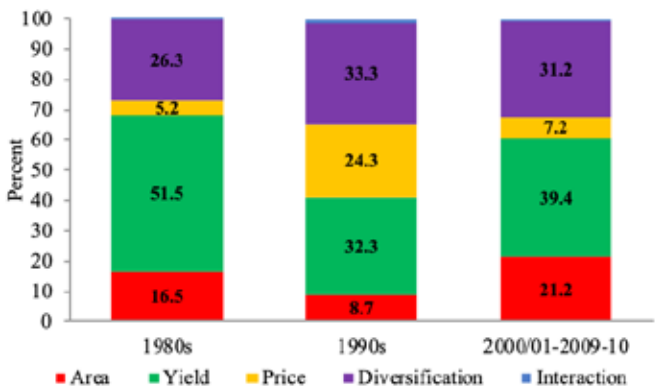

Figure 5. Sources of growth in crop-sector over time
Source: Birthal et al. (2014)

[3] In real terms, it was 3.3 %.

Birthal *et al.* (2014) observed limited prospects of growth through area expansion due to land constraints (Figure 5). The possibility of growth, therefore, lies in the intensification of the existing crop land. They observed a decline in the relative contribution of yield improvements to agricultural growth, which is a matter of concern. This warrants raising the level and efficiency of investments in agricultural research and development. Output prices also play an important role in stimulating agricultural growth, but this price-led growth may not be sustainable as this may add to inflationary pressure. Growth, in a way, can come from technological advancements and diversification. For the latter, it is essential to improve market infrastructure to reduce transportation cost. The contribution of diversification in agricultural growth is sustainably rising, and presents an ideal opportunity to smallholders to enhance their income.

3.2. Diversification

Tracing growth sources over time revealed that diversification was a significant contributor to the growth and farm income (Figure 5). Its share in the growth was 26.3% in 1980s and over one-third during 1990s and 2000s (Birthal *et al.,* 2014). At present, the share of livestock and fisheries has risen to more than a third of the total agricultural output (36% in 2018-19), and fruits and vegetables have surpassed the value of cereals (Rs 3.7 trillion and Rs 3.6 trillion respectively in 2017-18 in real terms). In several states, the allied activities have emerged as the major source of growth. For instance, livestock sector has grown at more than 8% per annum in Andhra Pradesh, Bihar, Madhya Pradesh, Tamil Nadu, Rajasthan, Himachal Pradesh and Jammu and Kashmir during 2012-18 (Pal *et al.,* 2020). In fisheries, growth was more than 10% in Odisha and more than 20% in Andhra Pradesh.

With rising per capita income and rapid urbanization, consumption patterns are changing, which have led to increase in the demand for milk, meat, fruits and vegetables. Promoting diversification further would accelerate agricultural growth, and hereby the desired strategy should be the introduction of high value and newer crops in agro-climatically suitable regions. Poultry sector also has high growth potential because of high consumer demand. Given the observation that marginal and small farmers would gain higher net returns from high value agriculture than staple crops like rice and wheat, the process of diversification would raise standards of living of smallholder farmers. Better access to feed and fodder and quality semen for AI would result higher contribution from livestock sector. Diversification is yet at a slow pace on account of lack of financial resources, poor access to markets and processing infrastructure, high price volatility, and lack of skills for local manufacturing of value- added products.

3.3. Land reforms

Liberalizing and legalizing agricultural land leasing have been found useful in promoting efficiency in agriculture. Such a system secures rights of informal tenants, who usually may not have sufficient proof for the land they operate. Further, reforms are necessary to facilitate investment in land improvement by tenants (GoI, 2016). Evidences are suggesting disappearance of productivity gaps on leased-in and owned-land in Karnataka and West Bengal due to tenancy reforms (Haque, 2003). Informal tenancy is widely prevalent in many states, and lack of proper land records has caused 1.3% loss in GDP (GoI, 2017b).

During the past seven years, 350 agricultural infrastructure projects, notably irrigation projects, have been stopped/stalled due to land related conflicts. Liberalizing land market with proper legal arrangements that ensure rights of the owners and the tenants is important for harnessing scale-economies in the production. Modernizing land records and resolving conflicts associated with land rights and other agricultural infrastructure projects would attract investment in agriculture. Village common lands for leasing and consolidation of land holdings on priority would go a long way in increasing agricultural productivity.

3.4. Investment

Investment is utmost needed for agricultural diversification, development of market infrastructure and export promotion. But the rate of investment has remained comparatively low to output growth. During 2011-12 to 2018-19, while GVA grew by 3.2% a year, public investment in agriculture was not much and it grew only by 1.3%[4]. And in the domain of agriculture, substantial differences exist across sub-sectors in resource allocation. Livestock sector remains under-invested; it shares only 11% of the total agricultural investment. The crop sector accounts for 81% of the investment. This difference can be attributed to the nature of the sectors and large investment needs for irrigation. The prominence of agriculture and allied activities is visualized in boosting overall economic growth, which needs increase investment in different activities based on their growth potential to contribution to the target.

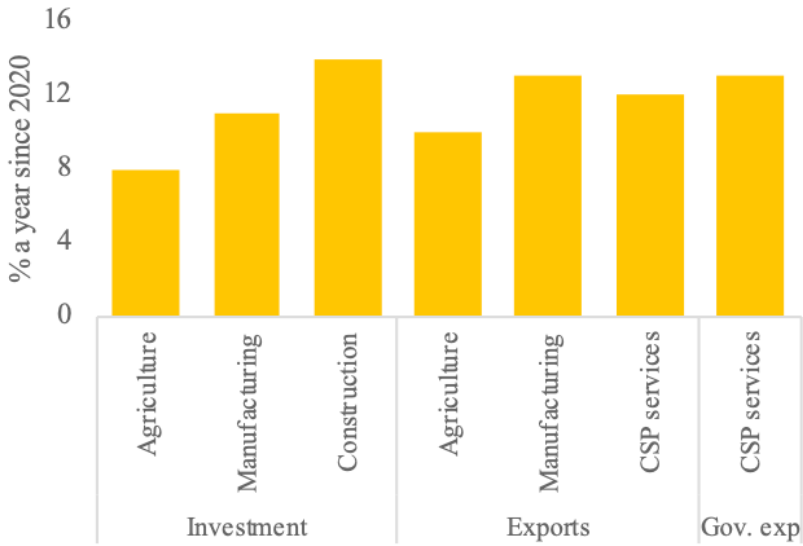

Figure 6. Required (real) rate of growth towards achieving the target of USD 5 trillion economy by 2025
Note: CSP stands for 'community, social and personal services'
Source: Conveners' estimates

[4] Investment comprises both public and private sectors. Estimates are derived based on the Agricultural Statistics at a Glance 2019.

A Social Accounting Matrix (SAM) based quantitative framework was used to measure the extent of increase in the capital required to realize five trillion dollar economy by 2024-25. This takes into account the parallel investments in non-agricultural sectors, exports across the sectors, and public expenditure requirements. The results show that in real terms (2011-12=100), growth rate of agricultural investment (public and private) has to be doubled from the present 4.2% a year (2015-19) to 8% during 2020-25; and exports growth needs to be tripled from 3.2% to 10% (Figure 6). This also indicates that investments in and exports of manufactured products should grow annually at 11% and 13%, respectively, and investments in construction at a rate of 14% during this period. Attaining the above mentioned rates of agricultural investment and export growth would require higher credit to farmers in the formal sector, especially for building long-term assets, and market reforms promoting the exports while curbing the imports.

Here, investments in agricultural research assume a critical role in addressing the challenges for fostering faster agricultural growth. The Indian agricultural research system is one of the largest and most productive research systems in the world with 58.5% median rate of return on the investment (ICAR-NIAP, 2020a). Yet, India underinvests in agricultural research. It invests 0.40% of agricultural GDP in agricultural research, much lesser than China (0.62%), Brazil (1.82%) and South Africa (2.0%). It is, therefore, imperative to increase the expenditure on agricultural research. Notably, investments in agricultural research are concentrated in public sector institutions; private sector contributes a small proportion of the gross expenditure on research as compared to 71% in China (Bera, 2015). For generation and dissemination of technologies in agriculture, efforts should be spearheaded to leverage academia-industry linkages.

3.5. Export promotion

Harnessing export potential of food commodities is another major activity to help meet the target. Since the structural reforms of 1990s, agricultural trade has generated surplus steadily till 2010 and at an accelerated rate afterwards. Now agricultural exports account for 11.9% of the national exports (2020), and imports are just 3.8% to the total imports. The Government of India has set a target to double agricultural exports by 2022. Focusing on the commodity profile, export growth of high foreign exchange earning commodities like spices has been 12.5% annually during 2015-2020, and marine products grew by 8.8%. Sugar (18.9%) and fresh fruits (13.5%) have gained substantial foreign market demand. The export growth of buffalo meat, rice (other than basmati), and cotton (raw) was moderate with a growth of 4-5%.

Enhancing exports also needs a focus on assessing global demands for Indian food commodities, ascertaining competition from other countries, and addressing challenges of quality standards. Pesticide residues in rice, salmonella and ethylene oxide in sesame seeds, and prohibited veterinary medicines in aquaculture are some of the issues that have raised concerns on the standards of Indian exports. This points out strict adherence to Good Agricultural Practices (GAP). Greater efforts shall be extended to comply with sanitary and phyto-sanitary standards at the successive stages (production and post-production) of value chains. Research on the value-chain in competing countries is to be strengthened for better competition, and strengthening of digital technologies to address the quality standards. Linking Farmer Producer Organizations (FPOs) and the Micro, Small and Medium Enterprises (MSME) with agricultural exports would

enhance export-led agricultural growth. Value-added products should be accorded priority while implementing export promotion strategies. This in a way requires augmentation of storage and processing infrastructure in the country by fostering private investment. The growth in the agricultural exports has to be tripled by 2025.

3.6. Revitalization of rural economy

India is predominantly a rural country; 68.8% of its population and 72.4% of workforce resides in rural areas. Further, steady transition to urbanization is leading to a decline in rural share of population, workforce and GDP. Rural areas are demarcated by low level of worker productivity and wide disparities (Chand *et al.,* 2017). A worker in rural India generates less than one-third of the income generated by an urban worker. To check on unplanned migration from rural to urban areas and to improve socio-economic conditions of the rural population, there is a need to strengthen rural economy through creation of sufficient employment opportunities.

Rural transformation must include strong measures for employment generation and shifting workers from farm to non-farm sector. Although the share of agriculture in rural net domestic product (NDP) has declined from 72.4% in 1970-71 to 39.2% in 2011-12, it still holds the key for rural transformation. Efforts should be extended to push agriculture-based industrialization as the main driver of growth in rural economy. In this context, cluster-approach may be adopted and agro-based special economic zones in rural areas may be promoted on a large scale. This would strengthen productive linkages between farm and non-farm sectors. Linking processing to production through efficient value chains, contract farming, and direct linkage between factory and farm offer considerable scope for rural transformation through income and employment generation.

3.7. Rural infrastructure and market reforms

The recent market reforms aim at increasing net gains to farmers and other stakeholders on the value chains through business investment in infrastructure for post-harvest management, storage, logistics and supply chains, and market connectedness. Associated policies like product-specific cluster approach for supply management, and channelizing farm inputs and outputs through Farmer Producer Organizations (FPOs) for intermediary management aim at boosting competition in the market. Attention has been paid sufficiently to promote MSMEs and to strengthen both forward and backward market linkages.

Apart from raising farmers' income and agricultural growth, agro-industrialization would complement rural employment generation, which in turn boost income growth and demand for agricultural commodities. The food processing sector shall act as a potential source for employment generation in rural areas and mostly it would be in MSME sector which shall need more capital and access to technology (Nithyashree and Pal, 2020). This is particularly true in the context of the pandemic lockdown and erosion of working capital of MSMEs. Farm mechanization would spare workers for industrial expansion. Along with the creation of a better regulatory environment, expansion of rural financial institutions, development of demand-driven skill, and promotion of entrepreneurship among rural youth would direct the rural economy towards higher growth trajectory. Developing e-commerce related service industries in rural regions, particularly in the field of services centres, input supply and product logistics, shall be the other potential source of growth.

3.8. Public- private partnership

Public and private sectors have synergistic relationship in agricultural development (Srivastava and Pal, 2020). The public sector is responsible for sketching path of agricultural development for maximizing social welfare, developing infrastructure and minimizing environmental externalities. Private sector can bring in innovative business models, processing infrastructure, efficient logistic management, and effective information technology and services support in developing efficient input and output markets. With the increased commercialization of agriculture, demand for off-farm inputs (quality seeds, fertilizers, plant protection chemicals, farm machinery) is expected to rise. These inputs are supplied largely by input manufacturing companies. Similarly, movement of food products from farms to consumers is mostly carried out by private players. The private sector can also supplement public food distribution system through storage and transportation support services. Thus, private sector has an indispensable role in entire value chain of agriculture commodities. As profit is the main focus of private sector, it can effectively disseminate technologies to farmers and can be a productive partner with public sector in delivering need-based technologies. A strong partnership between public and private sectors assumes importance in creating an enabling environment for acceleration of agricultural growth.

4. POLICY SHIFT TO UNLEASH THE POTENTIAL OF AGRICULTURE

The Government of India has created a congenial policy environment to unleash the potential of agriculture. One of the most important initiatives of the Government has been to reorient its policy towards investment, market reforms and farm income, along with continued focus on productivity growth. This would promote agriculture as a commercial enterprise and farmers as entrepreneurs. The efforts of NITI Aayog and Inter-Ministerial Committee on Doubling Farmers' Income (DFI) have suggested major sources of growth in agriculture and farm income. Creation of non-farm rural employment is also considered as one of the possible ways to augment farmers' income. For unleashing the potential of agriculture, it is envisaged that center and states should work together towards realizing the common goals.

In order to manage pressure on natural resources, address environmental concerns and promote sustainability of agricultural systems, incentives for ecosystem services, notably carbon sequestration, nutrient recycling and climate regulation become important (Pal *et al.,* 2018). While subsidies are irreversible in the short-run, to manage their negative consequences on the environment, these have to be linked with positive social and environmental outcomes. As increasing income and changing consumption style demand less staples for consumption, it is important to revamp food distribution system, both in terms of procurement and distribution. There is need to make it more decentralized and targeted, and promote efficiency of the operations like storage, transport etc. On increasing the role of institutional efficiency for better agricultural growth, it is necessary to facilitate (i) market functioning in the provision of financial products and credit, (ii) enforce contractual arrangement, and (iii) protect property rights. Meanwhile, traditional institutions functioning with people's participation should be promoted for natural resource management (Pal *et al.,* 2003).

To provide enabling environment for agriculture growth, the government has amended many existing Acts, and introduced structural reforms. Some of these are - The Farmers' Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020; The Essential Commodities (Amendment) Ordinance, 2020; The Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020; Model Land Leasing Act, 2016; Promotion of Farmers' Producers Organizations (FPOs), promotion of agri-business in clusters, etc. Further, concerted efforts and investment are being targeted to improve market infrastructure and logistics for export value chains. This shall make the post-harvest management and marketing better, improve value and foster production-consumption linkages. There is a need to monitor the impact of these reforms and inclusion of small farmers in the reform process.

5. IMPLICATIONS OF INCOME GROWTH

5.1. Food demand

The rise in per capita income at a level of five trillion dollar economy is expected to change the level and composition of food demand. It is important to foresee such changes and account for their effects on sustainable agricultural production. The likely effects on the consumption have been projected using expenditure elasticities, after accounting for population growth and incremental savings by the households. Per capita consumption expenditure (at the current price) is expected to increase by 58% over 2019-20. This will lead to increased food and non-food expenditure. Within the food basket, increase in demand (at the current price) would vary from 9 % for cereals to 75% for other foods (dry fruits, beverages, snacks and processed items, cooked meals taken outside home, spices, sugar and salt). Overall food expenditure is likely to increase by 43% (less than proportionate increase in income), and expenditure on non-food items may increase by 71%. Due to disproportionate increase in food and non-food consumption expenditure, the composition of food basket will undergo a drastic change; it will diversify towards high value food commodities.

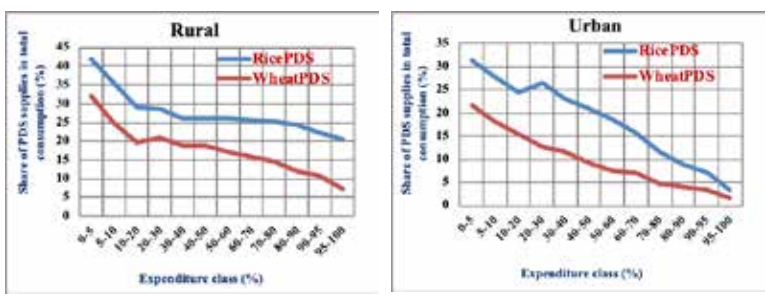

Figure 7. Expenditure class-wise share of PDS rice and wheat in their respective total consumption, 2011-12

5.2. Nutrition status

Nutrition status of the households is directly related to their income profile. Srivastava *et al.* (2016) estimated expenditure elasticities of calories as 0.23 for rural and 0.14 for urban households. In the five trillion dollar economy scenario, the calories intake is expected to increase by 11%, from

2,088 kcal/capita/day in 2011-12 to 2,318 kcal/capita/day in 2025. This will reduce incidence of undernourishment by 24%. Further, diversification of diets at higher level of income would contribute in alleviating malnutrition.

5.3. The production and resources-use

The per capita food production has been rising and seems to be sufficient to meet growing demand (Srivastava and Pal, 2020). But the production basket has been mainly grain centric. In Punjab and Haryana, the cereal basket of the country, sustainability of agricultural system has been observed to be compromised due to intensification of the rice-wheat system. There appears to be an urgent need to reorient cropping pattern matching with resource availability (Roul *et al.,* 2020). Birthal *et al.* (2015) pointed towards increased, frequency of (moderate) drought in rice -based production system in India. The climate change is expected to increase risk and uncertainties in agriculture. Given a large spatial variation and temporal fluctuations in rainfall, investment towards climate-resilient technologies and practices, particularly in rainfed areas is a must to improve stability in agriculture. Support like crop insurance must be extended to incentivize farmers to invest in farm business. Improving resource-use efficiency through adoption of improved conservation technologies is the potential option. There exists a huge potential to improve resource-use efficiency; for instance, only 11% of the gross irrigated area in the country is covered under micro-irrigation technology (Chand *et al.,* 2020).

Improvements in resource-use efficiency can be reflected in reduction in the production cost. Srivastava *et al.* (2017) observed higher growth in real cost of cultivation in the recent years than in gross revenue. This indicates efforts required towards improving cost efficiency in crop cultivation. Labour forms a larger share of the cultivation cost, and therefore labour management can help reduce the cost. Labour use can be substituted with the machines for many farm operations. In fact, increased farm mechanization has reduced labour use (Reddy *et al.,* 2014), but the pace of mechanization has remained inadequate to reduce wage push cost inflation, which is reflected from inelastic substitution of labour and machine (Srivastava et al. 2017). Consequently, the share of labour in the cost of cultivation has risen in the recent past. Therefore, farm mechanization needs to be accelerated through improving availability of and access to farm machineries. Another way to reduce the cost of production is to absorb rising cost through yield improvement; reflected from the negative values of yield elasticity of production cost. However, these elasticities are lesser than one; which implies that present pace of yield improvement is inadequate to absorb the rising cost. These evidences warrant technological upgradation and its large scale adoption by farmers.

6. IMPACT OF COVID-19 PANDEMIC

The COVID-19 pandemic has emerged as a biggest threat to livelihoods and the economy. Although the evidences show that agriculture sector is the least affected, the COVID-19 pandemic has definitely created disequilibrium in food value chains (ICAR-NIAP, 2020b). However, this can be taken as an opportunity to push conducive policy and institutional reforms, and foster investment to unleash potential of agriculture. Corrective actions are to be ascertained to negate the adverse effects of COVID-19 and bring back the economy at the pre-COVID-19 level and improve it further to achieve the growth target.

It is projected that due to COVID-19, the total household consumption expenditure in 2020-21 may decline by 6.36% to 26.68%; depending on the pace of recovering in the economy after the first quarter (Srivastava and Sivaramane, 2020). This will reduce food consumption expenditure by 4.98% to 21.24% and non-food expenditure by 7.69% to 32.79%. The households will reallocate consumption expenditure from non-essentials to essentials. However, the interventions of the central and state governments and civil society organizations through supplementary income and welfare measures may reduce the impact of COVID-19. For timely achievement of the target, it becomes all the more necessary to assess negative effects of COVID-19 on the economic growth and rework on the economic recovery and growth strategy. Strong demand-push measures are required to offset decline in the private consumption demand due to COVID-19. The Government has taken a number of steps to announce financial packages to boost demand and infuse capital in businesses affected by the COVID-19 lockdown.

7. RECOMMENDATIONS

i. The target of achieving five trillion dollar economy by 2024-25 would require doubling of agricultural growth taking the base growth during the past five years. But owing to slowdown in the economy due to COVID-19, the timeframe to achieve the target may be revisited. In the case of agriculture, identification of potential growth regions and development of region-specific growth strategies are required. This shall also promote inclusiveness in the growth process.

ii. Public investment has been a major source of growth in Indian agriculture, and the rate of investment growth should be doubled. Reviving surface irrigation, expanding rural infrastructure, and strengthening farm support services like R&D are important priority areas for higher investment.

iii. Subsidies to agricultural sector should be reoriented to focus on the productivity, sustainability, and improved environmental outcomes. Similarly, an incentive mechanism should be developed in agriculture for generating ecosystem services, and DBT programs should be linked to improve resource-use efficiency, economize the cost, and promote conservation of natural resources.

iv. The diversification would continue to be the main source of growth in agriculture and farm income. The diversification process shall be driven by high value products like livestock products, fruits, vegetables and fish. Technology, institutions and market infrastructure must support this diversification process. In case of livestock, increasing feed and fodder supplies, animal health service, and sex semen technology would go a long way in contributing to the productivity growth.

v. Land reforms and land-lease market are necessary to attract farm household investment and increase the scale of operation in agriculture. For this, modernizing land records, adopting Model Tenancy Act, and resolving conflicts in the contracts are necessary. Similarly, leasing of common and degraded lands should be accorded high priority for their restoration and generation of useful services for local communities. These reforms are in the domain of states. Modernization of land records can also

help target other government schemes like PM KISAN, and giving benefit directly to farmers under other schemes.

vi. Indian agriculture has reached a stage where management of surplus production and exports are essential to maintain the domestic prices and enhance farmers' income. This should go beyond the target of doubling agri-exports by 2022. A long-term strategy focusing on assessment of global market and competitiveness, modernization of infrastructure, good practices for food safety along the supply chains, and application of digital technology to manage the supply chains and trace the origin should be in place. The Government has taken steps in this direction, but prioritization of the markets and products by the agency like APEDA and DoC is necessary for immediate gains.

vii. Science, technology and innovations (STI) shall continue to be the main drivers of agricultural growth and development. Given the R&D challenges and likely contribution of STI in addressing the Sustainable Development Goals, research investment in agriculture should be doubled. Besides continuing emphasis on advancement of science and efficiency and sustainability of agricultural systems, food safety and quality, diversification and value creation for higher farm income, and better environmental outcomes, including building climate resilience system should be targeted. Interface between science and policy should be stronger in future and therefore evidence based policy making should be strived.

viii. Business sector's participation in agri-logistics shall determine the pace of agricultural development and value creation. Business opportunities, ease of doing business, risk management, and rural infrastructure like road, electricity and digital connectivity, shall play a greater role in attracting the business investment. Secondary agriculture and agri-value chains are in the business domain. Mostly MSMEs dominate this sector, which needs modernization by access to capital and credit. The restructuring of the loan due to the pandemic shall be instrumental in revival and modernization of MSMEs.

ix. For agricultural development, it is necessary that the Centre and the States work together and also seek participation of farmers in the local governance of development programs on the pattern of participatory management of irrigation and community forest. The initiative of the government to promote Farmer Producer Organization (FPOs) is a welcome step and these may need development of skill to manage the organizations and their business. State line department and KVKs can play a greater role in imparting entrepreneurship to FPOs.

x. The per capita income in the five trillion dollar economy shall be much higher to influence the consumer demand in favour of high value, quality products. Therefore, the production needs to be realigned with the changing demand for food and non-food agri-products. A significant increase in the per capita income would also alter the dependence of a section of the society on the public distribution system and

therefore the government may revisit the target beneficiaries and the mode of assistance under PDS after the economic revival.

xi. The five trillion dollar economy will also involve structural changes in different sectors of the economy, investment and employment, sectoral demand and external linkages like export-orientation. The national and international institutions with capacity in advanced simulation modelling in a general equilibrium framework should analyze the economy-wide scenarios.

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