

Chapter 10: Miscellaneous

Short Answers

CSM 05: Agriculture

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This chapter contains:

- Minor Forest Produce
- Support Tools
- Operationalising DFI Strategy
- Post-production Activities and Infrastructure
- Strategy and Approach
- Potential and Challenges
- Targeting the Outcome
- Crop Diversification and Post-production Management
- Analysis of Changes on Input Costs and Crop Income

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1. Minor Forest Produce

Tribal Society and Cultivation Practices

As per 2011 Census, the Tribal community population of the country accounts for 8 per cent. While the tribal population is spread across the nation's geography, the concentrated pockets mostly pan across the Central Indian, Eastern and North-Eastern States. In a number of eastern states like Jharkhand, Odisha and Chhattisgarh the tribal population goes up to as high as 23 per cent, and within these states there are districts with tribal community as the majority population. The social and economic life of these communities is woven around the forests; dwell as they amidst the forests.

In majority of such areas, not only is agricultural land not settled under individual ownership and continues as community owned land, the practice of agriculture is also not sustainable. Since agriculturally fertile land as the ratio of the total land in their dwelling region is less, the tribal society practices shifting cultivation along the slopes of hillocks which goes by different names like jhum, podu, etc. The practice in essence is slash and burn, where under the vegetation is put to fire during summers and the land is readied for raising millets and pulses. After raising the crops in successive years for about 3-4 seasons, they move onto the next hillock, to let the cultivated space rejuvenate. The cycle of such cultivation has gradually dwindled on account of growing population and restrictions brought under the Forest Act, making cultivation unsustainable.

The tribal communities gather different kinds of 'minor forest produces' (MFP) from the forest areas and this constitutes a major source of income.

Changing Forest Laws

Over the civilizational times, the traditional forest was a mixed forest that yielded a range of non-timber forest products (NTFP). These encompassed tree/bush borne oilseeds, fruits, flowers, roots, shoots, leaves, bark and herbs. They were the source of food and medicine, apart from constituting the ecology.

The rights of forest were entirely usufructs rights, which meant that there was no claim over the land. The Forest Act, 1927, changed the nature of relationship between the tribal society and the forests as the latter came to be notified as 'out of bound' for the tribal communities. With this piece of law, the tribal communities who had been living in symphony with forests for ages came to be rendered as trespassers. While this position continued for many decades, including after independence, the provisions of the Panchayats (Extension to Scheduled Areas) Act, 1996, commonly known as 'PESA' made a favourable breakthrough in favour of the tribals. However, while the Act conferred the

ownership of 'minor forest produces (MFP)', it did not define the term leaving a critical lacuna. In addition, no mechanism was provided for framing of rules at state level, so that a clear definition could emerge based on the local circumstances.

Another major deficiency of this Act was that the ownership of MFP was conferred on the Gram Sabha and not the NTFP gatherers. A favourable change in this regard was came to be achieved through the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. This Act commonly known as Forest Rights Act was brought into correct the deficiencies of PESA. That, this Act confers the tribal-gatherers a legal ownership over the MFP is a positive measure in the relationship between the tribal society and the forests. With proper implementation of the provisions of this Act, the rights of tribals society can be well protected.

Recommendations

- (i) It is necessary to recognize non-timber forest products (NTFPs) as a source of income at par with agriculture in case of the tribal communities and facilitate them to improve the practices of gathering MFPs. This requires proper training and orientation, use of appropriate mechanization process and harvesting practices.
- (ii) It would help to promote the self-help groups (SHGs) of the gatherers and provide them with a well-appointed place (drying yard, storage, primary processing support etc.) so that the small lots can be aggregated and traded more efficiently.
- (iii) The trading of MFPs can also be integrated with online agriculture trade platforms like e-NAM by developing needed standards, rates etc. and developing assaying labs. The provision for trading in MFP including online trading can become part of the State Marketing Act APLM or if the states feel necessary they may enact a separate Act on similar lines as that of Agricultural Marketing. The Act can be called as Minor Forest Produce Marketing (Promotion and Facilitation) Act. The Union Ministry of Tribal Welfare can develop and share Model Act and Rules with the states for adoption.
- (iv) Comprehensive development of the NTFPs may be taken up and funds available under various ongoing schemes like MGNREGA, Tribal sub-plans etc. can be used.
- (v) MFP value-system supported by integrated value-chain and supply-chain management may be put in place.
- (vi) Now that the government is promoting agro-forestry and bamboo under the National Bamboo Mission outside the forest areas, even these products can become part of the MFP value-system.

2. Support Tools

Measuring of Farmers' Income

The progress of agriculture so far has been monitored more in terms of area coverage, production and productivity. These are no adequate mechanisms existing, if income changes are to be measured. There is no system of direct measurement of farmers' income at fixed intervals. This would be a sine-qua-non, considering that the strategy for doubling farmers' income is time bound. Even if there is no such time-bound target, it would help in annual measurement of farmers' income (farm + non-farm income) to evaluate the progress and make necessary interventions. This would be a very effective instrument in transitioning agriculture as an agri-business, besides serving as one of the important measures of farmers' welfare.

MIS Based Dashboard - Effective and Qualitative Implementation

There is surfeit of data collected at various hierarchical and horizontal levels by different divisions & organisations within the department / ministry, as also across the departments / ministries. Unfortunately, the data structure is not uniform. The architecture of Applications, Portals, Websites and other data / information collection points is not standardised. The result is isolated databases that cannot talk to one another. Required, and possible today, is an effective tool for real time evaluation and monitoring of the performance vis-a-vis the laid out targets. Inter-operable and open source architecture will help in seamless integration through cross DB intelligence and use the power of big data analytics and its interpretation for visualising patterns & trends and delineating the messages.

An appropriately designed Management Information System (MIS), operated via dashboard, will serve as a command and control system. When installed on need to know basis, at various hierarchies – Gram Panchayat - Block/Taluk – District – State - National levels, it will provide for seamless sharing of data and information, and interpreted in a harmonised language and format. It is then possible to work for a shared vision, common mission and for universally accepted objectives & targets.

Rationalisation of Organisations

In response to specific needs arising from time to time, several organisations have come up over the years. They may be within an individual department or ministry or outside. These organisations are generally in the nature of autonomous bodies, attached offices, corporations, boards and directorates.

There are overlaps in mandates across these, leading to not just duplication, but at times also leads to cross-purpose work or differing messaging. This is in addition to the avoidable

establishment costs on men and material. Within the Ministry of Agriculture itself, there are several such organisations under each of its three (3) departments (DAC&FW, DAHD&F and DARE/ICAR).

Reforms and Ranking – Ease of Doing Agri-business

As well recognised by now, the reforms and liberalization story of India's economy that begins in 1991 has left out agriculture sector to a large sector. Nevertheless, there were some good initiatives taken as well, in agricultural marketing (Model APMC Act, 2003 and Model APMC Rules) and agricultural trade (removal of stock limits under control orders in 2006). However, the agriculture sector still needs to adopt comprehensive reforms with a view to ease:

(i) Pooling of land (ii) Mobilisation of farmers (iii) Promoting marketing efficiency (iv) Developing logistics infrastructure for market connectivity (v) Making available inputs that are low in cost and high in quality

Ranking of States

Competition can bring in a healthy spirit of achieving excellence and performing better than others. The "Ease of Doing Business" ranking of the World Bank at global level has demonstrated, that nations tend to compete and perform better. Within the country too, the "State of States" ranking by India Today magazine has introduced an element of healthy competition. The Prime Minister's Civil Services Awards by evaluating the performance of Districts in respect of Government of India's flagship schemes has also proved, that healthy competition can trigger change.

The NITI Aayog has identified five states and 200 districts that are lagging in terms of development, based on five domains including agriculture. In order to enhance the overall economic growth of the country on a sustainable basis, the NITI Aayog recommends special focus on these identified states and districts. The NITI Aayog is aiming at live competition for all the stakeholders based on measureable achievements in respect of the five domains. This initiative is also with the rationale that competition will bring out the best among all the stakeholders and lead them into better performance than hitherto.

On similar lines, it is suggested that inter-se ranking of all states and UTs may be taken up on an annual basis on "Ease of Doing Agri-business". A quantifiable, parameter based evaluation of states and UTs vis-à-vis the reforms done during the year to effect simplification of procedures, transparency, objectivity, etc. may be adopted. Such recognition itself is expected to position the states appropriately and help them attract investments. However, care must be taken to build an evaluation scale that is agreeable to all parties and is conducted by a third party in a credible manner.

3. Operationalising DFI Strategy

Setting a New Course for Agriculture

The Prime Minister of India has, in sharing a new vision for the farmers of the country, laid out a challenge, to double farmers' income by the time the country celebrates its 75th year of Independence in 2022. This challenge, though on the face of it, targets primarily the farmers; it in reality touches all Indians. For everyone, including the consumers, are affected by the status of agriculture and financial health of the farmers. The target is achievable with a good strategy, well-designed programmes, adequate resources and efficient governance framework for implementation.

New interpretations have been tabled by this Committee by redefining various concepts that were in vogue for long. Many of the policies & programmes that can support the DFI strategy are in place, and will serve the purpose better with appropriate changes. And, there is need for new ones too. It is in this context, that certain recommendations have been made to restructure the existing ones, including the governance mechanism, and also adopt new ones as needed. It is also important, that the available resources are prioritised and the strategy does allow to suitably improve upon the capital and resource use efficiency, as efforts are made to channel additional resources by creating a stake for multiple agencies.

The vision requires a grass root level shift in the attitude towards agriculture, in all citizens of the country, including among farmers and in the government agencies at different levels of hierarchy. The DFI Committee in its discussions felt that there is an urgent need to bring about a mind-set change amongst all stakeholders. What logically follows is the usefulness of creating a dedicated 'Centre-Point'. Otherwise, with diffused responsibility, the historical agenda that seeks to bring about a farmers' income revolution, can get lost. Sometimes, it may be a situation of missing the wood for the tree. The DFI Committee through its multistakeholder consultations, intra-committee deliberations and dissection of the complex agricultural value system was drawn to a logical conclusion, that the DFI strategy implies "Farmers' Income Revolution".

The agriculture sector needs an overhaul, and not just a transformation, if farmers' income is to be enhanced substantively and consistently. This makes a case for a change in the narrative that the time has come to transcend from 'Green Revolution' to 'Income Revolution', to give meaning to a comprehensive change. Green revolution, with its major emphasis on production attempts, is only a partial treatment of the agricultural sector. Income revolution impresses upon production through productivity, sustainability, marketability and an orientation shift towards farmers' income as outcome.

Empowered Body

However, the officers down the line beginning with Secretary of the Department/Ministry are extremely occupied with multiple and administrative tasks. They may hence be challenged, by both time and the mind space needed to create the implementation framework vis-a-vis the recommendations. An 'Empowered Body' can build such a framework and offer the needed support system to the principle stakeholders, namely, the DAC&FW and other Departments/ Ministries. As an illustration, one of the DFI recommendations is to popularise the post-harvest interest subvention based loans. This will call for development of 'Guidelines' and an 'Operational Strategy'. The Empowered Body should be able to meet this requirement. Similarly, Model Rules following the adoption of Model APLM Act, 2017 and Model Contract Farming & Services Act, 2018 will need to be developed. The DFI Report contains several such recommendations that need close attention, but may be difficult for the Ministries / Departments to allot the required time. It is the Empowered Body that can own such additional responsibilities and provide the much needed 'reform and restructuring support'.

Role and responsibility of the Empowered Body

The proposed Body housed in the Ministry of Agriculture and Farmers' Welfare will require coordinating directly with Secretaries of various ministries and departments, centre and state. The following roles & responsibilities are suggested to be assigned:

- i. Develop necessary Acts, Rules and Regulations for the concerned ministry/department, so as to assist states and the centre to fast track the required restructuring and governance reforms.
- ii. Draft executive orders and guidelines for the concerned ministry/department, that will help ease specific bottlenecks in implementation of programs and in executing the support planned by the government.
- iii. Help undertake necessary capacity building and advocacy, to build a greater understanding among general public, polity, academia and farmers, on the related set of changes they need to incorporate in their approach towards agriculture.
- iv. Coordinate between and among ministries/departments to help bring about a convergence in the financial resources deployed, for greater resource use efficiency; and synergy of efforts. This can be initiated for selected activities and regions, at first instance.
- v. Prepare the schedule and monitor the data on income status of farmers on an annual basis.
- vi. Suggest interventions needed for course correction in policy or implementation, which need may arise, as the agricultural system undergoes transformation.

The DFI Committee views this 'Empowered Body', by whatever name it goes, as the final necessary resource centre. It would be expected to study the recommendations and the

logic behind them, and provide a comprehensive support to the implementing ministries and departments.

4. Post-production Activities and Infrastructure

A few decades ago, our cities adjoined lush fertile farmlands; whose farmers would harvest their produce in morning hours, and aggregators would rush the produce to the local wholesale centres. The normal practice for fresh food supply (to reach our homes), was quite simple and a matter of routine. By the time the consumer visited to buy his/her daily basket, the local grocer or street vendor was ready with that day's fresh supply. This was an effective food supply system, even though highly fragmented, which ensured that each morning's harvest was at the tables well within 24 hours. There were those awkward vagaries of weather and unbalanced supply, but the consumer too was a friendly and understanding stakeholder

Urbanisation has ensured that farmlands are distanced very many kilometres away, entry points into our cities are becoming bottlenecks and transit time to reach markets is ever increasing. No more can the harvest reach the consumer within its natural life cycle. What now reaches the consumers' homes, was harvested a previous couple of days or more ago! This extended 'in-transit' time is compounded by the perpetually growing demand, wherefore the increase in handling volume adds to the delays. In case of perishable produce, the marketable life cycle is under pressure, and food quality is degraded rapidly without recourse to enablers such as coldchain. Lack of cold-chain systems force farmers to monetise their produce at first instance by selling into food processing units, inefficient wholesale markets; and these sales are the only opportunity, low down in the value chain system, and do not empower the farmers.

In case of cereals and grains, the post-production life cycle of the produce is naturally lengthier. The foodgrains are procured and stored in godowns and warehouses, for the near future requirements. These requirements can be consumption demand or as assessed for national security purposes. The market tends to rely only on cues from ongoing government interventions, by way of Minimum Support Price (MSP) and procurement targets of the government, or Minimum Export Price (MEP) to arrive at the associated market value.

Farmer's Market Channels

Post-production, the farmers monetise their produce and, across agricultural produce segments, having a series of market avenues as their selling points. These can be itemised to the following, each being a destination of the first stage evacuation, where the primary monetisation of farmers' produce occurs:

- a. Near-farm mandis, where farmers deliver produce for local buyers – for primary assembly and wholesale transaction.
- b. Near-farm 'Farmers markets', where farmers can sell to consumers – retail transaction.

- c. Government procurement of foodgrains – a controlled and limited market avenue.
- d. Near-farm processing units where farmers can deliver produce as raw material for new product creation – contracted or wholesale transaction.
- e. Near-farm aggregation points, such as milk-chillers and pack-houses, for extending onwards market connectivity – very few developed for horticultural crops.

Farmers perforce sell their produce at first points of evacuation, to local intermediaries (at-farm or near-farm), constrained and limited in their selling range, and thereby have no further direct role in the overall value system. Lack of logistics connectivity with farmer groups, effectively means that the markets are getting farther away from the reach of most villages, and therefore, the small and medium farmers find it technically and economically unviable to directly access various markets. Currently, intermediaries as aggregators step in to complete the logistics link for farmers, at times even upto the first level assembly markets (local mandi).

Infrastructure status

The primary development focus for agricultural post-production infrastructure, has been in the form of warehousing and cold stores, for holding inventory for extended durations. The infrastructure needed to connect with markets after the storage phase may not have found strategically linked policy support.

Inefficiencies in the Infrastructure

Over the years, a number of organisations and institutions have been established with a mandate to develop one or more areas of agricultural marketing such as procurement, storage and warehousing, credit, co-operative marketing, exports, food processing, agricultural prices, marketing training, research and extension. In infrastructure terms, special focus was given to creating storage capacities both dry and refrigerated as well as market yards.

The essential activity of physically transporting the farm produce to buyers' destination was largely left to individual commercial interests, which has then developed in a fragmented fashion. Neither was attention paid to provision of farm-gate or village level centres, in the hands of the farming community, to aggregate and prepare the produce for subsequent postproduction market linkage.

The private sector participation in agribusiness trade also developed, given the opportunities from government's initiatives as well as the near perpetuity of demand for food and agri-based products. However, the various control orders to regulate and manage the market, did not allow more holistic and larger private enterprise to develop infrastructure for all aspects of agricultural produce in the country.

Monetisation of Agricultural Produce

Monetisation is traditionally described as the conversion of an object into a medium of exchange, such as metal into coins. In economic terms, monetisation refers to converting a nonrevenue generating asset – investment, asset, event, debt, etc. – into a source of revenue. From the perspective of this Doubling Farmers’ Income Report (DFI), agricultural produce is a unit of value, which via a liquidity event (sale transaction) is converted into currency. Farmers’ produce undergoes the process of monetisation, via various market channels (explained in section 2.1). The total value monetised is also dependent on the extent of food loss mitigated and the magnitude of value captured from every grain, drop and ounce produced. The process is expected to be transparent, equitable and assign the most appropriate price to the unit of value (produce). This is enabled better, by gaining access to a choice in markets, balancing supply with demand and by appropriate governance mechanisms.

The purpose of monetisation in the context of income approach to agriculture is to capture the best possible value of the produce for the farmer, once harvested. While market is a place where an appropriate value is discovered on the produce offered for sale, the share of the farmer in the consumer’s rupee is predicated upon the market structure. It would, therefore, be necessary to not only maximise the price discovery through an efficient marketing system, but also enable the farmer to benefit from as large a share as possible in the end consumer’s rupee. This depends upon dis-intermediation or when intermediaries share in margins is proportionate to the service offered in the marketing chain.

The related issue is the extent to which the volume of produce harvested is monetised. Higher the food loss that occurs between the farm gate and market place, lower is the quantum of produce monetised. This is a function of agri-logistics including harvest practices, storage, handling, transportation, etc.

In sum, monetisation of farmer’s produce is dependent upon several factors, inclusive of agrilogistics, marketing system, marketing efficiency etc. It must be appreciated that marketing efficiency, though very important, is only one of the many factors influencing monetisation efficiency of the farmer’s produce.

5. Value System in Agriculture

“Agri -Value Chain” System

There is increasing emphasis on the development of efficient agricultural value chain system in India. A “Value Chain” is strictly understood as a process view of the set of operations and procedures, internal and in control of an individual business unit. The term was conceived to represent the linear operations that create value for a business unit, and to provide decision supporting analysis of the primary activities and secondary support in a firm. A value chain analysis allows the individual firm to identify unit cost of operations and make systemic changes to reduce internal inefficiencies and wasteful expenditure. These interventions are desired so that the business entity can accumulate more value. The analysis helps to refine its procedures, so as to improve its competitiveness and efficiency. The value chain does not define the business model, but details the internal operations of an individual entity.

A value chain is appropriately constructed at the level of individual business unit. Each such unit has a set of activities to create and sell its product or service. The desired outcome in value comes from the core operations, and in managing raw materials, manpower, credit, equipment and the administration. Each activity is expected to add value to the business, more than the sum of costs of all activities. Value chain is not necessarily about value-added products, but about optimising value for a business.

However, market linkage may not develop in a linear fashion, and multiple firms (each an individual value chain) function to integrate into a sectoral or industry level value system. The industry value system is a model where multi-stakeholder activities integrate, to produce goods and in delivery of the final product to end-consumer. This integration is commonly known as the supply chain (the supply chain is not a value chain). As a number of value chain entities collaborate, each firm intercedes to vertically integrate their activities into the external supply chain, to target a market. The ensuing value based supply system, is also at times misread as an incremental build-up of costs, across the activities from first source to end-market.

In a value system, the cost of a set of linked activities in the supply chain, is expected to capture value equal to, or greater than the sum of costs incurred. For e.g., the aggregation and transport activities are expected to carry the produce to a higher paying market. Balancing supply with demand is another key factor in discovering value. Therefore, the value finally realised will not always be equal to a value evaluated at source or where surplus exists. If the systemic costs incurred, detract from final value realised, then the industry level value system is considered inefficient. The system depends on how effectively each entity optimises its own functions (reduces costs and losses) in supplying the target market. An entity can also choose to internalise external activities, and thereby expand its scope in the larger supply chain.

The supply chain can be product agnostic, and relates to the agricultural produce marketing system. For example, a cultivator's value chain includes the primary functions of input procurement (inbound logistics), the sowing, cultivation and on-field care of the crop (production), the harvesting and carrying of produce to a local market (outbound logistics) and the primary sales (marketing). The support activities in this value chain are the acquiring and managing of tools, equipment and manpower involved in the primary activity (deploying farm labour, weeding, pumps, tractor, harvester, etc.). The farmer can shift crops, can transact with another firm, the aggregator, transporter, wholesaler or processor. The transporter, wholesaler, or processor are separate value chains, if not under umbrella of a single capital or management, each constantly tweaking their internal competences and procedures to compete with others in their trade. They however, form a part of the larger value system that directs the value first produced, to point of final consumption.

A supply-chain is the integration of the individual activities undertaken by multiple value chains, each an actor in the supply chain, with the purpose to manage the flow of the materials and goods, starting from raw inputs to supply of final value at last mile. In a supply chain, a series of enterprises systemically integrate their operations. Though the actors can be transient; together the value chain actors coalesce into the overall supply chain to ensure that systemwide, value based outcomes are effected. The business scope of a firm, is directly linked to how well it integrates into the market linked system. A single business entity rarely internalises the entire supply chain, ranging from inputs, production to final end-consumer retailing, though many may undertake supply chain management. Simply put, 'value chain' is the operations of an individual business entity; 'supply chain' refers to the business model.

The term 'Agri-Value Chain', therefore, refers to the value based system at a combined level, to the overall system-wide correlation between value chains of the producer, market channels, retailer and consumer (each a value chain segment). Hence, the agri-value chain represents the agricultural supply chain in the country. The industry or sector level value system, also includes secondary activities such as research, development, front line demo, extension work and all others support that addresses the core activity of producing and marketing the produce.

Expanding a farmer group's operations to the immediate post-production aggregation and handling activities helps capture greater value and has happened on occasion. Even the transport link can be integrated into operations by farmer groups and/or by involving the rural youth as driver entrepreneurs, to assure that more value is captured at the village level.

6. Strategy and Approach

Market Linked Strategy

Agriculture economy of India is undergoing a natural progression of development, in terms of trade practices, business opportunities and availability of technologies, enabled by policy support. These dynamics offer opportunities and as well throw challenges for the agri-business systems and trade. A shift in food preference of the consumers, towards high nutritional value produce, characteristic of the rise in disposable income, is also resulting in a shift in trading preferences both in value and practices. To fully harness these opportunities, farmers today have the option to undertake crop diversification, vertically integrate as a value chain component of existing processors, horizontally integrate with market through appropriate aggregation of the produce and associated adoption of technology for the wider supply chain.

The required systemic and policy changes, however, need calibration to empower the farmers to convert these opportunities into income growth, ensuring an inclusive approach, as in the country there is a predominance of small and marginal farmers (>86 per cent). This calls for evolving an enabling environment and infrastructure that will endow the farmers with the tools to overcome the inherent constraints of the sector, for increasing their incomes from agriculture as well from activities allied thereto.

To double the farmers' income by 2022-23, the strategies will need to bring key focus on production enhancement, cost reduction through smart nutrient management, low input farming system approach, non-farm income enhancement through diversification and skilling, stabilising of income and risk management. However, these components which are mostly productioncentric need to be complemented with ease in market access with efficient post-production logistics, as the first step to market arbitrage. All efforts towards enhancing the production and productivity, along with diversification, require to be linked with market demand, with prime emphasis on ensuring that the complete quantity produced has physical access to all possible selling avenues and can get monetised. The priority has to be to increase the market reach of farmers to enhance their selling volumes, while all other incremental revisions to optimise upon the inputs would remain as ongoing interventions.

There are two key linkages that need to be strengthened between farmers and market in the postproduction stage of farming. These are the physical logistics linkage with markets and information flow from markets, and this calls for significant attention on issues of access to infrastructure, technology, the institutional arrangements; and support services for capacity building, identification & development of markets.

Inverse Approach, from Fork-to-Farm

The concept of seamless farm-to-fork connectivity is normally presented when relating to food supply systems. However, to function in agri-business mode, there is need to adapt to demand triggered supply chains. The farm-to-fork connectivity tends to infer, that farmers will directly interact with the consumer. The concept stems from a mind-set that promotes a push model from farms to market end, from a time when the market could absorb all that was supplied. However, the price and the quantities absorbed at markets are directly related, and require understanding market demand. All businesses dealing with consumer products follow a demand linked methodology when accessing market channels. While in case of certain crop types like fibres, potatoes for chips, grapes for wines, etc. the demand is consolidated in the hands of the agro-processing unit, in case of fresh consumables, such consolidation of demand is limited.

This has special import in case of India, which is the world's largest concentration of vegetarians, making the fresh market important. A reverse approach, to link demand with agriculture is needed for the crop types where farmers depend on income from marketing of fresh whole produce. Effectively, there is need to work backwards from demand, providing information that can intelligently direct the physical flow of foods to linked markets.

Adopting an inverse, FORK-to-FARM strategy, to guide future developments, is needed. A well designed strategy will look at capturing new markets so that subsequent ramping up of production will be monetised optimally. The immediate concern is to connect the produce with as many markets as possible and the business model requires linking the source with target markets, and planning a delivery or settlement mechanism after farm-gate procurement.

Access and Tactic

To double farmers' income, the first priority is to ensure that the entire production off the farms finds a market to get monetised. To double income it is essential to double the selling volume of the farmers. This is critical when a large percentage of produce is lost after production, detracting from income, which results in the input costs being loaded on the remaining saleable volume. In the shorter term, value can be recovered by targeting sectors, where food loss incurred is high and demand goes unfulfilled.

The primary concern for India today, is to bring its immense farm-gate production to gainful and effective end use - to reach the hands of consumers, regularly and efficiently. Every kilogram wasted due to poor post-harvest handling & logistics capabilities is also a loss multiplied in terms of resource wasted and in greenhouse gas emissions. Any loss on the supply side has an immediate ramification on farmers' income and inflation.

The ability to physically connect the material produced with markets is inhibited for individual farmers due to low handling quantity per farmer. This inhibiting factor is due to the generational fragmentation of land holding, leading to small lots of marketable surplus. All access to markets is made via some mode of transport and a critical mass or viable quantity is required for this purpose. Where the farmers are able to collectively pool their produce (milk is an example), onwards market linkage is easily undertaken to the benefit of the farmers. Except in case of milk and large plantation crops, there is little organised collection for onwards market linkage evident, though hundreds of market yards have been developed.

Categorising Agri-produce by Holding Life

Strengthening of the country's agri-logistics for doubling the farmers' income and improving the post-production productivity is a necessary priority. Agriculture post-harvest logistics includes a) first stage aggregation; b) first mile transport; and depending on type of produce, c) transitory or long term storage; d) long haul or wholesale transportation (rail, road, water, air); e) distribution hub; f) last mile transport; and g) intermediary processing or manufacturing for certain produce types.

A modern supply chain needs to function within the holding life, or usable life of the produce. This is a primary factor when planning the post-production phase of logistical activities to cover the remaining life cycle of the farm harvest. Broad categories are long and short life cycles, as explained below. The holding life indicates the "time spread" in hand for sales.

Role of Agro-processing

The agro-processor is an intermediary in the farm-to-consumers supply system and communicates demand from end consumers to farms, and constitutes another mode of revenue for the farmer. In case of non-food crops, processors are the oldest example of agriculture allied business enterprises, which converted farm produce into usable consumer goods. Agro-industries like textile, leather and medicine are apt examples and have been a driving force for agriculture worldwide. Modern technology allows even the traditionally unwanted by-product from food produce, to be brought into commercial use as raw material for use in building materials, polymers, cosmetics, adhesives, dyes, fuels, detergents, bio-energy, etc.

Agro-processing activity is an important source of income for farmers as it converts the primary agricultural produce into usable items for food, feed, leather, fibre, fuel or industrial raw material. Regular developments in agro-processing technologies have led to the progress of agro-allied industrialists and they have become a primary market for the farmer. Of these, food processing specifically deals with manufacture of food products and given industry status in the country.

Globally, there are varying interpretations of food processing and some countries include the activities that only prepare and package the fresh produce for marketing purpose. However, these activities do not convert the farm produce into another product, but only precondition the fresh produce for travel to market.

Role of Railways in Agri-logistics

Once agricultural produce has been aggregated and prepared for onwards transit, the next step is to evacuate the pre-conditioned produce to distant markets, thereby bridging the supply side with demand, through the provision of transport over multi-modes, i.e. roadways, railways, waterways and/or airways. The aspect of sub-continental distances to consumption centres, indicate that Railways can play an important role in triggering an agricultural marketing revolution, wherein railheads can co-locate or be linked to the modern produce collection centres, encourage a number of floating stock of containers (refrigerated) dedicated for food cargo, and be the transport backbone to the National Agricultural Market.

Railways not only speed up the logistics connectivity, which is important in case of perishables, but also can cover longer distances, which is key to achieving improved value realisation for farmers. As such, railways will play an important role in the marketing and delivery mechanism.

7. Potential and Challenges

Farmers' see agricultural markets as an important avenue to monetise their produce. Essentially, for the farmers, the possible ways to monetise their produce are the local mandi, the wholesaler, agro-industry and local consumers. Any inability to do so, leaves the farmers to sell off their produce to agents or intermediaries between these points of sales, which comes at a cost. The future growth of farmers, is therefore, limited to the growth of such intermediaries, rather than their own capability to connect with larger markets. From the farmers' perspective, the ability to easily connect with buyers and safely execute an exchange with market players, is a priority.

Without expanding the market range of farmers, their income growth is directly linked to growth of local buyers (growth in population plus shift in consumption patterns). To capture a larger share of consumption, the frontiers of their market need to expand into the national market and further into exports. For this, agri-logistics capabilities of both farmers, as well as aggregators and facilitators, have to be suitably developed. Agri-logistics plays an enabling role, by aiding direct connectivity with the larger market, backwards to the farmers.

There has been much focus on creating farmer markets, as an opportunity for farmers to directly sell to local consumers. Farmers' markets are operating in different States in the name of Apnamandis in Punjab & Haryana; Rythu Bazaars in Andhra Pradesh and Telangana; Uzhavar Sandhai in Tamil Nadu, Shetkari Bazaars in Maharashtra; and Raitha Santhe in Karnataka. These are typically located at the rural-urban fringe and benefit both farmers and local consumers.

These farmer bazaars can be compared with the local dairy shed, where consumers could visit the milking shed and buy their daily needs directly from the milk producer. Being limited in their geography, these bazaars do not change the selling radius of a farmer. As a result, the customer footfall remains limited to local consumers, and the capacity of local population to absorb higher production is constrained. Like the local doodh-wala, farmers' bazaars are essentially a stop gap measure, to provide individual enterprising farmers an independent and nearby avenue to monetise their produce. They do get a higher share of the consumers' spend, but any agenda to tap into other markets is not fulfilled.

Near-farm jobs

Pack-houses provide a permanent near-farm facility to initiate an organised flow of produce to markets, for the post-production supply chain. Pack-houses require transport connectivity to feed the terminal markets which in turn distribute the food to consumers. Pack-houses, in effect function as small scale logistics centres at village level, connecting agriculture with urban centres. They are opportunities for growth and job creation.

Increase in selling volumes

Higher selling volumes mean higher income and impetus for greater productivity on farm. Logistics connectivity allows more produce to securely reach more markets. The idea behind scientific post-harvest management is to enhance post-production monetisation of the produce.

The obvious corollary is that after primary post-harvest care, the value must be transported to end-destination. Increase in production quantity has to be met with expansion of the market frontiers, so that all that is produced has a chance to get monetised.

Agri-logistics when limited to warehousing or storage alone, only builds buffers to buy time for a delayed transaction. This may be suitable for foodgrains and allied goods, as the commodity has long holding life and can be actively traded in futures linked to demand from the processing industry or end consumers. However, the organised users who take final delivery, stay limited and volumetric throughputs can remain more or less flat.

In case of perishables, the time gained in holding life by using cold chain, is better used for covering distances and capture a larger market footprint. Expanding the geographical reach of producer from growing area across the unified market, will help to bridge the demand supply gap and increase the selling volume. Improved post-production logistics will also transform the dynamics of the unified National Agricultural Market network.

In all cases, post-production activities that lend towards expanding the market reach of the farmers, will increase the selling footprint of the produce and bring greater organisation to the flow of produce from farms to markets. Keeping in mind food loss reports and other inputs, effective market linkage provides opportunity to reduce produce loss and convert that share into revenue. Besides converting food loss into earnings, an increase in selling volume is also expected to build confidence in the farmer to accordingly produce more and adopt more productive practices for cultivation.

Financial assistance provided by Government

The Government has various subsidy based schemes for strengthening marketing, cold-chain, warehousing and processing infrastructure facilities in the country. The broad outline of some of the major schemes that subsidise the creation of post-production infrastructure are:

- i. Schemes of Ministry of Food Processing Industries (MoFPI)
- ii. Schemes of Department of Animal Husbandry, Dairying & Fisheries (DAHDF)
- iii. Mission for Integrated Development of Horticulture (MIDH – DAC&FW)
- iv. Rashtriya Krishi Vikas Yojna (RKVY – DAC&FW)
- v. Integrated Scheme for Agriculture Marketing (ISAM – DAC&FW)
- vi. Programmes supported by Food Corporation of India (FCI – DFPD)

- vii. Agricultural and Processed Food Products Export Development Authority (APEDA - MoCI)
- viii. National Cooperative Development Corporation (NCDC – DAC&FW)

Challenges to Post-production Activities

In the agriculture allied domain, the infrastructure development efforts were focussed largely on building storage capacity, basis a favoured hypothesis of cross seasonal carry through of produce. This has resulted in the development of single commodity bulk storage and warehousing (both ambient storage and cold storage).

All infrastructure need assessments were done with the harvest quantity as the starting point, assigning a predetermined percentage of the production as surplus for storing. The assessment presumed that all agricultural commodities can be stored endlessly, for trading or against collateral based credit, like other hardy commodities. However, the large basket of agricultural produce, requires a highly differentiated approach to the infrastructure development, keeping market access, storable life and the marketable life cycle of the produce in context.

A mind-set change is required to move away from mere storage of excess production, and adoption of a system-wide value chain approach, to ensure that all inventory can be brought to final consumption, in quality and in time. For the immediate benefit of farmers, the priority is to connect with demand, and not delaying or deferring the consumer as a preferred option, where practicable. Agriculture is not fully served by procuring and storage of produce, but by directing the harvest to consumption. A holistic approach to logistics requirements is needed.

The infrastructure system – the aggregation, transportation, storage and distribution – requires to integrate their operational capacities so as to serve as a conduit to the market and not function in isolation. This also necessitates that the capacities and number of infrastructure created, complement the overall volume being handled. For e.g., having a large capacity in warehouses, without access to an equivalent handling capacity in transportation, only results in a selfinflicted bottleneck to the desired market connectivity. This delayed or failed linkage is the cause of unnecessary inefficiencies, including price instability for consumer. Many a time lack of collaboration and market linkage has let good inventory to turn into wasteful discard.

8. Targeting the Outcome

To enhance farm incomes, an important component of farmers' income, there is the related need to enhance the selling volume of the farmers, and not merely the growth in farm output. This desired increase in selling volume can be achieved by enabling that a large part of the currently high percentage of the losses, especially in high value produce, reaches markets and is monetised; besides opening up the country as one market with eased access. Metrics for evaluating impact of development efforts need to be rationalised and made outcome oriented. The annual reports by development agencies normally list the financial and physical numbers to demonstrate achievements. There is need to observe outcome and output measures to adopt result oriented targets. These measures would typically be the throughput achieved vs capacity created; food loss vs production; revenue vs inputs costs; and new market capture.

Throughput achievement

Agri-logistics infrastructure is created in case of agri-allied activities for post-production market linkage. The physical target of implementing agencies should include the volumetric throughput of farm produce, at least for first 3 years of operation. Throughput measure is a multiple of two factors - the holding capacity created, and the number of rotations or cycles achieved on this capacity in a year. Using this measure as a target, will ensure that the development activities do not cease at just creation of infrastructure, but also encompass monitoring and support in the initial years of operation, making the development more outcome based.

Food Loss reduction

Normally, production statistics are put forth during and after harvest season. These production numbers undergo a series of iterations, until the final production by district or state is declared. The declared production figures are used to assess the GDP/GVA contribution of farmers. The quantum of production that cannot be monetised, due to lack of post-harvest market linkage, is a loss that must be considered as recoverable value to farmers and the country.

An independent and regular sampling survey schedule to assess physical loss of food produced along various activity stages should be put in place. The key stages in post-production would be the quantum aggregated and rejected at farm-gate (local market yard, pack-house, or private aggregator); quantity discarded at wholesale market (processor, warehouse and wholesale mandi); and quantum lost in fields. Reducing such physical loss will permit more saleable volumes in the value chain system, allowing for greater monetisation of the produce.

Revenue generated

There has been no comprehensive and regionally differentiated assessment of the revenue generated by farmer from various available avenues. An ongoing third party assessment of the revenue by farmer from sale of own cultivation (to wholesaler, processor, trader/aggregator), from near-farm jobs, from non-farm jobs, from migratory jobs may be initiated. The development activities can accordingly be adjusted and relevant course corrections initiated to achieve the overall strategy of doubling farmers' income.

Market expansion and access

In order to give the farmers better access to markets, a number of reform measures have been undertaken by Government of India in recent years. Government of India has formulated the Model Agricultural Produce and Livestock Marketing (Promotion & Facilitation) Act, 2017, and States should adopt its provisions to evolve a common market for the marketing of agricultural produce across the state and country. A central Agricultural Trade Act is also being contemplated, which will more pronouncedly provide a legal footing to create a barrier free access for trade across the country and enable all the pre-requisites for a truly unified national agricultural market. The constitutionality of such a central Act will however need to be evaluated.

The focus needs to be on integrating the small holders, constituting 85 per cent of Indian agriculture, into an organised mechanism that will facilitate national level access and increase the selling range of the farmers. An effective linkage, however, is also stymied by small lots of marketable surplus, dispersed & disjointed centres of production, resource constraints, high price risk, etc.

Infrastructure Development Targets

Creating infrastructure is not a sufficient condition; the creation must be outcome oriented and they must come into productive use. Besides the existing methodology of monitoring annual physical and financial achievements, the following 'outcome matrix' is recommended for use by various development agencies and departments.

In case of long holding commodities, the throughput could also refer to the unit's inventoryturn-ratio. Generally, having larger stocks over extended periods would reflect as a signal about demand variation, and be used as an indicator for the next cropping cycle.

Lowered throughput achievement in relation to the size created would be used as a signal to rationalise the expenditure on infrastructure creation and divert efforts to the missing links.

To double farmers' income, changes need to be implemented to measure and monitor the outcome from developmental efforts. The target setting should primarily be to affirm that more of the farm production reaches all possible market avenues and gets monetised.

Besides having a direct impact on increasing the earnings, this will also lend impetus to become more productive of the land, which will further add to farmers' incomes.

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Development interventions must keep their focus on making sure that every grain, every ounce and every drop of produce finds opportunity to realise value, and not limited in markets by place, time and form.

9. Crop Diversification and Post-production Management

Backdrop

Food security concerns, have hitherto, brought specific focus on raising production and productivity, mainly of cereals. The critical aspect of ensuring nutrition security for Indian population, in general, and how it correlates to enhance the net income of farmer households, in particular, are two aspects that have not received equal attention by policymakers. However, during the last decade, researchers have begun to pay considerable attention to the following:

- Augmenting the growth of agriculture through the diversification towards high-value crops (HVC), particularly horticulture (mainly fruits and vegetables);and
- Assessing whether the small holders have benefited from the diversification towards HVC

These studies have contributed significantly to our understanding of how diversification has led to the growth of the agriculture sector in the wake of the shifting consumption pattern of Indian households towards high value products like fruits, vegetables, milk, fish, and meat.

During the discussion on doubling of farmers' income, it has been argued that expanding the area under HVC will help increase farm income, as it has been found that expanding HVC by one hectare at the expense of staple crops, yields an additional "gross returns up to Rs. 1,01,608 per hectare"⁴⁷. However, it is important to determine the extent to which expanding the area under HVC would help in increasing the net income.

Another important issue to be considered pertains to a high degree of harvest and post-harvest losses, particularly in fruits and vegetables, which account for significant economic losses.⁴⁸ The existing marketing system of agricultural produce is also reportedly fragmented and entails high transaction costs. Since there is a wide variation in the estimates of harvest and postharvest losses given by different agencies, this issue needs to be examined from the perspective of enhancing farmers' income. The other associated issues that need to be addressed include the role of private traders in regulated markets, and evolution of an appropriate marketing system to increase farmers' income and reduce market fragmentation.

It is also pertinent to examine the level of gains that can flow to farmers through improved post-harvest management and development of the agro-processing industry. An efficient postharvest management, comprising aggregation, preparatory activities and pre-conditioning, refrigerated transportation and other cold-chain/agri-logistics, not only reduces the proportion of agricultural produce, especially perishables that are otherwise discarded, but also aids in expanding the size of the market.

Harvest and Post-Harvest Losses

This section focuses mainly on:

- The harvest and Post-Harvest Losses (PHL) of horticultural produce that is of a perishable nature; and
- The relative roles of different agencies to which the farmer sells his horticultural produce.

Special attention is paid to the losses incurred on certain products that are deemed as sensitive products because of their mass consumption, such as onion, potato and tomato. These products are considered sensitive in the sense that even a mild rise in their prices adversely affects their consumption by a large section of the population, particularly the poor.

A large number of studies have been conducted on the measurement of harvest and post-harvest losses in different regions of the world, covering a wide variety of agricultural crops and seasons. A meta-analysis of PHL has been done by Kitinoja and Kader (2015), offering a critical review of various studies. These authors argue that the estimates of PHL from these studies cannot be easily compared as the research has been done “without much explanation of what is being measured, when or how”. Even the studies on PHL in India (say, on horticulture) are not easily comparable due to the varying coverage and concepts of PHL used by different authors.

Role of the Private Trader in Perishables

It is interesting to note that despite the APMC being in operation, the largest single agency at the national level to which the farmers sell their horticulture produce is the private trader. The mandi (regulated market) is, in fact, second in order of importance as a purchaser of the farmers’ produce.

Nature and Composition of the Indian Food Processing Industry (FPI)

It is important to understand the nature of the food processing industry for at least three reasons: (i) employment and income generation opportunities in the non-farm sector increase if a greater proportion of the agricultural produce is processed; (ii) the relatively low skilled labour gets employment in view of the significant role played by the unregistered sector or informal sector in food processing, although this may not provide a decent (high wage) level of employment; and (iii) since an increasing Total Factor Productivity (TFP) in the food processing industry is an indication of the sustainable linkage between agriculture and industry, a sustained growth of the former would further enhance the prospects of raising non-farm income. However, the extent to which it would benefit the farmer households directly is difficult to quantify.

10. Analysis of Changes on Input Costs and Crop Income

The agricultural sector had registered impressive growth during the 1980s, which was followed by a slump in growth during the 1990s and early 2000s. Various studies have shown that the total factor productivity (TFP) growth in major crops decelerated in the 1990s. Despite the revival of growth since the mid-2000s, concerns have been expressed by researchers and policy planners about various issues including the decline in crop incomes; the fact that agriculture is turning out to be non-remunerative; and causes economic distress among farmers.

With the improvement in production, India's position has changed from being a net importer of agricultural products to an exporter of certain commodities. At the farm household level, the Green Revolution technology has helped improve the livelihood pattern, nutrition and education of children (Hazell and Ramasamy, 1991; Foster and Rosenzweig, 1996; Baker and Jewitt, 2007).

According to the findings of the Government of India's National Sample Survey conducted in 2003, 27 per cent of the farmers did not find farming profitable, and 40 per cent said that if they were given the choice to pursue some other occupation, they would quit. There were also concerns about slowdown in the yield of major crops. Despite the occurrence of some degree of diversification from field crops to horticulture, the amount of income generated from field crops still matters for improving the income of farmers' households.

Estimation of Crop Income

For the estimation of agricultural income, secondary data were compiled from the National Accounts Statistics and the Cost of Cultivation of Principal Crops in India. While data from the National Accounts Statistics are used to analyse the changes in agricultural income at the macro level, the cost of cultivation surveys are used for the state level analysis. The 'cost of cultivation' surveys are conducted annually by the Ministry of Agriculture to collect farm level data on inputs, output and prices.

The Commission for Agricultural Costs and Prices (CACP) mainly uses the cost of cultivation data for fixing crop-specific minimum support prices. Eight types of cost concepts are used for working out the alternative incomes from crop production based on the cost of cultivation survey data. Among these costs, Cost A2 is the paid out cost and is widely used for analytical purposes to track changes in the welfare of farmers. Cost A2 includes all actual expenses in cash and kind incurred by cultivators, and the rent paid for leased-in land. However, the CACP uses the total (full) cost given in the form of Cost C2 for fixing of the minimum support price. The Cost C2 includes the rental value of owned land and interest on fixed capital. These cost components have been estimated through the method of

imputation, which is considered to be defective as it does not reflect the actual prevalent rates. Nevertheless, Cost C2 is also used to analyse the changes in crop income.

Changes in Agricultural Income at the National Level

India's National Accounts Statistics provides the agricultural GDP, which is estimated in terms of gross value added by deducting the value of consumption of intermediate inputs from the value of output for the sector. This also includes gross value added from the operation of government irrigation system. Figure 5.1 shows the trend in annual growth in gross value added and consumer price index for agricultural labourers (CPIAL). The gross value added indicates agricultural income, while the CPIAL shows the price that rural persons pay for the purchase of consumer products. It is evident that the percentage change in CPIAL was higher than the agricultural income during most of the years under study. The years which were characterised by high agricultural income over the consumer price index, were affected by drought and hence the higher base value has resulted in higher growth. Agricultural growth showed a declining trend continuously from the mid-1990s to the early 2000s. There was a revival in growth from 2005-06, albeit with wide fluctuations, but it declined sharply again during recent years. The trend in movement of agricultural income clearly indicates that the purchasing power of farmers has remained low and has, in fact, been worsening during recent years.
