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Mapping of Policies Related to Fruits and Vegetables Accessibility in India

Shweta Khandelwal ^a, Garima Verma^a, Nida I. Shaikh ^{b,c}, Karen R. Siegel^{b,d}, Divya Soni^a, Deepa Soni^a, and Anne-Marie Thow^e

^aDepartment of Nutrition, Public Health Foundation of India, New Delhi, India; ^bDoctoral Program in Nutrition and Health Sciences, Laney Graduate School, Emory University, Atlanta, GA, USA; ^cFogarty Global Health Fellow, Fogarty International Center, National Institutes of Health, USA; ^dHubert Department of Global Health, Rollins School of Public Health, Emory University, Atlanta, USA; ^eMenzies Centre for Health Policy, University of Sydney, Sydney, Australia

ABSTRACT

Background: Multiple forms of malnutrition (MOM) are a public health concern that requires strong and collaborative policy action. One common thread across MOM is inadequate consumption of fruits and vegetables (FV). An underlying reason is inadequate supply that manifests as problems in accessibility.

Objective: Using India as a case study, our aim was to understand how the FV supply-chain functions, to identify related policies that affect it and to explore opportunities for strengthening existing policies and creating new ones to improve FV accessibility.

Methods: We conducted an online search in publicly-available databases to identify key FV supply-chain policy documents and prepared a sector-wise list. Stakeholder interviews in nutrition, agriculture, public health and economic sectors were conducted to verify/populate the same.

Results: We identified 29 policies and conducted 55 interviews. The FV supply policy needs to focus on collaboration and coherence of various stakeholders. State governments' clout and their discretionary powers played a major role in deciding the focus of each policy. An increment in government's attention to this sector was noted but challenges like inter-ministerial coordination, prioritization, and duplication were also identified. Scaling-up existing policy environment with the inclusion of nutrition as a priority may increase accessibility of FV.

KEYWORDS

Public nutrition; policies; fruits and vegetables; agriculture; India

Introduction

Malnutrition is a huge problem in India.¹ According to National Family Health Survey (NFHS) – 4 data, India is home to 48 per cent stunted, 42 per cent wasted and 39 per cent underweight under 5 year olds.² Iron deficiency anaemia is also high among this group^{3,4} ranging from 39 per cent

CONTACT Shweta Khandelwal  Shweta.khandelwal@phfi.org

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in Andhra Pradesh to 75 per cent in Delhi.⁵ About 90 per cent of adolescent girls are anaemic in India.⁶ Moreover, there is vitamin A deficiency in 62 per cent of school-going children. Malnourished adolescent girls giving birth thus feed into this vicious inter-generational cycle of under-nutrition.⁷

Fruits and vegetables (FV) have shown to be protective against micronutrient deficiencies as well as chronic diseases.⁸ The National Institute of Nutrition (NIN, ICMR) dietary guidelines of India emphasize a need for whole grains and a variety of FV in children and adolescents' diets but implementation of these recommendations is sub-optimal. The average household consumption of FV in India is 149–152 grams/day/person (<3 servings),⁹ as compared with the World Health Organization (WHO) recommendation of 400g/day (5 servings).¹⁰ The actual intakes, if closely analysed, show high consumption of potatoes and onions (considered as vegetables in India) and low consumption of fresh fruits and green leafy vegetables.

The broad question we wanted to attempt answering was how public nutrition in India (in this case assessed/represented by FV intake) was impacted by supply-chain processes and policies. For this, we undertook a two-phased study with the primary aim to identify policies that affect the FV supply chain in India and to investigate opportunities to strengthen these policies, in order to increase supply, accessibility and consumption of FV (particularly non starchy vegetables). In the second phase, based on our findings from the former phase, we conducted stakeholder interviews and developed policy recommendations and strategies to increase availability and affordability of FV in India that are: *specific* (i.e. related to the existing policy content and show how it could be strengthened); *contextually appropriate* (i.e. related to current policy debates and priorities); and *feasible* (i.e. consistent with implementation capacity, policy reforms, and international commitments). The first-phase results from a detailed review of the FV supply-chain policies in India are presented in this paper. The second-phase results have been published elsewhere¹¹ which chiefly outlined that efforts to enhance FV supply chain from government sector were plenty but not coordinated between ministries and programmes. This led to huge opportunities to work towards an integrated plan to attain nutritionally appropriate public health standards.

Methods

The overall study (with two phases) was conducted from December 2014 to December 2016. This paper describes the first-phase findings which involved a comprehensive FV supply-chain policy mapping exercise via online search and expert consultation. We defined a 'policy' as a *plan or course of action, as of a government, political party, or business, intended to influence and determine decisions, actions, and other matters*.¹² This definition encompasses policy documents, Acts of Parliament, schemes, regulations, programmes,

missions, etc. Our focus was on policies at the national level but included schemes which are being implemented locally in villages, towns, and cities. To facilitate identification of policies in sectors affecting production, distribution, storage, transportation, retail and marketing of FV, we developed a matrix based on Hawkes' Consumption-Oriented Supply-Chain analysis framework.¹³ This framework has been validated for use in low- and middle-income countries (LMICs).

In our online search for policy documents, we used the following keywords: policies, schemes, acts, regulations, programme and operational guidelines, supply chain, and FV. We focused on the production, storage, transport, retail and marketing of FV, including policies from agriculture, trade, finance, commerce, health and related ministries. Mapping was based on a review of the policy documents and attempts were made to identify where the policy intersects with the FV supply chain. Once the list was prepared, the policy document and information were reviewed to see the most relevant sector of the identified five, namely: production, trade, storage and transformation, retail and marketing and consumer oriented it catered to. The list of policies were checked with at least two stakeholders from each of the above mentioned sectors to identify missed relevant policies and documents.

Results

We identified a total of 29 policies in India that are believed to affect FV supply (Table 1). The policies were grouped as per five main sectors, namely production ($n = 9$), trade ($n = 7$), storage and transformation ($n = 7$), retail and marketing ($n = 2$), consumer oriented ($n = 4$). Details of each policy are described in Table 2. The majority of these government interventions are schemes, which are promulgated at the national level and implemented at the state level.

Below, we detail the Indian FV supply-chain model including the production, distribution, processing, and retailing of FVs in India.

In India, the traditional retail model involves farmers as producers; distribution by agents, auctioneers and wholesalers; and retailers including local kirana (the organized retail stores) stores, push carts, and roadside shops. Most work is manual, and non-refrigerated trucks or tractors are the means of transport of FV.¹⁴ The supply chain of FV is dependent on intermediaries. This can involve several stages of buying and selling by intermediaries before consumers purchase it for consumption. This raises the price of FV as they move along the supply chain. Creation of a direct interface between farmers and consumers has been proposed to create a more competitive market for farmers.¹⁵

Table 1. List of fruits and vegetable policies in India**.

S. no.	Name of the policy	Year of revision, launched
Ministry of Agriculture, Cooperation and Farmers Welfare, Department of Agriculture and Cooperation (DAC)		
	National Mission on Agricultural Extension & Technology (NMAET)	2013–17, 2010
1.	Price Stabilization Fund (PSF)	2015 to 2017
2.	Rashtriya Krishi Vikas Yojana (RKVY)	2013–17, 2007–08
3.	National Mission for Sustainable Agriculture (NMSA)	2014
4.	Integrated Scheme for Agricultural Marketing (ISAM)	2014
5.	National Agroforestry Policy (NAP)	2014
6.	National Crop Insurance Programme (NCIP)	2013–14
7.	Mission For Integrated Development of Horticulture (MIDH)	2014
8.	Model APMC Act	2003
9.	Agmark grading and standardization	1986
Ministry of Food Processing Industry (MoFPI)		
10.	National Mission on Food Processing	2013–17
11.	Cold Chain, Value Addition and Preservation Infrastructure scheme	2013–17
12.	Mega Food Park Scheme	2011
Ministry of Chemical and Fertilizes		
13.	Fertilizers policy	2014
Ministry of Water Resources, River Development and Ganga Rejuvenation		
14.	Pradhan Mantri Krishi Sinchayee Yojana	2015
Ministry of Commerce and Industry		
15.	Foreign Trade Policy	2015–2020
16.	Transport Assistance Scheme	2014–2017
17.	Consolidated Foreign Direct Investment Policy	2015
18.	Export Regulation, Agricultural and Processed Food Products Export Development Authority (APEDA)	2015–2016
19.	Market Development Assistance Scheme	2013
Ministry of Health and Family Welfare		
20.	Food Safety and Standards (Packing and Labelling) Regulations	2011
21.	Food Safety and Standards (Food Products Standards and Food Additives) Regulations	2011
22.	Food Safety and Standards (Prohibition and Restrictions on Sales) Regulations	2011
Ministry of Women and Child Development		
23.	National Action Plan for Children	2016
24.	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG)-SABLA	2011
25.	National Nutrition Policy	1993
26.	Integrated Child Development Services (ICDS)	1975
Ministry of Human Resource Development		
27.	Mid-Day Meal Scheme	2004, 1995
National Cooperative Development Cooperation (NCDC)		
28.	Cold Storage and Fruits & Vegetable Programmes	2004

**Arranged from newest to oldest within each sector/department.

Table 2. Key policies affecting the fruit and vegetable supply chain in India.

Policy	Policy description	Policy implemented by
PRODUCTION		
1. National Mission on Agricultural Extension and Technology (NMAET)	<ul style="list-style-type: none"> • Farmers are given awareness skill based training of enhanced use of appropriate technologies in agriculture & allied sectors. • Institution strengthening to promote mechanization among farmers. • Provision of quality seeds and plant protection to the farmers for strengthening Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA). • Formation of Farmers into Interest Groups (FIGs) to form Farmer Producer Organizations (FPOs). • Communicating awareness message to farmers on National television channel and radio. • Involved in agriculture marketing 	All the trainings and field extension components in NMAET or other programmes of Department of Agriculture and Cooperation (DAC) and State Government are implemented by Agriculture Technology Management Agency (ATMA) and Block Technology Teams (BTTs).
2. National Mission for Sustainable Agriculture	<ul style="list-style-type: none"> • Explore utilization of soil and water conservation interventions and activities under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Integrated Water Management Programme (IWMP), Rashtriya Krishi Vikas Yojana (RKVY), etc. Farmers can choose one or combination of farming system through Krishi Vigyan Kendras (KVK), State of Agricultural Universities (SAU), Indian Council of Agricultural Research (ICAR), ATMA, etc. • Promotes integrated nutrient management (INM) through use of chemical fertilizers • Supports in adopting specific agro-climatic condition farming system models. 	The implementing agencies will be under the direct simple of state government like MGNREGS, IWMP, National Rural Livelihood Mission (NRLM), RKVY, National Food Security Mission (NFSM), NMAET, etc.
3. Rashtriya Krishi Vikas Yojana (RKVY)	<ul style="list-style-type: none"> • Provides financial assistance for production growth, infrastructure & assets, special schemes and flexi funds. • Incentivize the states for public investment in Agriculture and allied sectors. • Maximize returns to the farmers by increasing productivity of crop using facilities under RKVY 	The State Agriculture Department implements the scheme. The production growth stream are generally covered under various ongoing schemes/ programmes of Central Government viz. DAC, Department of Animal Husbandry, Dairying & Fisheries, Dept. of Land Resources, Ministry of Water Resources, Ministry of Food Processing and Industries (MoFPI), Ministry of New & Renewable Energy, Ministry of Rural Development, etc.

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
4. National Agroforestry Policy	<ul style="list-style-type: none"> • Promotes increase farm income and reduce climate risk through production, industrial application and value addition ventures. • Simplify multiple rules and regulations by Forest dept., revenue department, the bodies under Forest rights act (FRA), PESA act, etc. • Increases computerization of land records, use satellite imagery to find existing trees in farmland, etc. • Increase Public Private Partnership (PPP) for agroforestry. 	It involves convergence and dovetailing with MGNREGA, IWMP, NRLM, RKVY, Mission MIDH, National Green India Mission, Warehouse Development and Regulation Act (WDRA), fund. The nodal agency may be ATMA or any other department to be identified by the State, with other partners such as the KVVKs, NGOs, private sector, Self-Help-Groups, Farmers' Cooperatives, FPOs, and Panchayati Raj Institutions (PRIs), etc.
5. National Crop Insurance Programme	<ul style="list-style-type: none"> • Support farmers financially for losses in crop yield, maintaining flow of credit, adopting progressive higher technology farming practices and thus, to maintain production, employment & economic growth of farmers and agriculture. 	Agriculture Insurance Company of India Ltd, Private sector insurance companies with adequate infrastructure and experience jointly implement the scheme.
6. Mission for Integrated Development of Horticulture	<ul style="list-style-type: none"> • Research & Development focusing seed and planting material, technology standards and acquisition, training and demonstration. • Production of plantation material by setting up Hi-tech and small nurseries, strengthening of existing tissue culture units and setting up new TC units, hybrid seeds and import of planting material • Seed Infrastructure for proper handling, storage and packing of seeds and also promotes horticulture mechanization • Integrated post- harvest management: construction of pack- house, cold storage, pre-cooling unit, refrigerated transport vehicle, integrated cold chain supply-chain system. • Establishment of marketing infrastructure for horticulture production in government/ private/ cooperative sector. • Also involves Trade & Storage and Transformation sector 	It is implemented by State Horticulture Department, State Horticulture Mission, State IAs, Contractual staff. The Central Government Institutes under ICAR, CSIR, SAUs, National level Govt. agencies and others location specific Institutes will take up need based.
7. Fertilizer Policy	<ul style="list-style-type: none"> • The quality of the fertilizers imported in the country is invariably checked by the fertilizer quality control laboratories of the Government of India. • Provision of subsidy for the farmers to utilize the urea and P&K fertilizer on the crop through New Investment policy (NIP) and Nutrient Based Subsidy (NBS) Policy. 	NBS and NIP policies are being implemented by the Department of Fertilizers under Ministry of Chemicals and Fertilizers, Gol

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
8. Pradhan Mantri Krishi Sinchayee Yojana	<p>PMKSY has been formed by amalgamating on going schemes from 2015:</p> <ul style="list-style-type: none"> ● Accelerated Benefit Programme (AIBP) of the Ministry of Water resources, River Development & Ganga Rejuvenation (MoWR, RD & GR), ● Integrated Watershed Management Programme (IWMP) of Department of Land Resources (DoLR) and ● On Farm Water Management (OFWM) of DAC. ● PMKSY ensures convergence with all rural assets/infrastructure based programmes related to water conservation and management programmes/schemes like MGNREGS, RKVY, Jawaharlal Nehru National Solar Mission and Rural Electrification programmes, Rural Infrastructure Development Fund (RIDF), Member of Parliament Local Area Development (MPLAD) Scheme, Member of Legislative Assembly Local Area Development (MLALAD) Scheme, Local body funds, Working Plan of State Forest Department, etc. 	<p>A National Executive Committee (NEC) will be constituted under the Chairmanship of Vice Chairman, NITI Aayog to oversee programme implementation, allocation of resources, inter-ministerial coordination, monitoring & performance assessment, etc.</p>
9. National Nutrition Policy (NNP)	<p>The policy frames guidelines for:</p> <ul style="list-style-type: none"> ● Nutrition intervention for the children of age group 0 to 6 years ● Non-formal education to adolescent girls on nutrition and health ● Increasing the per capita availability of FV in schools ● Improving the purchasing power of the families by collaborating with local farmers to the school based programs. 	<p>The Department of Women & Child Development (WCD) is the nodal department for implementation and funding of NNP</p>
TRADE		
10. Model Agriculture Produce Market Committee (APMC) Act	<ul style="list-style-type: none"> ● Formulates liberalized agriculture market for the farmers through commission agents in the local market (mandi) at wholesale rate. ● Commission agents provide most of the transport for produce from farm to market for farmers and also provide space in the mandi to sell. <p>It works under the supervision of APMC.</p>	<p>Ministry of Agriculture & Farmers Welfare, Gol has implemented a new model APMC Act.</p>
11. Transport Assistance Scheme	<ul style="list-style-type: none"> ● Provides export standards and guidelines for horticulture, processed food and poultry products from India. ● Exporters claim transport assistance on shipment basis by air and sea ● The processing charges as decided by the Govt. would be applicable. Currently the charges are 5% of the total amount paid to exporter by Agricultural and Processed Food Products Export Development Authority (APEDA) as Transport Assistance. 	<p>The scheme has been introduced by APEDA under Ministry of Commerce and Industry, Gol</p>

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
12. Consolidated Foreign Direct Investment (FDI) Policy	<ul style="list-style-type: none"> ● Supplement domestic capital, technology and skills, for accelerated economic growth of India ● Investment by non-resident entity/person resident outside India in the capital of an Indian company who are subjected to FDI policies except in those sectors/activities which are prohibited ● 100% FDI capital for Horticulture and cultivation of Vegetables & Mushrooms under controlled conditions along with development and production of seeds and planting material ● Budget 2016, allows 100% multi brand retail trade in food processing sector. 	The Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce & Industry, Government of India makes policy pronouncements on FDI through Press Notes/ Press Releases which are notified by the Reserve Bank of India as amendments to the Foreign Exchange Management (Transfer or Issue of Security by Persons Resident outside India) Regulations, 2000.
13. Price Stabilization Fund (PSF)	<ul style="list-style-type: none"> ● Helps to stabilize wholesale and retail price for FV in all over Indian market creating no fluctuation in commodity prices ● Direct approach for farmers to consumers at farm gate/ Mandi without any intermediaries. ● Also involved in Retail sector. 	The PSF scheme was transferred from Department of Agriculture, Cooperation & Famers Welfare to the Department of Consumer Affairs (DOCA) w.e.f. 1st April, 2016.
14. Foreign Trade Policy (FTP)	<ul style="list-style-type: none"> ● FTP is the procedure followed by exporters and importers or by the licensing/Regional Authority or by any other authority for purpose of executing the necessities of Foreign Trade (Development & Regulation) Act, the Rules/simples made thereunder and the provisions of FTP. ● The policy will help to double the exports from 466 billion \$ in 2013-14 to 900 billion \$ by 2019-20 and raise the India's share in world exports from 2% to 3.5%. It will increase economic growth by giving a thrust to employment generations. 	The Department of Commerce formulates, implements and monitors the FTP.
15. Market Development Assistance (MDA) Scheme	<ul style="list-style-type: none"> ● Exports FV at the rate of 25% of total cost of packaging material ● Development of market information and promotion for sale. ● The various activities are export promotion activities, assisting Export Promotion Councils (EPCs), undertaking nonrecurring innovative activities, assist Focus export promotion programme in specific regions abroad like FOCUS (LAC), Focus (CIS), Focus (Africa) and Focus (ASEAN + 2) programme and activities connected with marketing promotion efforts in abroad. 	The MDA scheme is being implemented by Department of Commerce under Ministry of Commerce and Industry, Gol

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
STORAGE AND TRANSFORMATION		
16. Export Regulations, APEDA	<ul style="list-style-type: none"> Establishes a system for controlling residues of pesticides in exportable fruits at the farm level and monitor pesticide residues in water and soil at farms and pack houses. Surveillance system for controlling residues of pesticides allowed by National Research Centre for Grapes/ Pomegranates for cultivation of grapes/ pomegranates as well as for traces of other pesticides, which might be found due to previous use on the land. Establishes a system for corrective action in the event of issuance of an Internal Alert Information. To ensure that grapes exported from India to the European Union do not test positive for pesticide residues in excess of the prescribed levels. 	The Directorate of Plant Protection, Quarantine and Storage and DAC are advisors. APEDA will frequently monitor the working of each laboratory to ensure operation of the procedures based on its testing capacity for pesticide residue analysis.
17. Agmark Grading and Standardization	<ul style="list-style-type: none"> Certified packing of the cut packed fresh fruits, dehydrated FV or semi-transformed The decentralized commodities (include wheat, rice and other cereals, oilseeds, edible nuts, FV, etc.) graded under 'AGMARK' for internal trade do not require elaborate testing facilities. Standards are being coherent with international standards keeping in mind the World Trade Organization (WTO) requirements. 	The Directorate of Marketing and Inspection (DMI) managed by the Agricultural Marketing Advisor, Department of Agriculture & Co-operation (DAC) implements agricultural marketing policies and programmes of the Government of India. It undertakes Standardization, Grading and Quality control of agricultural and allied produce.
18. National Mission on Food Processing (NMFP)	<ul style="list-style-type: none"> Facilities for post-harvest operation including setting up of food processing industries. Support established self-help groups working in food processing sector to facilitate them to achieve small and medium enterprises (SME) status. Augment the capacity of food processors Augment farm gate infrastructure, supply-chain logistics, storage and processing capacity Raise the standards of food safety and hygiene Capacity development and skill upgradation through institutional training Also involved in consumer interaction 	NMFP under MoFPI also works with APEDA, National Horticulture Board (NHB) and National Cooperative Development Cooperation (NCDC).
19. Mega Food Park Scheme	<ul style="list-style-type: none"> Infrastructure facilities for the food processing along the value chain from farm to market Creation of infrastructure near the farm, transportation, logistics and centralized processing centres. 	Implementation is same as NMFP

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
20. Cold Chain, Value Addition and Preservation Infrastructure scheme	<ul style="list-style-type: none"> • Integrated and complete cold chain and preservation infrastructure facilities from farm gate to consumers • Pre-cooling facilitates at production site • Set up by groups or individual entrepreneurs of integrated cold chain and preservation infrastructure 	Implementation is same as NMFP
21. Food Safety and Standard (FSaS) (Packing and Labelling) Regulations	<ul style="list-style-type: none"> • The regulation is formulated for the packing and labelling of food products. • Fruits are waxed to increase their shelf life. 	Implementation of Prevention of Food Adulteration Act and Rules rests with State/U.T. Governments.
22. FSaS (Food Products Standards and Food Additives) Regulations	<ul style="list-style-type: none"> • Regulation gives the provision to store fresh FV till the time they are sold to the consumers. 	Implementation of Prevention of Food Adulteration Act and Rules rests with State/U.T. Governments.
RETAIL AND MARKETING		
23. Cold Storage and Fruit & Vegetable Programme	<ul style="list-style-type: none"> • Construct of cold storages and ice plants for the produce at various locations in between farm and market and also in market • Construction of packing and grading sheds and godowns for stalking the produce • Setting processing unit by private owners and helping the farmers to store their perishable produce • Assistance for purchase of transport vehicles • Strengthening of share capital base of fruits and vegetables • NCDC cooperation assists via projects to market FV in India. • Involved in Retail and Marketing sector 	The financial assistance for the projects provided by NCDC along with collaboration of other ministries or organizations like MoFPI, APEDA and National Horticulture Board.
24. Integrated Scheme for Agricultural Marketing (ISAM)	<ul style="list-style-type: none"> • Managing marketable surplus for the distribution and satisfaction of consumers at affordable price • Encouraging private and cooperative sector investments in establishment of godowns and storage houses • Promote innovative and latest technologies in marketing to spread the information on better price. • This also works in collaboration with PSF for keeping the produce surplus in market and maintain the price at fixed level. ISAM is used to promote the AGMARK standardization of products 	Directorate of Marketing & Inspection (DMI) in the Department of Agriculture & Cooperation, Ministry of Agriculture, is the Nodal authority for certification of Agricultural commodities including horticulture commodities under AGMARK.

(Continued)

Table 2. (Continued).

Policy	Policy description	Policy implemented by
25. Food Safety and Standard (Prohibition and Restrictions on Sales) Regulations	<ul style="list-style-type: none"> • The retailers are the point person for this regulation. • Prohibition on sale of fruit if use of carbide gas is done in ripening of fruits. • According to this "Provided that fruits may be artificially ripened by use of Ethylene gas at a concentration up to 100 ppm (0.01%) depending upon the crop, variety and maturity". • Sale of fresh fruits and vegetables shall be not be decayed and free from coating of waxes, mineral oil or colours. • Regulation motivate Good Manufacturing Practice (GMP) on the sale of FV by maintaining the quality of sold items. 	Implementation of Prevention of Food Adulteration Act and Rules rests with State/U.T. Governments.
CONSUMER ORIENTED		
26. National Action Plan for Children (NAPC)	<p>National Action Plan for children is been made for developing a plan based on the strategies needs to be taken by the govt in the next years.</p> <ul style="list-style-type: none"> • Provisions for nutritive attainment in a life cycle approach • Adolescents access to information, support and services for health • Maternal health care training given to mothers • Behaviour change communication of adolescent girls and women 	It is an initiative to further strengthen and activate the implementation and monitoring of national constitutional and policy commitments and the UN Convention on the Rights of the Child.
27. Integrated Child Development Services (ICDS)	<p>Services given to children under ICDS are supplementary nutrition, pre-school non formal education, and nutrition and health education.</p> <ul style="list-style-type: none"> • Nutritional and health status improvement among 0-6 years of children • Reduction of infant mortality and morbidity Promote child development in India 	These three services are implemented by Dept. of Women and Child Development (WCD).
28. Mid- Day Meal Scheme	<ul style="list-style-type: none"> • Provide food grains to the children in schools. • Improving the nutritional status of children studying in classes I – VIII • Nutritional support to children of elementary stage in drought-affected areas 	The overall responsibility for providing cooked and nutritious mid- day meal lies with the State Governments and Union Territory Administrations. States/ UTs have to ensure that all logistic and administrative arrangements are made to ensure regular serving of wholesome, nutritious and cooked meal in every eligible school.
29. Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) -SABLA-2011	<ul style="list-style-type: none"> • It aims to empower the AGs of 11-18 years by improving their nutritional and health status • Supplementary nutrition for adolescent's girls via Anganwadi centres in villages. • Nutrition & Health Education (HE) for adolescents girls in Anganwadi Centres jointly by the ICDS and health functionaries 	It is implemented by state governments/ UTs. It is implemented using the platform of ICDS Scheme through Anganwadi Centers (AWCs).

More modern approaches are variations on a ‘hub and spoke’ model, in which farmers transport vegetables from farming location to the buying centres without any involvement of agents in the chain. Customers buy vegetables from kirana or supermarkets. There are existing value chain models connecting contract farmers to consolidation centres, who transport FV to organized retailers and processors. Under the intervention of state governments there is direct procurement of FV for midday meals in schools, for example, as seen in Uttar Pradesh¹⁶ and Karnataka.¹⁷

High production has not made FV cheaper.⁹ The supply is characterized by the interaction of formal with many informal networks at all points in the supply chain. The key challenges include post-harvest losses, climatic conditions, transportation and infrastructure facilities, and dependency on intermediaries.¹⁸ In India, post-harvest losses are estimated to be 30-40 per cent of total food produce during transportation and storage of fresh food produce. The value of the food loss was estimated to be around INR 92,000 crores (14.2 billion US dollars), which is nearly two-thirds the cost borne by the government under the National Food Security Programme to feed 600 million poor people with subsidized rations.¹⁹ Climatic conditions (e.g. heavy rains and droughts) and disasters (e.g. earthquakes) can also cause

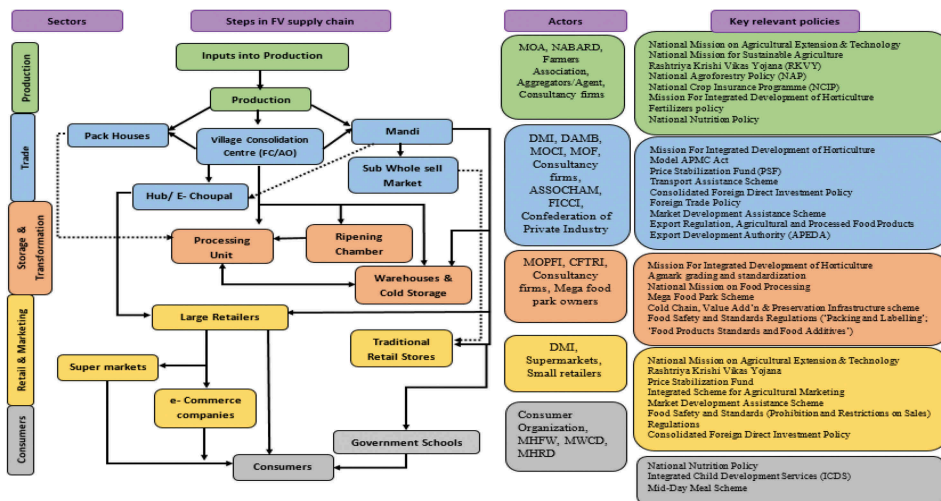


Figure 1. Summary of the fruit and vegetable (FV) supply chain in India, with key relevant actors and policies. MOA, Ministry of Agriculture and Farmers Welfare; NABARD, National Bank for Agriculture and Rural Development; DMI, Directorate of Marketing and Inspection; DAMB, Delhi Agricultural Marketing Board; MOCI, Ministry of Commerce and Industries; MOF-Ministry of Finance; ASSOCHAM, The Associated Chambers of Commerce of India; FICCI, Federation of Indian Chambers of Commerce and Industry; MoFPI, Ministry of Food Processing and Industry; CFTRI, Central Food Technological Research Institute; MHFW, Ministry of Health and Family Welfare; MWCD, Ministry of Women and Child Development; MHRD, Ministry of Human Resource Development; FC/AO, Facility centre/Area outlet. Note: One policy can appear in more than one sector depending upon the policy involvement in more than one area.

shortage of FV supply in the market. For instance, heavy rains in Delhi results in prices of some vegetables going up by 35–40 per cent in a single month in 2016²⁰ Other challenges pertaining to transportation of FV are believed to be due to high cost of transportation, unavailability of timely transportation and lack of temperature controlled vehicles.²¹

Figure 1 illustrates the findings from the policy mapping, in terms of how each policy interacts with each sector of the fruit and vegetable supply chain.

Strength and Weakness in Policy Space

The Government of India has formulated the policies for each stage, from providing production inputs to the farmers, through to consumption by consumers. The main strength evident throughout the 29 policies was state governments' clout and discretionary powers in deciding the focus of each policy. This enabled state governments to focus their policy implementation on relevant areas of supply and required commodities.

The policy landscape is characterized by growing government support for agriculture over the past decade, with a policy focus on employment, livelihoods and economic growth, but integration of nutrition considerations in agricultural policy is also a critical need of this era. The latter was lacking in the policies reviewed. The shared responsibility for agriculture-related policies between government sectors and coordination across the central and State governments remain a challenge. The complex chain of supply has created technical glitches; for example, the same facility/scheme is being provided and claimed by various ministries. FV supply chains are diversifying with co-existing traditional, commercial and modern approaches. This requires innovation in production, transport, and retail to meet changing markets. The best source of information was online website or documents, but were found to be infrequently updated by the government.

Solutions to Policy Gaps

Based on our review, we found that there is consensus and endorsement by diverse stakeholders from multiple sectors to take the following action steps towards enhancing FV supply chains:

- (1) Foster qualitative and quantitative research and innovation to improve efficiencies, reduce wastage, and improve healthy competition for FV as a high-value crop both economically and nutritionally.
- (2) Improve the provision of infrastructure for the storage and transport of perishable produce, including drawing upon indigenous techniques such as slowing the ripening, modified packaging, etc.

- (3) Improve collaboration and coherence in policies across the supply chain, with a focus on improving outcomes for consumers in terms of access and quality.
- (4) Strengthen policy implementation across sectors by drawing on expertise from the core nutrition professionals in addition to the Ministry of Food Processing and Industry, Department of Agriculture (National Horticulture Board), Department of Health, as well as from States and Industry.
- (5) Strengthen demand for FV through targeted awareness activities and media-supported social advocacy, through engaging with local supply and markets and considering seasonality.

Conclusion

Our review highlights the growing support by the Government of India for agriculture over the past decade, including initiatives like the National Crop Insurance Scheme and the Horticulture Mission. Of the 29 policies that we identified related to agricultural supply-chain sectors from production till it reaches to consumers, 15 policies were newly developed (post 2010) and 6 had been revised by the Government of India in the past 10 years. FV production is prioritized as part of this, particularly through the Mission on Integrated Development of Horticulture. However, policies to support FV specifically – as a high-value crop both economically and nutritionally – are limited, and support for FV production and supply (including storage, transport and marketing) are generally embedded in broader agricultural policy initiatives. Sometimes FV crops were found to be marginalized in these broad policy documents. We also observed little formal integration of nutritional considerations in agricultural policy; the main policy focus was found to be on exports, employment, livelihoods and economic growth. Similar to this, we also found a lack of emphasis on FV consumption/inclusion in daily diets in our National Nutrition Policy 1993. Most nutrition guidelines from the country mentioned FV consumption but did not share practical ways of including them in daily diets.

The policy landscape relevant to FV supply demonstrates a high level of shared responsibility for agriculture-related policies. Policies relevant to FV supply are situated within different government sectors, namely Agriculture, Food Processing, Commerce and Industry, and Health (particularly with respect to standards), as do policies related to demand, which are mainly situated within the Agricultural Marketing and Women and Child Development. There is an additional layer of complexity in responsibility sharing namely the central and state level purviews.

Taking a supply-chain approach to our analysis highlighted the fact that policies are responding to the changing agricultural and marketing context. FV supply chains are diversifying, with co-existing traditional, commercial and modern value chain approaches. This impacts approaches to production, marketing and processing. Policy responses have included new investments in food processing infrastructure, and reform of the Agricultural Marketing Act. At the same time, the size of farms is decreasing and farming as a career is becoming less attractive. We did not identify any specific initiatives seeking to attract school drop-outs, young college students or fresh graduates to farming/horticulture careers, which may indicate an opportunity for targeted marketing of horticultural careers. Related to this, there may be opportunities for strategic public-private partnerships to improve FV supply, in line with Sustainable Development Goal 17 which aims to strengthen means of implementation and revitalize the global partnership for sustainable development. In particular, these might provide a mechanism to engage stakeholders with diverse expertise across the supply chain.

The shared responsibility for FV supply suggests three opportunities to support a shared policy agenda between agriculture and health: the first is the opportunity to engage the health sector in supporting specific initiatives to increase demand. For example, encouraging engagement between Government of India departments with responsibilities related to FV supply and demand at the field to identify opportunities for local FV marketing particularly for green leafy vegetables and fresh fruits. Second, there is an opportunity to build on initiatives to improve integration and coherence in FV policies across the supply chain. This could include convergence of schemes focused on rural infrastructure, more initiatives to bring together FV relevant expertise that is spread across government sectors and jurisdictions (including within health); and increasing investment into policies focused on local production and access to local markets. Third, developing targeted modules for farmer education or extension related to FV production specifically as high-value crops both economically and nutritionally. Expertise from the Ministry of Food Processing and Industry, Department of Agriculture (National Horticulture Board), Department of Health, and Industry could be sought for the development of such targeted modules.

The study also has a few limitations. The findings presented here are from an exploratory study, which has identified the policies affecting supply chain of FV and provided suggestive information on the possibility of pursuing an integrated supply policy approach to nutrition. However, the study is limited by the policy document reviews which are available online for most of the policies. We found 29 policies which seems to be exhaustive but there might be few which we may have inadvertently missed. However we did consult experts from various allied sectors like agriculture, environment, finance, food processing, health, etc., to populate our list to the best of our abilities. Many policies are not directly related to FV but focus on the broader domain

of agriculture. The study is also limited as a point in time analysis of policies in a constantly changing policy space. However, this can be considered as a starting point for those who would like to further pursue research or policy work in the intersectional space of agriculture, nutrition and public health.

In summary, this study draws attention to the opportunities and challenges relating to FV policies in India. Our endeavour is to solicit political will and commitment towards joint ventures in the agriculture, nutrition and public health, focused on, but not limited to, a mere discussion around the FV accessibility issues but to promote local consumption of high quality FV. As public health and nutrition advocates, we will continue working towards both highlighting the opportunities and addressing the challenges related with FV policies in India so as to contribute to making India healthier and better nourished each day.

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ORCID

Shweta Khandelwal  <http://orcid.org/0000-0002-7208-670X>

Nida I. Shaikh  <http://orcid.org/0000-0002-3684-2651>

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