Asian Journal of Agricultural Extension, Economics & Sociology

Volume 41, Issue 10, Page 913-929, 2023; Article no.AJAEES.107669
ISSN: 2320-7027

Aggregate Public Support to Indian Agriculture

Atri Mukherjee [a++], D. Suganthi [a#*], Rishabh Kumar [a#] and Priyanka Bajaj [a†]

[a] Department of Economic and Policy Research, Reserve Bank of India, Mumbai, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2023/v41i102244

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/107669

Original Research Article

Received: 12/08/2023
Accepted: 19/10/2023
Published: 30/10/2023

ABSTRACT

Agricultural subsidies, public investment and income transfer are the three main instruments of India's farm support policy. This paper examines the aggregate level of public policy support to Indian agriculture for the period from 1995-96 to 2020-21, by putting together different support measures extended by central and state governments and classifying those under three different categories, namely, subsidies, public investment and green box support. The findings reveal that despite some moderation from the peak level achieved during 2008-09, the aggregate support to Indian agriculture continues to remain sizeable at 22.4 per cent of agriculture GVA in 2020-21. In the aftermath of the global financial crisis (GFC) in 2008-09, which is also coincident with the global food crisis, input subsidy declined sharply, whereas the decline in investment was more gradual. Furthermore, there is a distinct shift in the composition, away from input subsidies and in favour of green box support, which includes direct transfer to supplement farmers' income. Using multi dimension index method, the effective aggregate support index, constructed after assigning different weights to the three components as per their impact on agricultural growth, highlights

[++] Director;
[#] Manager;
[†] Assistant Adviser;
**Corresponding author: E-mail: suganthid@rbi.org.in;*

that effective public support to agriculture, which was low in the late 1990s improved substantially till 2008-09 and moderated thereafter. The index values suggest that there is scope for further improvement in policy support for Indian agriculture with higher emphasis on public investment.

Keywords: Subsidy; public investment; green box support; WTO; direct benefit transfer; index.

JEL Classification: Q1, Q14, Q18, C430, F130, H200.

1. INTRODUCTION

India has achieved record production of foodgrains and horticulture crops over seven consecutive years during 2016-17 to 2022-23. The production of horticulture crops touched 350 million tonnes in 2022-23 from 215 million tonnes in 2008-09, with an average annual growth of 3.6 per cent, far exceeding the 2.6 per cent average growth of foodgrains during the same period. Similarly, the contribution of the allied sector comprising livestock, fisheries and aquaculture in the overall growth of the agriculture sector has increased significantly over the years. As a result, India has emerged as one of the leading producers of milk, cereals, pulses, vegetables, fruits, cotton, sugarcane, fish, poultry and livestock in the world. This has made the country self-reliant and an exporter of many agricultural products [1]. The sustained increase in agricultural production over the years was made possible through various government policy measures, including institutional and technical support to agriculture as well as provision of input subsidies, price support and public investment in farm infrastructure.

With the increase in food production, the issue of supply management has gained importance. Farm infrastructure development in terms of cold storage and food processing capacity has not kept pace with production levels achieved for foodgrains and horticulture crops. Surplus agricultural production with inadequate rural infrastructure and lack of alternative rural employment opportunities resulted in supply chain wastages, distress farm sales and price crashes, thus, eroding the farmer's income [2, 3]. To ensure that the farmers get a fair value for their products and make agriculture policy and programs more sustainable and income-oriented, the government has adopted a multi-dimensional seven-point strategy which emphasises on micro-irrigation, provision of quality seeds and soil nutrients, large investments in warehouses and cold chains to prevent post-harvest losses, promotion of value addition through food processing, creation of one integrated market through the implementation of e-National Agricultural Markets (e-NAM), provision of crop insurance at a lower cost, and promotion of agriculture allied activities [3]. Recently, the Indian Council of Agriculture Research has formulated a state-wise strategy for doubling farmer's income.[1] The central and state governments have also implemented different income transfer schemes to boost farmer's income directly.

Against this backdrop, this paper examines various agricultural support measures currently in place in India and their relevance in the present context. The objective of the paper is twofold. First, an attempt has been made to put together the different support measures extended by the central and state governments to the farm sector from various sources to work out the aggregate government support for agriculture in India.[2] For analytical convenience, the support measures have been classified into three categories: subsidy, green box support and public investment. The shift in emphasis of government policy at different points in time has been captured in the study. Second, an attempt has also been made to construct an index to measure the level of effective government support in terms of agricultural growth, recognising the divergent effects of investment and subsidy on the growth and development of the agriculture sector [4, 5, 6]. Past studies in this area have mainly focused on subsidy and public investment, ignoring green box support. The paper fills this gap in the literature by building a comprehensive measure combining all the three forms of support.

The remaining part of the paper is organised as follows: an overview of the different agricultural support measures, empirical literature and cross-country experience is provided in Section 2. The different subsidy measures extended by the central and the state governments to the farm

[1] *https://icar.org.in/content/state-specific-strategies-doubling-farmers-income-22*

[2] *The sources of various indicators has been given in Table A1 in the annex.*

sector are analysed in Section 3. Section 4 highlights the green box support provided by the government to increase agricultural production and augment farmer's income. The importance and the present state of public investment in Indian agriculture are discussed in Section 5. The newly constructed index of effective aggregate farm support and its implication for the farm sector is described in Section 6. Section 7 concludes.

2. AGRICULTURAL SUPPORT MEASURES: AN OVERVIEW

2.1 Features and Classification of Agricultural Support

Farm subsidies, public investment and income transfer are the three main instruments of India's farm support policies. The debate on the trade-off between subsidy *versus* public investment has been well recognised in the literature [7, 4, 8, 9, 6] The conventional idea behind input subsidies is to enhance productivity by promoting new technology in the short run [7, 8, 4, 9]. The success of the Green Revolution in India and across several Asian countries can be attributed to the generous input subsidies provided to the farmers [10]. Public investment, on the other hand, improves agricultural productivity in the long run through capital accumulation. Investment in agricultural research, education, energy and rural roads are important for promoting agricultural growth, alleviating poverty and crowding in private investment, which can yield long-term benefits [8, 6, 7].

The different types of farm subsidies currently prevailing in India are input, export and food subsidies.[3] Input subsidies help in maintaining the sustained flow of inputs at reasonable prices to the small and marginal farmers. The major forms of input subsidies are (a) irrigation subsidy; (b) power subsidy; (c) fertiliser subsidy; (d) credit subsidy; and (e) subsidised sale of seeds. Export subsidies encourage export of goods through direct payments, low-cost loans, tax breaks for exporters, *etc.* The third and the most important form of farm subsidies is the food subsidy, which serves the multiple objectives of providing price support to the farmers, supplying foodgrains to consumers at a reasonable price, and maintaining a buffer stock for national food security.

Economists have criticised the provision of subsidies due to its several weaknesses [7, 5]. Subsidies crowd out investment, lead to environmental degradation, intensify inefficient cropping patterns, increase fiscal burden and accentuate inequity across regions [7]. In the case of international trade, subsidies to domestic producers enable them to offer internationally competitive prices, reduce imports, or raise exports.

Given the trade distortionary nature of subsidies, the World Trade Organisation (WTO) has imposed limits on them. Recognising the need for providing support to the farmers, many of whom are economically weak, while at the same time allowing minimum trade distortion, the WTO has classified farm support measures into three categories, the amber box, the blue box and the green box. The subsidies that distort international trade by making products of a particular country cheaper in the international market compared to the same or similar product from another country are classified under the amber box. Blue box supports are subsidies tied to programmes that limit production by imposing production quotas or encouraging farmers to set aside land for other purposes. The farm supports that do not distort trade or, at most, cause minimal distortion are categorised as green box support and are exempted from reduction commitment. The developed countries can provide amber box subsidies, both product-specific and non-product specific, up to 5 per cent of the value of the product and agriculture production, respectively. The developing countries, on the other hand, can provide product specific and non-product specific subsidies up to 10 per cent of the value of the product and agriculture production, respectively. The farm support measures falling under the blue and green box are exempted from any such limit.

2.2 Empirical Literature on Cross-Country Experience

While government policy support is important for agriculture, its level and composition vary widely across countries. After the adoption of Agreement on Agriculture (AoA) [4], the

[3] *The entire food subsidy is not extended to farmers, as a large part of it is spent on distribution of foodgrains at free of cost or at a discounted price to the weaker section of the population and thus serves the purpose of consumer welfare rather than farm support.*

[4] *The Agreement on Agriculture (AoA) was designed by WTO to promote multilateral trade and minimise trade distortions. India joined WTO in 1995. The AoA contains various agricultural policies to be adopted by the member countries. These include reduction of tariffs on imports, elimination of export subsidies, reduction of domestic subsidies and limiting them to permissible types of subsidies.*

phenomenon of box shifting has been observed among several developed countries. For instance, countries like, Japan, Canada, the European Union and Australia have witnessed a sharp compositional shift in favour of green box support from the amber box [11]. Further, the findings showed that the increase in green box support enhanced agriculture productivity to a varying degree in developed countries between 1995 and 2007. Notwithstanding the recent box shifting, the overall level of domestic support for agriculture in developed countries is much higher compared to the developing world [12]. More than 90 per cent of global aggregate measurement of support entitlement is provided by the developed members . In terms of per farmer entitlements, domestic support in developing nations is merely a fraction of that in developed countries [12]. The developing countries are severely affected by unfair competition in global trade due to the huge trade-distorting support provided by the developed countries [13, 14]. In the Indian context, several studies have shown that the product-specific support for rice and wheat has been negative both in rupees and dollar terms, highlighting low levels of support to poor farmers [7, 15, 16, 17].

The common policy recommendation highlighted across different existing studies indicate that the domestic support to agriculture should shift away from subsidies towards public investment in infrastructure, research and development and income transfers [17, 18, 19]. A detailed analysis of the three major expenditure categories, *viz.,* subsidy, green box support and public investment in agriculture are provided in the following section.

3. SUBSIDY

In India, agriculture falls under the State list of the Constitution, which essentially means that the state governments are supposed to address all issues related to agriculture. However, recognising the importance of agriculture to achieve food security and provide a livelihood for its population, both the central and state governments have extended different types of subsidies to the agricultural sector. The most important among the central government subsidies are food, fertiliser, seed, export, credit and insurance. The major forms of state government support, on the other hand, comprise of irrigation and electricity subsidies.

3.1 Central Government Subsidies

3.1.1 Fertiliser subsidy

The fertiliser pricing policy of the government is postulated with twin objectives: to facilitate the availability of fertiliser to farmers at a lower price to encourage its use and to ensure remunerative returns to the fertiliser companies for their production and investment [20,17]. Accordingly, the government has followed a policy of restricting the maximum retail price of urea at a much lower level than its cost of production and the difference is paid as the fertiliser subsidy to the companies. For phosphatic and potassic (P&K) fertilisers, prices are decontrolled, and the government is implementing the Nutrient Based Subsidy (NBS) scheme introduced in 2010.

The expenditure on fertiliser subsidy by the government had increased sharply in 2008 due to the rise in fertiliser prices driven by underlying petroleum prices (Table 1). However, with the easing of global petroleum prices, introduction of the NBS policy in 2010 and control of leakages through direct benefit transfer (DBT) since 2017, the fertiliser subsidy moderated thereafter. The fertiliser subsidy of the government spiked again in 2022-23 due to increase in fertiliser prices on account of the supply disruption created by ongoing Russia-Ukraine war. With the subsidised price of fertilisers, the consumption of fertilisers in India has increased steadily over the years. The increased pace of consumption of fertilisers has created a conducive environment for intensive agriculture, which, in turn, has resulted in steady growth in foodgrain production during the last four decades (GoI, various rounds).

Notwithstanding its positive contribution to agricultural growth, the fertiliser subsidy policy has drawn strong criticism. The negative impacts of the fertiliser subsidy policy are felt through the low response of grain to fertiliser, degradation of soil, contamination of underground water and the environment with excessive nitrogen.

3.1.2 Seed subsidy

Seeds are important inputs for crop production and are covered under the Essential Commodities Act (ECA), 1955. To encourage the use of certified quality seeds, the government distributes subsidised seeds below the market

prices. The government also gives training to farmers to produce, process and save quality seeds [2]. Assistance for boosting seed production in the private sector is often provided by credit-linked back-ended capital subsidy at the rate of 25 per cent of the project cost, limited to Rs. 25 lakh per unit on seed infrastructure development.[5] Seed subsidy, however, accounts for a negligible part of the central government's budget.

3.1.3 Credit subsidy

The access and availability of credit is a major problem for the resource-poor farmers, as they lack collateral to access the formal credit market and mostly depend on private money lenders for loans at a very high-interest rate [21, 22]. According to the 'All India Debt and Investment Survey', 93 per cent of the outstanding agricultural credit was from non-institutional sources in 1950-51, which has significantly declined to 40.3 per cent in 2018-19 [34]. To increase the penetration of institutional credit, the government has encouraged more banking operations in rural areas, lower interest rates for the farmers and relaxation in terms of credit. Thus, credit flow into agriculture has to a large extent, been driven by policy thrust, particularly through lending targets, interest subvention schemes and priority sector lending (PSL) stipulations [23].

To extend loans at a lower interest rate, the government introduced an interest subvention scheme in 2006-07, under which short-term crop loans up to Rs.3 lakh at a concessional rate of 7 per cent is being offered to farmers. The timely repayment is rewarded by an additional subvention of 3 per cent, implying an effective interest rate of only 4 per cent. The government pays the difference between the actual cost of credit and the interest payment received from the farmers as credit subsidy. The credit subsidy under the interest subvention scheme has gone up by around eight times during the past decade. Over the years, the Kisan Credit Card (KCC) has emerged as the most common instrument for obtaining agricultural loans. Overall, the credit subsidy as a per cent of agri-GVA hovers in the range of 0.1 to 0.6 per cent, which is quite small, compared to other subsidy heads.

3.1.4 Insurance subsidy

From the mid-1980s till 2016, several crop insurance schemes[6] were implemented in India with modest success. Gleaning lessons from the earlier schemes, a revamped version of the weather-based crop insurance scheme, the Prime Minister Fasal Bima Yojana (PMFBY), was introduced effective from the 2016 *Kharif* season. The most notable feature of this scheme is that the farmer's share of insurance premium is minimal (which was not the case with old schemes). The subsidised premium rate payable by farmers is 2 per cent, 1.5 per cent and 5 per cent of the sum insured for the *Kharif* (food and oilseeds), *Rabi* (food and oilseeds) and perennial (commercial and horticulture) crops, respectively.The difference between this rate and the actual premium is shared equally by the central and state governments. Thus, the subsidy component is way much higher than the previous schemes. Accordingly, the amount of insurance subsidy, which was modest earlier, increased sharply after the introduction of PMFBY in 2016-17 and subsequently, it remained at an elevated level but less than one per cent of agri-GVA (Table 1).

Under PMFBY, insurance companies are required to settle the claims within two months of completion of crop cutting/harvesting period, subject to availability of yield data and receipt of premium subsidy from the state government. However, claim settlement in some states/areas gets delayed due to several reasons, including the delayed transmission of yield data, insurance companies raising disputes on yield data, reconciliation of individual farmer data on the portal by bank branches, late release of premium subsidy share by some states, *etc.* [24, 25]. The revamped PMFBY 2.0 is an improvement over its earlier version in terms of rationalisation of the procedure for damage assessment in a fixed period. However, in this revamped scheme, the central government subsidy on crop insurance premium is capped at 30 per cent in unirrigated areas; 25 per cent in irrigated areas; and 90 per cent in the North-Eastern states; the rest has to be borne by the state governments.

[5] *The detailed account of the working of the seed subsidy can be found at http://seednet.gov.in/material/prog-schemes.htm*

[6] *Comprehensive Crop Insurance Scheme (1985), National Agricultural Insurance Scheme Rabi (1999), Modified National Agriculture Insurance Scheme-Rabi (2010-11) and Weather Based Crop Insurance (since 2007).*

Table 1. Major Agriculture Subsidies Provided by Central Government of India

Particular	(Amount in Rs. Crore)					(Per cent of Agri-GVA)				
	2000-01	2007-08	2014-15	2020-21	2022-23	2000-01	2007-08	2014-15	2020-21	2022-23
1. Food	12,060	30,052	1,13,171	5,29,691	2,86,979	2.6	4.2	5.4	14.7	6.4
2. Fertiliser	13,800	39,990	75,067	1,27,922	2,25,220	3.0	4.9	3.9	3.5	5.0
3.Credit*	-	1,700	6,000	17,790	22,000		0.2	0.3	0.5	0.5
4. Insurance#	57	148	2,239	26,052	-	0.01	0.02	0.1	0.7	-
5. Others (seeds, machinery, *etc.*)$	-	400	1,873	26,75	3,200	-	0.1	0.1	0.1	0.1
6. Total (1+2+3+4+5)	25,917	72,289	1,98,350	7,04,129	5,37,399	5.6	9.4	9.8	19.5	12.0

Source: Compiled from central government budget documents (various years); Fertiliser Association of India; Food Corporation of India; and Agricultural Statistics at a Glance (various years)

"": Interest Subvention Scheme was started in 2006-07*

"#": Data pertains to subsidy provided by central and state governments combined.

"$": Others include the expenditure incurred under National Food Security Mission

3.1.5 Export subsidy

Export subsidy is provided to farmers to promote the export of certain farm products and to remain competitive in the international market. Various export promotion schemes[7] are currently in place which primarily focus on developing better export-oriented infrastructure facilities, capacity building, and export competitiveness. While the amount of agricultural export subsidy has increased in value terms, its share in agri-GVA has remained almost insignificant in the range of 0.01-0.02 per cent during the last two decades. As per the WTO decision in 2015, agricultural export subsidies have been prohibited and the rule will be effective for India by 2024.

3.1.6 Food subsidy

Food subsidy in India serves multiple objectives of providing price support to the farmers, supplying foodgrains to consumers at reasonable prices, and maintaining strategic buffer stock for national food security. Procurement, storage and distribution of foodgrains involve substantial economic costs for the government. Food subsidy is the difference between the cost incurred by the government to procure and the price at which foodgrains are distributed to the beneficiaries (known as Central Issue Price).

In India, the government has been pursuing the price support programme wherein the minimum support price (MSP) is announced for all major crops just before the commencement of *Kharif* and *Rabi* sowing seasons to incentivise production. Based on the recommendations of the National Commission on Farmers (2004-06), since 2018-19, the MSP is calculated such that it is at least 1.5 times the cost of cultivation. The government agencies purchase crops, *viz.,* rice, wheat, pulses, oilseeds, and cotton from the farmers at MSP, which are then distributed (food crops) to the economically weaker sections of the population through the public distribution system (PDS). A part of the procurement is also maintained as buffer stock by the Food Corporation of India (FCI). While the economic cost of procurement, storage and distribution has been rising over the years, there has been no commensurate increase in the issue price. This coupled with higher procurement and periodic rises in MSP has led to gradual rise in food subsidy bill over the years (Table 1). In addition, the government's decision to provide free foodgrains to the economically weaker sections during the Covid-19 pandemic under the Prime Minister's Garib Kalyan Anna Yojana (PMGKAY) has resulted in a sharp spike in food subsidy in 2020-21.

3.2 State Government Subsidy

Electricity and irrigation are the two major subsidies provided by the state governments to the farmers. Apart from these, the state governments also provide various other subsidies and assistance to the farmers, which varies across states, *viz.,* subsidy on seeds, manures, extension and farmer's training, soil survey and testing. The state governments receive major funding from the centre under various agricultural missions. For instance, the National Agricultural Development Plan (Rashtriya Krishi Vikas Yojana) requires states to conceptualise state and district level plans to accelerate their spending on several crop and livestock sectors through developing

[7] *Market Access Initiative (MAI), Market Development Assistance (MDA) and Merchandise Exports from India Scheme (MEIS).*

mechanisation, natural resources management and extension services. Besides, many states have their own agricultural policies towards improvement in irrigation in terms of groundwater harvesting and drought-proofing.

3.2.1 Electricity subsidy

Electricity is an important input for agricultural production and rural development in India, as it is primarily required for powering pumps for groundwater irrigation. Electricity subsidy induces farmers to invest in water pumping sets, bore wells, tube wells, *etc.* The large-scale groundwater irrigation driven by electricity subsidy has played a significant role in agriculture intensification and has made Indian agriculture resilient to weather shocks [2]. The states, through their regulatory bodies, set the electricity tariff charged to different categories of customers, such as agriculture, industry, domestic, and commercial. The agricultural users are charged much lower electricity tariff than the average unit power supply cost [2]. Electricity subsidy is the difference between the cost incurred (generation and distribution) and the price charged to the farmers. The electricity subsidy to the agriculture sector has been mounting as the unit cost of power supply has increased faster than changes in tariff rates.

3.2.2 Irrigation subsidy

The government incurs huge costs towards building, operating and maintaining irrigation infrastructure facilities like canals and dams. The cost of providing surface water for irrigation is higher than the price charged by the state government agencies. The irrigation subsidy, which is the difference between the operating and maintenance cost of irrigation infrastructure and charges recovered from farmers, has been climbing [17].

3.3 Total Farm Subsidy

After identifying different types of subsidies provided by the central and state governments in India, those were classified into product-specific price support and non-product specific input subsidies as per WTO classification. Price support provided by the government to the farmers for procurement of specific agricultural products, such as rice, wheat, pulses, oilseeds, coarse cereals and cotton, falls under the product-specific subsidy. Non-product specific input subsidy, on the other hand, is estimated as the sum of fertiliser, electricity, irrigation, credit and insurance subsidy. The government's expenditure on procurement operations in the form of price support is much lower compared to input subsidies (Chart 1).

In its presentation to WTO, India notifies input subsidy as Special and Differential Treatment under the Development Programmes, and hence, those are largely exempted from the reduction commitment, as 99.4 per cent of farmers in India are low-income or resource poor as per the Agricultural Census, 2015-16. [8] However, the WTO's list of exemptions for domestic support programmes does not include subsidies on premium for crop insurance programmes. Accordingly, India notifies insurance subsidy under the non-exempt category to WTO, which remains less than 1 per cent of agri-GVA.

4. GREEN BOX MEASURES

The government's support to the agriculture sector, which is not trade distortionary or causes minimum distortion, is qualified as green box subsidy. The WTO member countries are permitted to pursue such expenditure without limit or reduction commitment. The green box generally comprises two support groups: (i) public service programmes like research, training, marketing promotion, infrastructure, domestic food aid or public food security stocks and relief payments for a natural disaster; and (ii) direct payments, also known as decoupled income support measures as these do not influence the market price or production decisions of farmers. While green box supports are widespread among developed countries, their application in developing countries is limited due to a lack of financial resources.

4.1 Direct Income Transfers

Identifying the weaknesses of various subsidy measures, both the central and the state governments in India have introduced direct support measures under which cash payments are made directly to farmer's bank accounts. These measures do not accentuate market distortions and result in efficiency losses, as seen in the case of different subsidy schemes. Apart from the central government scheme - PM-KISAN (*Pradhan Mantri Kisan Samman Nidhi*), several state governments, *viz.,* Telangana,

[8] *Article 6.2 of the AoA allows developing countries to have some additional flexibility in providing domestic support under the special category of Development Box.*

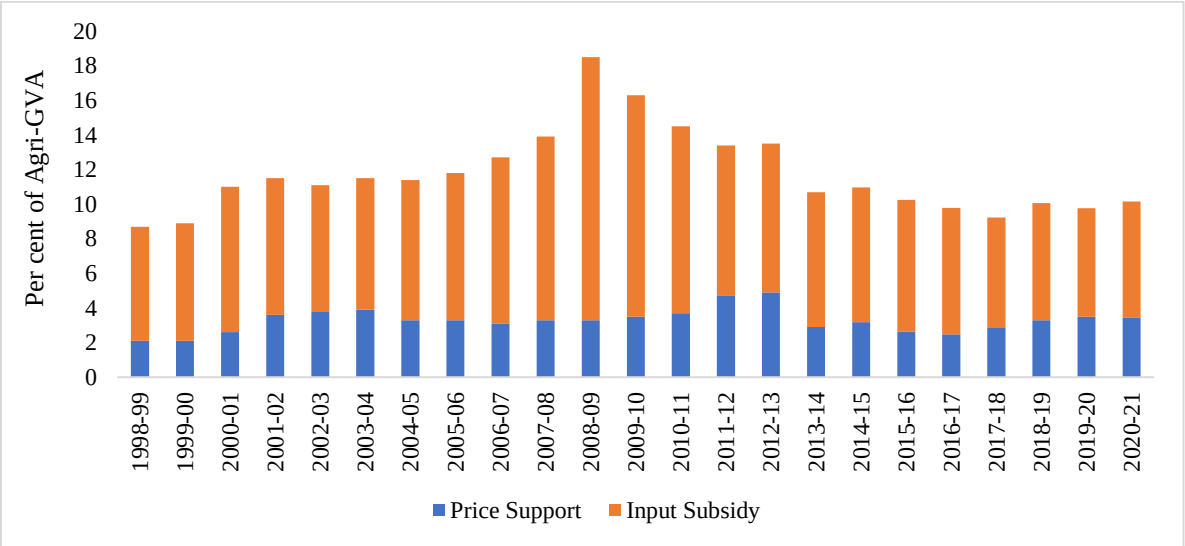

Chart 1. Product Specific and Non-Product Specific Farm Subsidies in India
Source: Compiled from WTO (www.wto.org) and GoI (various years)

Odisha, West Bengal, Jharkhand and Andhra Pradesh, have also announced unconditional income/investment support schemes for the farm sector in recent years. These schemes are mainly targeted at small and marginal farmers with landholding up to 2 hectares.

4.2 Farm Loan Waivers

While the first incidence of farm loan waiver can be traced back to the late 1980s, it gained prominence at the end of the last decade, coinciding with the global food crisis (2008) [26]. Since then, the farm loan waiver has emerged as a major source of transfer of resources by state governments to the farmers. Various state governments, including Tamil Nadu, Maharashtra, Karnataka, Uttar Pradesh, Jammu & Kashmir, Punjab, Chhattisgarh, Andhra Pradesh, Telangana and Union Territory (UT) of Puducherry have rolled out their own farm loan/debt waiver schemes to extend relief to the needy farmers since 2014-15. Farm loan waivers implemented by the state governments are part of the green box support.

4.3 Total Transfer from the Central and State Governments

By taking into account both direct income support and farm loan waivers, the total transfer to the farm sector has seen a spurt in the last few years (Chart 2). Debt waivers are generally criticised by economists as they tend to disrupt the credit culture. A shift towards direct income support, on the other hand, can bring greater inclusiveness by generating higher benefits for the resource-poor farmers.

4.4 General Services to Agriculture and Allied Sector

The government provides support for various agricultural services, *viz.,* research, training, pest control, marketing promotion, infrastructure and extension services for the improvement of agricultural production and general development of the sector. The combined central and state government's expenditure on such general agricultural services has increased over the years but continues to remain modest at less than one per cent of agri-GVA (Table 2).

4.5 Total Green Box Support

Total green box support to the Indian agriculture sector increased gradually from 2.8 per cent of agri-GVA in 2000-01 to 8.9 per cent in 2020-21. Within the green box support, the cost incurred towards the operation of buffer stock of foodgrains accounts for the largest share. The scale of other supports varies from year to year based on requirements. The sharp increase in cost incurred towards buffer stock operations in 2020-21 reflects the additional expenditure made by the government towards distribution of free foods under PMGKY during the Covid-19 pandemic.

Table 2. Green Box Support to Agriculture Sector

(Rs. Crore)

	2001-02	2004-05	2008-09	2012-13	2017-18	2019-20	2020-21
I. General Services (a to f)	477.0 (0.1)	1,582.8 (0.3)	4,011.0 (0.4)	21,372.5 (1.3)	23,275.9 (0.8)	23,082.8 (0.7)	23,141.9 (0.6)
a. Research	332.0	1,064.7	2,046.5	4,699.9	6,419.9	72,179.4	7,942.9
b. Pest and disease control	8.7	141.5	185.3	430.5	314.5	1,153.1	1,108.8
c. Training services	6.6	45.2	40.2	55.3	2,28.7	298.9	466.7
d. Extension and advisory services	106.3	87.1	326.1	3,084.3	5,761.5	5,703.0	5,370.0
e. Marketing and promotion services	6.4	108.7	153.7	2,338.4	3,743.7	2,679.3	2,851.2
f. Infrastructure Services	10.1	135.6	1,259.4	10,764.2	6,807.7	6,069.2	5,402.2
II. Decoupled income support (includes PM KISAN)	-	-	-	-	-	48,713.8	60,989.9
III. Payments for relief from natural disasters	598.4	350.0	801.0	-	11,080.0	10,454.2	8,227.0
IV. Buffer stock operations	17,494.0	25,746.5	43,668.0	80,563.2	1,16,281.7	1,32,408.0	2,16,833.0
V. Structural adjustment assistance provided through investment aids	517.3	102.4	29,370.0	-	52,028.0	-	12,439.2
VI. Total Green Box (I to V)	**19,086.7 (3.8)**	**27,781.7 (4.9)**	**77,849.0 (8.2)**	**1,01,935.7 (6.1)**	**2,02,665.5 (7.2)**	**2,14,658.8 (6.4)**	**3,21,630.9 (8.9)**

Source: Compiled from WTO (www.wto.org)

Note: 1. Values in the parentheses are per cent share of agri-GVA.

2. Item V includes dryland farming/rainfed farming, provision of loans at concessional rates and debt waiver, scheme for reclamation of alkaline soils and drought-prone area programme

3. Values may not match exactly with budget data of India because the WTO considers October 1 to September 30 i.e. the agriculture marketing year for compilation of annual data on agriculture.

4. '-' refers to not applicable.

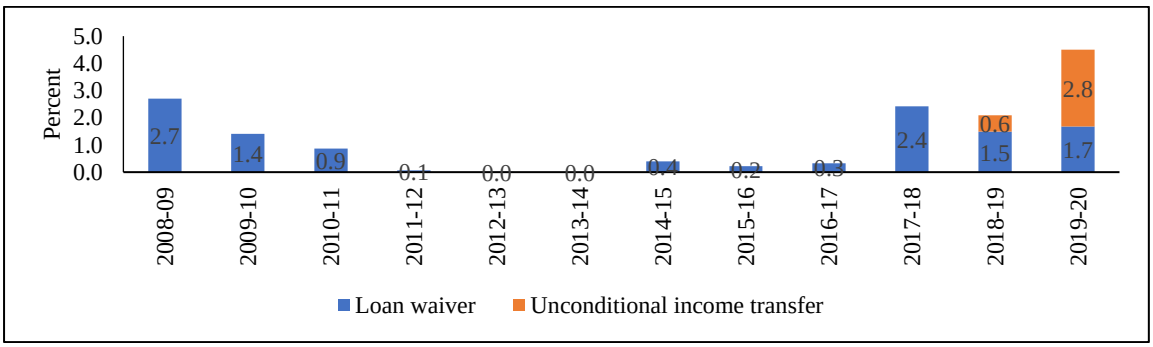

Chart 2. Transfers from the central and state governments

Source: *Compiled from budget documents of GoI, State Finance Report of RBI and Report of the Internal Working Group to Review Agricultural Credit*

5. PUBLIC INVESTMENT IN AGRICULTURE

The combined capital expenditure of the central and state governments in Indian agriculture has remained modest in the range of 2.5 to 5.5 per cent of agri-GVA during the period from 1990-91 to 2021-2022 (Chart 3). The capital expenditure of the state governments continues to remain significantly higher than that of the central government as the major and minor irrigation accounts for nearly 60 per cent of the capital expenditure in agriculture, mostly incurred by the state governments. Certain factors that kept the growth in public investment modest are diversion of government resources to current expenditures like subsidies, expenses on maintenance of existing projects, delays in project completion and relatively lower allocation for rural infrastructure, research and development [27]. While public investment usually strengthens infrastructure, private investment complements the productive capacity, and over the years, the share of public investment has been less than the private investment, with around 25 per cent of the total investment in agriculture [28].

6. EFFECTIVE AGRICULTURAL SUPPORT INDEX

The overall support to Indian agriculture by the government reached a peak of 32 per cent of agri-GVA in 2008-09, the year of the food crisis (that coincided with the GFC) (Chart 4).[9] Although the global prices of food, as well as inputs manufactured from petroleum (fertiliser and diesel) shot up, the impact was not felt much in India because the government expenditure on input subsidy, procurement of foodgrains, green box support and public investment reached an unprecedented scale during the year to mitigate the adverse impact of the crisis on the rural economy. Despite some moderation from the peak level achieved during 2008-09, the aggregate support to agriculture continues to remain sizeable at 22.4 per cent of agri-GVA in 2020-21. Excluding the exceptional year of 2008-09, the decadal average of aggregate support as per cent of agri-GVA has improved from 18.9 per cent during 1998-99 to 2007-08 to 22.4 per cent during 2009-10 to 2020-21. In the aftermath of GFC, input subsidy declined sharply, whereas the moderation in green box support and public investment was more gradual and witnessed a pickup during the Covid-19 period. The product-specific subsidy, which mainly comprises price support to farmers, remained broadly stable in the range of 3-5 per cent of agri-GVA in the post-crisis period.

After aggregating public support for agriculture from various sources, we have attempted to construct an index that measures the effectiveness of government support for the growth and development of the Indian agriculture sector. The rationale behind the index construction is to reduce the dimensionality of the underlying indicators and to enable comparison across time the level of support from the public policy perspective. In the context of agriculture, there exist few indices like the Agriculture Orientation Index (AOI) of the Food and Agriculture Organisation (FAO), which is defined as the ratio of the share of government expenditure in agriculture to its share in GDP. The value of AOI less than one would indicate a

[9]*The resource allocation to all the three components peaked in 2008-09 due to the global food crisis. This observation is consistent with the results of FAO's AOI that shows similar jump in global allocation of resources for agriculture during the global food crisis (FAO, 2019). Along with higher allocation, contraction of agri-GVA by 0.24 per cent in 2008-09 also provided an upward bias to the aggregate support measured as a per cent of agri-GVA during the year.*

lower orientation of the government towards the agriculture sector relative to its contribution to the economy, while a value of more than one indicates a higher orientation of the government towards the agricultural sector compared to its contribution to the economy. The advantage of AOI is that it is a unit-free measure, which facilitates cross-country comparison. However, it does not capture the heterogeneity in the contribution of different components of public expenditure to agricultural growth.

The overall aggregate support to agriculture as a per cent of agri-GVA is a reasonably good indicator of the performance of the agriculture sector, though it has a few limitations (Chart 4). For instance, it gives equal importance to all underlying components, assuming that those are equally effective for the overall performance of the agricultural sector and the rural economy. However, it has been recognised in the literature that subsidies are distortionary and can yield only short-term

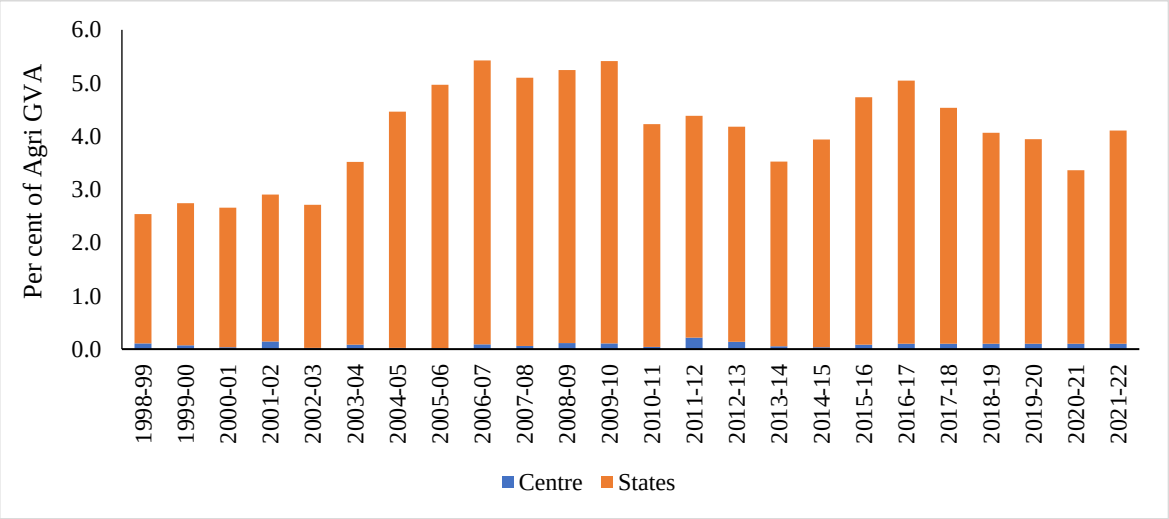

Chart 3. Public Investment in Agriculture in India

Source: Compiled from Indian Public Finance Statistics, GoI (various issues) and State Finance Report (RBI)

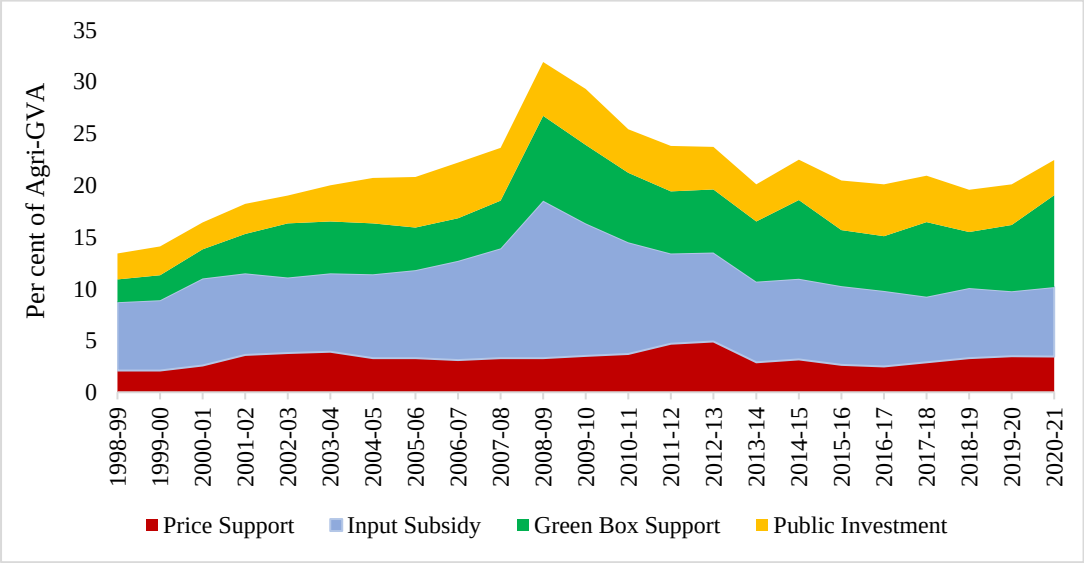

Chart 4. Composition of Aggregate Support to Indian Agriculture

Source: Authors' calculation based on data compiled from WTO (www.wto.org) and GoI

benefits, while capital expenditure is beneficial in the long run and can place the agriculture sector at a higher growth trajectory [7]. Therefore, an index capturing the movements in different underlying indicators can be useful to study the trends and identify any shift in the resource allocation for the agriculture sector. For this, different weights need to be assigned to different components of government expenditure based on their effectiveness to catalyse agricultural growth. The higher value of the index will indicate that the current mix of government support is more effective for agricultural growth and *vice versa*.

6.1 Index Methodology

The index has been constructed based on the methodology followed by the United Nation Development Programme [29] to compute indices like the Gender Development Index (GDI), the Human Poverty Index (HPI), the Human Development Index (HDI) and more recently, the Index of Financial Inclusion [30]. The identified dimensions of the effective aggregate support index (EASI) are subsidy, green box support and public investment. These indicators were standardised by taking their values as a percentage of agri-GVA.

At first, the dimension index for each dimension of the EASI was computed using equation (1)

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} \quad (1)$$

where, d_i is the dimension index and it measures its position in the context of resource allocation; w_i is the weight attached to the dimension *i* and captures the relative importance of the dimension in quantifying the resource allocation for the agriculture sector, $1 \geq w_i \geq 0$; and $A_i, M_i, and\ m_i$ represent the actual , maximum and minimum values of the dimension *i*, respectively. The choice of $M_i\ (upper\ limit)\ and\ m_i\ (lower\ limit)$ is important for the computation of the dimension index. It needs to be fixed for two reasons, first to normalize the dimension value between 0 and w_i; and secondly to make comparison possible across years with respect to the same benchmark on various dimensions. Following the literature, the lower bound is chosen to be 0 for all the dimensions. For subsidy, the highest value was fixed at 10 per of agri-GVA in line with WTO norms. In contrast, the empirically observed highest value from 1995-96 to 2020-21 for public investment and green box support was considered as the upper limit to compute their respective dimension index.[10]

Equation (1) ensures that $0 \leq d_i \leq w_i$. With three dimensions for EASI, the position for a year is represented by a point X = (d_1, d_2, d_3). The point O = (0, 0, 0) represents worst position and W = (w_1, w_2, w_3) represents an ideal position. To compute the index, the Euclidean distance between X and O represented by X_1 and the inverse Euclidean distance between X and W represented by X_2 are constructed and the simple average of X_1 and X_2 gives the EASI (Equation 2, 3, 4). The constructed EASI lies between 0 and 1, thus higher the value higher is the resource allocation for agriculture.

$$X_1 = \frac{\sqrt{{d_1}^2 + {d_2}^2 + {d_3}^2}}{\sqrt{({w_1}^2 + {w_2}^2 + {w_3}^2)}} \quad (2)$$

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_3 - d_3)^2}}{\sqrt{({w_1}^2 + {w_2}^2 + {w_3}^2)}} \quad (3)$$

$$EASI = \frac{X_1 + X_2}{2} \quad (4)$$

Various factors were considered while assigning weights to the three dimensions. First, the association between growth in total subsidy, public investment and green box support with the growth in foodgrains production was estimated using ordinary least square regression method for the period from 1995-96 to 2020-21. The regression results showed that investment has a significant positive influence and subsidy has a significant negative association with the growth in foodgrains production[11]. The coefficient of green box support was positive but statistically

[10] *For instance, the UNDP uses the empirically observed highest value as the maximum for the computation of dimension indices for the Human Development Index (HDI) (UNDP 2011).*

[11] $FP_t = -0.204\ (S_{t-2})^{**} + 0.253\ (PI_{t-2})^{***} + 0.253\ (GBS_{t-2}) + 4.631(Constant)$
(0.093) (0.089) (0.072)
R-squared 0.22

Number of observations: 23
FP_t: Food grain production growth is the dependent variable. S_{t-2}, PI_{t-2} and GBS_{t-2}: represent Input subsidy growth, Public investment growth and Green box support growth.
***Note**: ***, ** and * represent significance at 1, 5 and 10 per cent level, respectively.*
Standard errors reported in parentheses.

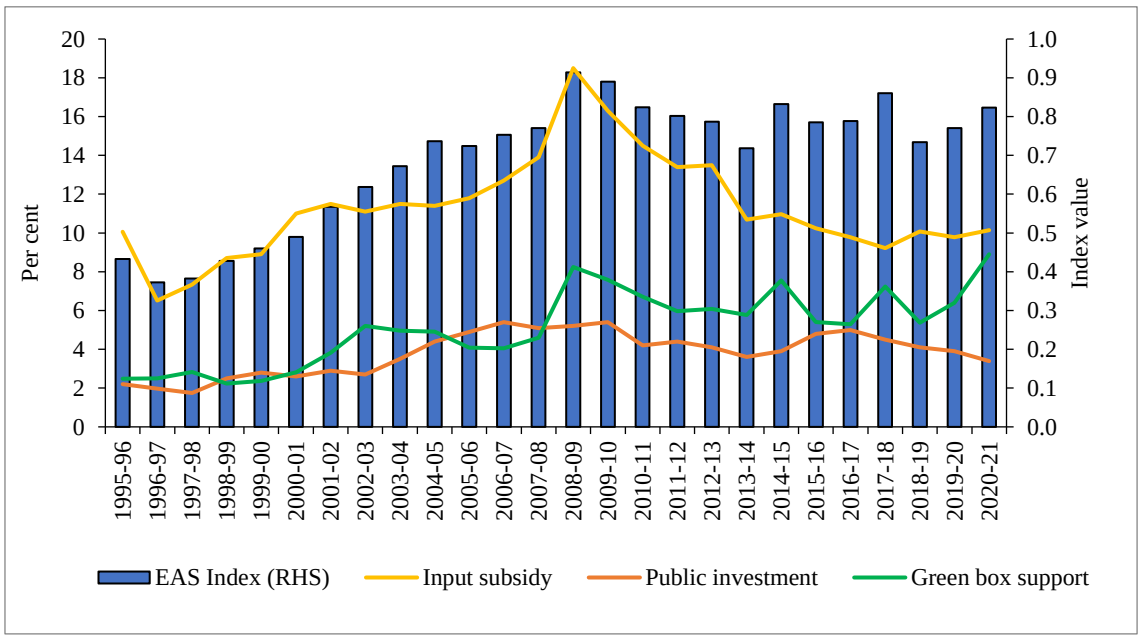

Chart 5. Co-movement of EASI and Underlying Indicators

Source: Authors' calculation based on data compiled from WTO (www.wto.org) and GoI (various years)

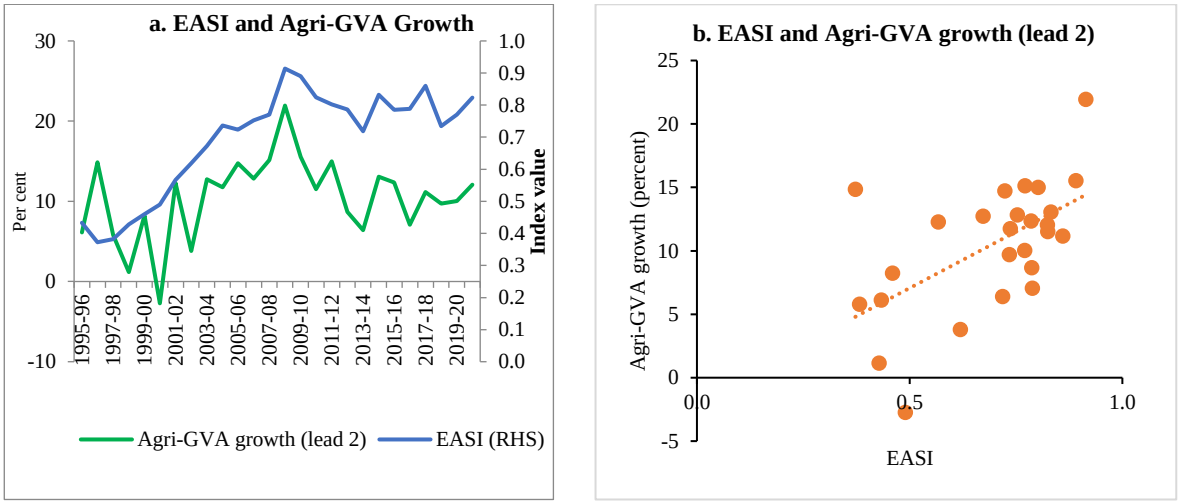

Chart 6. Co-movement of EASI and Growth in Agriculture GVA in India

Source: Author's estimates

insignificant. These findings are in line with the existing literature on the input subsidy *versus* infrastructure investment debate [31, 32].

Based on the regression results, assigning weight to subsidies was most challenging. Even though subsidies have a negative relationship with agricultural growth, they may still play a major role in a country like India, where nearly 86 per cent of the farmers are small and marginal. However, as in the recent times, India has achieved back-to-back record production in foodgrains and horticultural crops, there is a case for gradual phasing out of subsidies and move towards direct income support and higher public investment. Based on these considerations, equal weights have been assigned to the two dimensions, green box support and public investment, and a lesser weight for subsidy. Accordingly, in the three-dimensional space, (0,0,0) indicates the worst position with the poor allocation of resources to the agriculture sector and the point (0.5,1,1) represents the ideal position with a considerable amount of resource allocation for the agriculture sector.

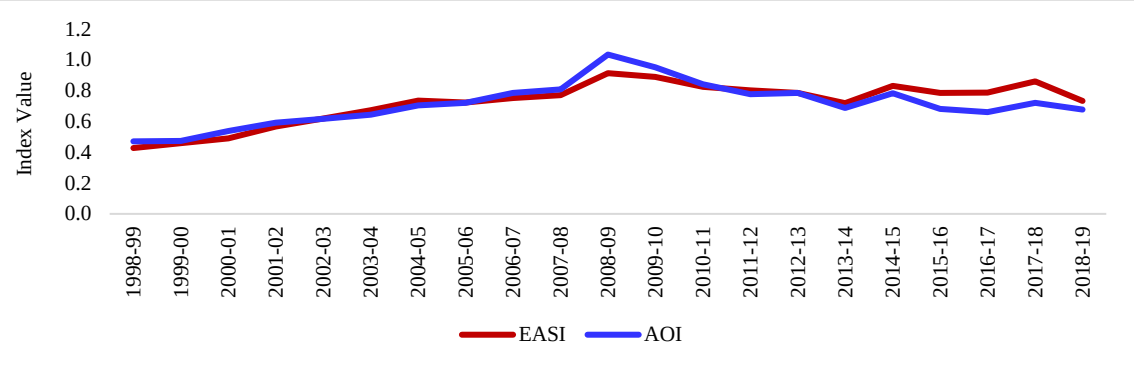

Chart 7. Co-movement of EASI and AOI
Source: Author's estimates

6.2 Results and Discussion

The constructed effective aggregate support index (EASI) shows that allocation for the agriculture sector, which was low in the late 1990s improved substantially till 2008-09, and moderated thereafter, mapping the movements in the underlying indicators (Chart 5). The index value improved from 0.5 in 2000-01 to 0.8 in 2004-05, notably due to increase in public investment and green box support. In 2008-09, the index value reached a peak of 0.9 due to a sharp rise in resource allocation to all the three underlying indicators, to mitigate the adverse impact of the global food crisis. This rise in index value is consistent with the results of AOI that global allocation of resources for agriculture spiked during the global food crisis period [33]. Subsequently, the government expenditure on subsidy declined steeply with a corresponding fall in the index value from 0.9 in 2008-09 to 0.7 in 2013-14. Since 2014-15, the index has hovered in the range of 0.7 to 0.9.

The relevance of the constructed EASI will depend on how well it captures the movements in the output variable. The EASI adequately maps the growth in agri-GVA as the correlation coefficient between EASI (2-period lag) and growth in agri-GVA works out to be 0.6 (Chart 6a), statistically significant at 1 per cent level. Similarly, the scatterplot between EASI and agri-GVA shows that the higher the effective support to the agriculture sector, the higher is the agricultural growth (Chart 6b). The index value for 2020-21 at 0.8 indicates that public policy support to agriculture remains significant in the recent period [34, 35].

For robustness check, an alternative index, the Agriculture Orientation Index (AOI) of FAO was constructed considering the support provided by both central and the state governments. The index values of EASI and AOI show strong co-movement with a correlation coefficient of 0.89 (Chart 7).

7. CONCLUSION

This paper attempts to quantify and aggregate various public support measures to farm sector in India. These measures are broadly classified under three categories: subsidy, public investment and green box support. The paper finds that despite some moderation from the peak level achieved during the GFC in 2008-09, the aggregate support, combining all three components, remains sizable at 22.4 per cent of agri-GVA in 2020-21. The decadal average of aggregate support has improved from 18.9 per cent of agri-GVA during 1998-99 - 2007-08 to 22.4 per cent during 2009-10 - 2020-21 (excluding the GFC year). In addition, there is a distinct shift in the composition, away from input subsidies and in favour of green box support, which includes direct transfer to supplement income of farmers. The value of effective aggregate support index remained in the range of 0.7 to 0.9 (on a 0-1 scale) during 2013-14 to 2020-21.

The composition of public support is pertinent from the standpoint of expected desirable impact on the economy. The index values suggest there is scope for further improvement in policy support for Indian agriculture. Given its higher weight in the index, raising the share of public investment in total support to agriculture, would impart greater beneficial impact on the sector by bridging the gap in the physical infrastructure, in terms of markets, warehouses, cold storage, all-weather roads, continuous supply of electricity,

food processing and agri-export zones. Rationalising the share of subsidies, particularly those promoting the overuse of fertiliser and groundwater, would also be important from the environmental standpoint. Further, the shift from subsidy to decoupled income support/ direct benefit transfer is only possible if land records are digitised to facilitate identification of vulnerable farmers and for it to be inclusive, tenancy reforms should be strengthened.

DISCLAIMER

The views expressed in the paper are those of authors and not of the Reserve Bank of India.

ACKNOWLEDGEMENT

The authors are grateful to Dr. Sitikantha Pattanaik for overall guidance and support. We also thank Dr. Ashok Gulati, Shri Siraj Hussain, Shri Thangzason Sonna, anonymous referee and the participants of DEPR Study Circle for their valuable comments and suggestions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Suganthi D. Competitveness and competitiveness and determinants of agricultural commodity exports: Evidence from India, Working Paper series, Reserve Bank of India; 2023.
2. Bossard F, Cahill, C, Deuss A, Greenville J, Sorescu S, Brink L, Saini S, Gulati A, Hoda A, Terway P. Review of agricultural policies in India, Report no. TAD/CA (2018)4/FINAL). Trade and Agriculture Directorate, Committee for Agriculture, Organisation for Economic Cooperation and Development (OECD), Paris; 2018.
3. Chand R. Doubling farmers' income, Policy Paper No. 1/2017. National Institution for Transforming India (NITI) Aayog, Government of India, New Delhi; 2017.
4. Chand R. Kumar P. Determinants of capital formation and agriculture growth: Some new explorations. Economic and Political Weekly. 2004;39(52):5611-5616.
5. Fan S, Brzeska J. The role of emerging countries in global food security, IFPRI Policy Brief 15. International Food Policy Research Institute, Washington D.C; 2010.
6. Bathla S, Joshi PK. Kumar A. Revisiting investments and subsidies to accelerate agricultural income and alleviate rural poverty in India, Discussion Paper No. 01701. International Food Policy Research Institute (IFPRI), South Asia Office, New Delhi; 2017.
7. Gulati A, Sharma A. Subsidy syndrome in Indian agriculture. Economic and Political Weekly, 1995;30(39):A93-A102.
8. Fan S, Gulati A, Thorat S. Investment, subsidies and pro-poor growth in rural India, IFPRI Discussion Paper 00716. IFPRI; 2007.
9. Gulati A. Narayanan S. The Subsidy syndrome in Indian agriculture. Oxford University Press, Oxford; 2003.
10. Dorward A, Fan S, Kydd J, Lofgren H, Morrison J, Poulton C, Rao N, Smith L. Tchale H, Thorat S. Rethinking agriculture policies for pro-poor growth, Natural Resources Perspectives (94). Overseas Development Institute (ODI), London; 2004.
11. Banga R. Impact of green box subsidies on agricultural productivity, production and international trade, Background Paper No. Rvc-11. Geneva, Unit of Economic Cooperation and Integration amongst Developing Countries (ECIDC), UNCTAD; 2014.
12. Sharma SK, Lahiri T, Neogi S, Akhter R. Revisiting domestic support to agriculture at the WTO: Ensuring a level playing field, Working Paper No. CWS/WP/200/56. Centre for WTO Studies, New Delhi; 2020.
13. Josling T. Rethinking the rules for agricultural subsidies, Report. The E-15 Initiative, ICTSD, Geneva; 2015.
14. Sharma SK, Das A. EU-Brazil proposal on farm support: Strengthening agricultural reforms or undermining them. Agricultural Economics Research Review. 2018;31(1):75-86.
15. Chand R, Phillip LM. Subsidies and support in agriculture: Is WTO providing level playing field? Economic and Political Weekly. 2001;36 (32):3014-3016.
16. Narayanan S. The National food security act vis-à-vis the WTO agreement on agriculture. Economic and Political Weekly. 2014;49(5):40-46.
17. Hoda A. Gulati A. India's agricultural trade policy and sustainable development goals, Issue Paper No. 49. Programme on

agricultural trade and sustainable development, International Centre for Trade and Sustainable Development (ICTSD), Geneva; 2013.

18. Gulati A, Ferroni M. Zhou Y. Supporting the Indian farmers the smart way. Academic Foundation in association with Indian Council for Research in International Economic Relations (ICRIER), New Delhi. (ISBN 13: 978-93-327-0472-5); 2018a.
19. Gulati A, Kapur, D, Bouton MM. Reforming Indian Agriculture. Economic and Political Weekly, LV(11). 2020;35-42.
20. Sharma VP, Thaker H. Fertiliser subsidy in India: Who are the beneficiaries? Economic and Political Weekly, 2010;45(12): 68-76.
21. Kumar A, Singh DK, Kumar K. Performance of rural credit and factors affecting the choice of credit sources. Indian Journal of Agricultural Economics, 2007;62(3):297-313.
22. Kumar A, Mishra AK, Saroj S, Joshi PK. Institutional versus non institutional credit to agricultural households in India: Evidence on impact from a National Farmers' Survey, IFPRI Discussion Paper 1614. IFPRI, Washington D.C; 2017.
23. RBI. Report of the internal working group to review agricultural credit, RBI, Mumbai; 2019.
24. Gulati A, Terway P, Hussain S. Crop insurance in India: Key issues and way forward, Working Paper No. 352. ICRIER, New Delhi; 2018b.
25. Mukherjee S, Pal P. Impediments to the spread of crop insurance in India. Economic and Political Weekly, 2017;52(35):16-19.
26. Narayanan S, Mehrotra N. Loan waivers and bank credit reflections on the evidence and the way forward, Working Paper No. 2019-038. Indira Gandhi Institute of Development Research, Mumbai; 2019
27. Sivagnanam KJ, Murugan K. Impact of public investment on agriculture sector in India. Journal of Economic and Social Development. 2016; XII (2):45-51.
28. Bathla S. Public and private capital formation and agricultural growth in India: State level analysis of inter-linkages during pre and post-reform Periods. Agricultural Economics Research Review. 2014; 27(1):19-36.
29. UNDP (2011), Human Development Report 2011,United Nations Development Programme.
30. Sarma, M. (2012). Index of financial inclusion - A measure of financial sector inclusiveness, Working Paper (No. 07/2012) on money, finance, trade and development. Competence Centre Money Trade Finance and Development, Berlin.
31. Kumar P, Joshi PK. Input subsidy vs farm technology: Which is more important for agricultural development? Agricultural Economics Research Review. 2014;27(1):1-18.
32. Singh A. Pal S, Jha GK. Transitioning India's public expenditure in agriculture towards higher growth and equity. Indian Journal of Agricultural Economics, *70*(902-2016-68390). 2015;246-258.
33. Washington D.C. Food and Agriculture Organisation (FAO). Government expenditure on agriculture, Report. Economic and Social Development Department, FAO, Rome; 2019. Available:http://www.fao.org/economic/ess/investment/expenditure/en/
34. GoI. All-India Debt and Investment Survey (2018-19), National Sample Survey Organisation, 77th Round, Government of India, New Delhi; 2021.
35. GoI (various rounds). Agricultural Statistics at a Glance, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics, Ministry of Agriculture and Farmer's Welfare, Government of India, New Delhi; 2022.

ANNEX

Table A1. Data sources for the variables used in the Construction of EASI

S No.	Variable	Source
1	Food Subsidy	Food Corporation of India
2	Fertiliser Subsidy	Union Budget (GoI)
3	Agricultural Credit Subsidy	Union Budget (GoI)
4	Agricultural Crop Insurance Subsidy	Agricultural Statistics at a Glance (GoI)
5	Other agriculture related subsidies	Union Budget
6	Electricity and Irrigation Subsidy	India's submission to Committee on Agriculture, World Trade Organisation
7	Agriculture Loan Waiver	State Finance Report (RBI) and the Report of the Internal Working Group to Review Agricultural Credit (RBI)
8	Cash transfers under PM-KISAN	Union Budget (GoI)
9	Green Box Support to Indian Agriculture	India's submission to Committee on Agriculture, World Trade Organisation
10	Public Gross Capital Formation for Agriculture	National Accounts Statistics (NSO)
11	Agriculture GVA	National Accounts Statistics (NSO)

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/107669