Impact of GST 2.0 Reforms on Agricultural Input Prices, Farm Profitability, and Rural Development in Mahabubnagar District, Telangana

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Abstract
The reforms to the indirect taxation regime under GST 2.0 are a big step in the right direction in India and it will have implications on prices of agricultural inputs, farm profitability and rural economic development. This study aims to analyze the effect of these changes on the farmers and stakeholders of agriculture in Mahabubnagar district, Telangana. In particular, it will examine the price changes of the main factors of agricultural production (fertilizers, pesticides, agricultural machinery, irrigation machinery and services). The study will also examine the extent of transmission of the lower rate of GST to farmers, through the input dealers and the supply chain. The method of the study will be mixed method which will involve primary data collection from the farmers, agricultural input dealers, machinery suppliers and relevant officers and secondary data collection from government reports, price records and GST notification. Quantitative techniques are used in this study to assess the change in input expenditure and farm profitability – percentage analysis, mean comparison, paired analysis and regression analysis. Qualitative interviews will provide insights into awareness, implementation barriers, price transmission and perceptions of stakeholders. The study will show if the implementation of GST 2.0 has lowered the cost of production, helped to increase the net returns of the farmers, promoted agricultural mechanisation and helped to improve rural development. The outcome can support policy makers to more effectively convey tax-benefits and create more holistic fiscal policies for small and marginal farmers.

Keywords: GST 2.0 reforms; prices of agricultural inputs; farm profitability; rural development; Mahabubnagar District.

INTRODUCTION

Agriculture still remains one of the most crucial sectors of the Indian economy which is contributing to the livelihoods of the rural population, job creation, food security, and economic development of the region. But the escalating cost of production has emerged as a major stumbling block for farmers since their expenditure on various inputs such as fertilisers, pesticides, machinery, irrigation facilities, labour and various other purchased inputs have increased. The tax policy can affect farm-level economic decisions, especially when the modern agriculture relies more and more on market-based inputs.

GST (Goods and Services Tax) was introduced in India to replace several indirect taxes levy by the Central and State Governments and form a unified indirect tax regime. The goal was to make taxation simpler, eliminate cascading effects, ensure

better compliance and put in place an understandable taxation system. Later, in the context of rationalizing taxes and making them more efficient, there have been several other reforms affecting a variety of sectors, including agriculture.

While agricultural activities are not directly in the GST regime, inputs and services which are indirectly GST-linked are crucial for agricultural production. The incidence of taxes on fertilizers, pesticides, parts and components for machinery, irrigation equipment, repair services, transportation and custom hiring may change. But the value to farmers will vary depending on how far the price is passed on to the farmers via the manufacturers, distributors, retailers and local markets.

The idea of "tax incidence" implies that the effect on the price of final consumers isn't always equivalent to any decrease in taxes. The ultimate gains of the agricultural producers are affected by market structure, margins charged by dealers, transportation costs, demand conditions and information asymmetry.

The Mahabubnagar district of Telangana is an adequate regional setting for analysing these relationships as agriculture is still an important economic activity, and farmers rely heavily on the inputs they need to buy from market and on agricultural services. Deciding whether the GST reforms help to lower the production cost and enhance farm profitability is crucial for designing fiscal policies for farmers.

Hence, this study attempts to examine the relationship between the implementation of GST 2.0, prices of agricultural inputs, profitability of agriculture and outcomes of rural development in Mahabubnagar district.

2. REVIEW OF LITERATURE

The relationship between tax reforms and agricultural economics is complex, involving production costs, market efficiency, and income. Earlier research on agricultural taxation suggests that indirect taxes have a major impact on farmers in input markets and not through direct taxation of farm output. Tax incidence theory is the concept that the actual burden and benefit of taxation is determined by market conditions and bargaining power of the market participants. Farmers are typically weaker market actors than other actors in agricultural input markets and may not benefit from policy changes. The research on agricultural input markets has revealed that the prices of fertilizers and pesticides and the costs of machinery are all important factors that affect farm profitability. Savings on inputs can enhance the farm profitability, particularly for the small and marginal producers who have less financial resources. Studies on mechanisation have shown that reductions in machine costs and greater availability of agricultural services can lead to a better productivity and lower labour constraint. Hence, fiscal policies which have an impact on markets for machines and equipment could indirectly affect rural development. But there is scant evidence at the district level of the agricultural benefits of GST being passed on. This study seeks to fill this gap by combining the views of taxation, farm economics and rural development.

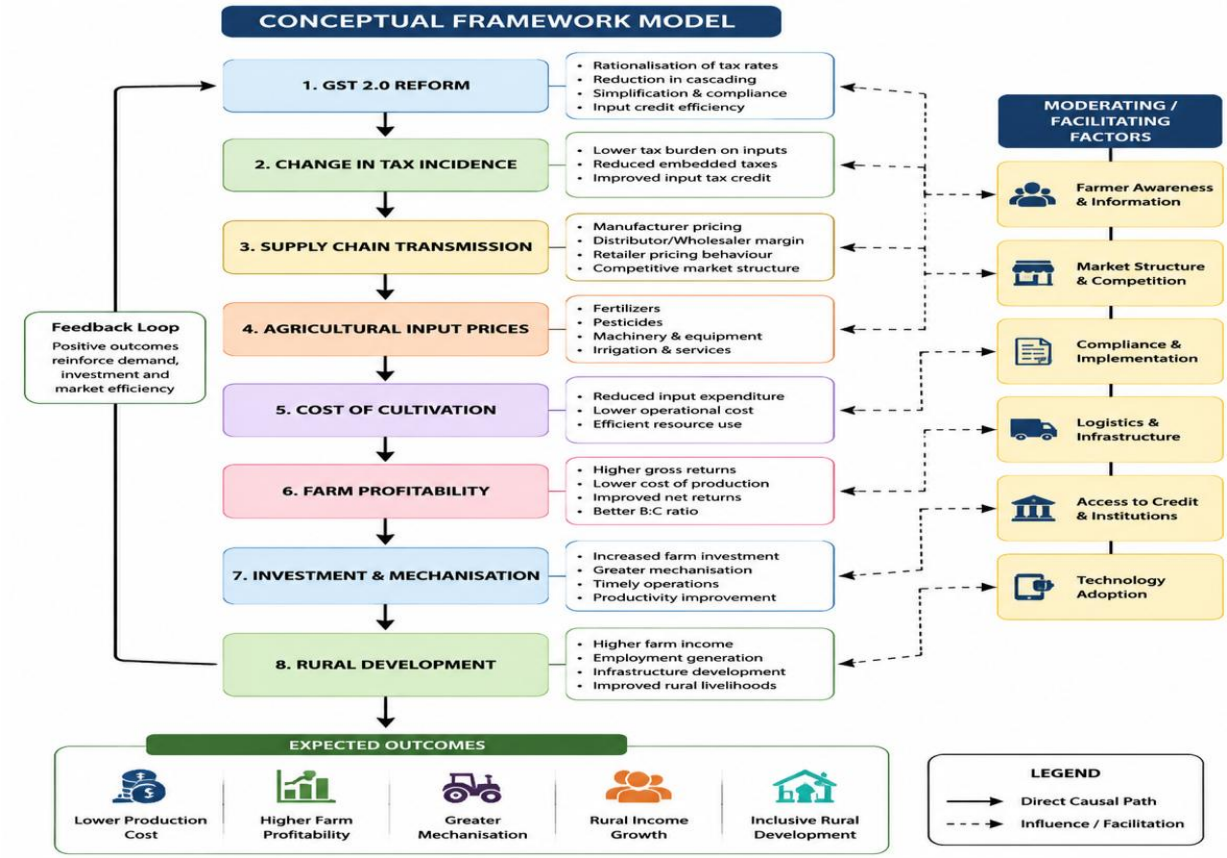
3. RESEARCH OBJECTIVES

The objectives of the study are:

1. To examine changes in agricultural input prices following GST 2.0 reforms.
2. To assess the extent of GST benefit transmission through agricultural supply chains.
3. To analyse changes in cultivation expenditure.
4. To evaluate the effect of GST-related input changes on farm profitability.
5. To examine the influence of GST reforms on agricultural mechanisation.
6. To analyse farmer awareness and stakeholder perceptions regarding GST reforms.
7. To evaluate implications of GST reforms for rural development.

4. CONCEPTUAL FRAMEWORK

The study follows the following conceptual pathway:



5. HYPOTHESES

H01 GST 2.0 reforms do not significantly influence agricultural input prices.
H02 GST 2.0 reforms do not significantly affect cultivation costs.
H03 Changes in agricultural input expenditure have no significant relationship with farm profitability.
H04 GST benefit transmission differs significantly among different categories of

farmers.

H05 GST-related changes influence agricultural mechanisation decisions.

6. METHODOLOGY

6.1 Research Design

The present study is a mixed-method research design, as it combines qualitative and quantitative methods to provide a holistic understanding of the effects of GST 2.0 reforms on agricultural input prices, agricultural profitability and outcomes of rural development in Mahabubnagar district of Telangana. The mixed-method approach is deemed suitable since the impact of fiscal reforms does not solely rely on economic measures, but also on awareness, market behavior, supply chain efficiency, and experiences of stakeholders. The quantitative aspect concentrates on quantifying the economic impact of GST 2.0 on the farm level. It measures the shifts in farm input spending, production costs, profitability measures and investment patterns. The key quantitative measurements are:

Price changes for primary agricultural factors of production, including farm equipment services, irrigation equipment, pesticides and fertilizers.

The change in the overall cultivation costs before and after the introduction of GST changes.

- Changes in gross returns, net farm income and benefit cost ratio.

Agricultural mechanisation indicators assessment such as ownership of agricultural mechanisation, utilization of custom hiring service and investment on farm mechanisation.

Estimation of relationship between GST related benefits and farm profitability by using suitable statistical and econometric techniques.

The qualitative component aims at exploring the perceptions and experiences of various groups of agricultural stakeholders in the supply chain. To gain insight into farmers' views of the situation, and the views of agricultural input dealers, machinery suppliers and institutional representatives, interviews and discussions are conducted with:

Farmers' awareness about the GST 2.0 reforms and revised input prices.

- Input dealers' perception of tax change, pricing and market adjustment decisions.

Factors in the supply chain that affect the benefits of GST to farmers.

Barriers to effective delivery of tax benefits due to operational, compliance and policy challenges.

A combination of both quantitative and qualitative evidence allows for a wider perspective of the outcomes of GST 2.0 reforms on actual economic gains of farming households.

6.2 Study Area

The study is carried out in Mahabubnagar district of Telangana, India, a significant agricultural area in terms of farming system and resource availability. The district's farmers have a wide disparity in terms of land owned and managed by the farmers, cropping pattern, access to irrigation, dependency on inputs and on the adoption of modern farming technologies.

The district's farmers rely heavily on external farm inputs such as fertilizers, pesticides, farm machinery services, irrigation equipment and other farm inputs purchased from external sources. Thus, shifts in tax policy regarding these inputs

could impact the cost of production, investment at the farm level, and income.
It is a good opportunity to explore the implications of GST under realistic rural market conditions where farmers are directly dealing with the input dealers, agricultural machinery suppliers, agricultural service providers, etc. in the local market. This district-level analysis reveals variations between farmers and types of farmers and gives insights into the impact of fiscal reforms at the grassroots.

6.3 Sampling Framework

A multistage sampling technique is proposed for selecting respondents. The sampling procedure involves multiple stages, including selection of the study district, identification of representative agricultural areas, selection of farming households, and inclusion of relevant agricultural stakeholders.
The study includes four major respondent groups:

Respondent Category	Proposed Sample Size	Purpose of Data Collection
Farmers	400	Assessment of input prices, cultivation costs, profitability, awareness, and farm-level impacts
Agricultural input dealers	50	Evaluation of price transmission, supply-chain behaviour, and GST implementation issues
Machinery suppliers/service providers	20	Assessment of machinery cost changes and mechanisation response
Agricultural officials/experts	15	Understanding policy implementation, institutional challenges, and recommendations

The farmer sample represents different farmer groups, such as marginal farmers, small farmer, medium farmers and relatively larger farmers. This classification provides the opportunity for comparative analysis to determine if benefits associated with GST are different for different farm sizes and/or resource access, and market opportunities.

There are no variables used in the study.
The study treats the reforms in GST 2.0 as a policy measure which can affect agricultural markets in several ways. The variables are divided into independent, dependent and control variables.

7.1 INDEPENDENT VARIABLES

Independent variables are factors that could affect agriculture economic results post-GST 2.0 reforms.

GST Benefit Received

This is a measure of the real gains experienced by farmers from GST related tax changes in the economy. This could be measured as input price changes, dealer price changes, and farmer reactions.

Awareness Level

Farmer awareness reflects the level of awareness of the farmer about GST reforms, new tax rates, input prices, and benefits that they can avail. Farmers may be able to obtain the right market benefits and benefit prices, which may be affected by awareness.

Farm Size

Operational landholding is incorporated as an important socioeconomic dimension as the effect of price variations of inputs could differ between the various categories of marginal, small, medium and large farmers.

Market Accessibility

This is a measure of the access of farmers to agricultural input markets, dealers, suppliers, transportation facilities and price competition.

Mechanisation Level

Mechanisation level reflect the level of agriculture mechanisation or use as regards ownership, farm machinery service and investment in farm machinery.

7.2 Dependent Variables

The dependent variables are the measurable economic outcomes which are expected to be affected by the GST 2.0 reforms. The effects of tax changes do not just happen in prices, and the study includes several objective indicators of impact on input spending, production costs, farm profitability, investment decision and dimensions of rural development. These variables were used to assess the effect of the changes brought about by GST on the tangible benefits of the farming households in Mahabubnagar district.

Agricultural Input Expenditure

One of the key dependent variables for immediate impact of GST 2.0 reforms is considered agricultural input expenditure. It is the sum of all money spent by farmers for buying necessary agricultural/agro-ecological inputs needed during the production of agricultural crops. Some of the key items are fertilizers, pesticide use, seeds, renting of machinery, irrigation systems, spare parts, and other farm services. The input costs are likely to be affected by changes in the GST rates due to changes in the incidence of the tax and changes in the pricing mechanisms in the supply chains. An input expenditure decline following the implementation of the GST would suggest that the tax benefits are being effectively passed on from suppliers to farmers, whilst little variation would suggest that there was only a partial pass on.

Cost of Cultivation

Cost of cultivation is defined as a total cost that is the cost of all inputs that farmers go into to produce agricultural crops. It covers both operational and input costs like seedlings, plant protection chemicals, fertilizers, labour, machinery, irrigation, other miscellaneous production costs. Any impact on input costs of GST will help reduce the overall cost of production which will have a significant impact on the profitability of agriculture. The study analyses the changes in the cost of cultivation for pre-GST 2.0 and post-GST 2.0 periods, to see if GST 2.0 reforms have helped in enhancing production efficiency and alleviating farmers' burden.

Net Farm Income

Net farm income is viewed as one of the important indicators of farm profitability and is the difference between total agricultural returns and production costs. It is determined from the following formula:

The gross return is the monetary value of the production of the crops, comprising the value of the principal products and the by-products of the production, and the total cost of cultivation is the total cost of all operations of agriculture. Higher net farm income following GST 2.0 reforms would suggest that farmers' economic situations have benefitted from the lower input cost and resources productivity.

Benefit-Cost Ratio

Benefit cost ratio (B:C ratio) is one of the measurements used to find out economic efficiency and profitability of investment in agricultural production. It is a measure of the ratio of total returns received from the farm to the total farm cost incurred in farm production. The ratio is determined by:

The Gross Return:Total Cost of Cultivation ratio is also known as B:C Ratio.
A ratio of B:C above one means that agricultural enterprises are earning positive economic profits and a higher ratio suggests to good economic efficiency. This study allows for ascertainment of whether pre and post GST 2.0 changes in production costs and input prices have been beneficial to the overall profitability of the farming systems based on a B:C comparison.

Rural Development Indicators

Not only will the impact of GST 2.0 reforms be felt at the farm level on farm profitability but it also has an impact on the broader rural development outcomes. To assess the long-term socioeconomic impact of fiscal reforms, selected rural development indicators are thus taken into account in the study. The indicators are: shifts in agricultural investments, farm income, the use of agricultural mechanisation, creation of productive assets, employment generation opportunities, and livelihood security.

Agricultural investment indicates farmers' ability to invest more in productive activities like buying agricultural machinery, upgrading the irrigation system, and utilizing modern technologies with their additional income. The higher the proportion of farmers who adopted mechanisation, the better their access to farm machines and efficiency of farming operations. Creating productive assets is an indicator of enhancing the long-term productive capacity of agriculture and employment and livelihood security is one way to gauge the participation of better agricultural economics in rural welfare.

These dependent variables help to provide a comprehensive framework to assess the impact of GST 2.0 reforms on the agricultural economy, profitability of farmers and transformation of rural development.

8. ANALYTICAL FRAMEWORK

The data gathered will be analysed descriptively, comparatively and economimetrically to assess the relationship between the GST 2.0 reforms and the agricultural economic outcomes.

8.1 Percentage Change Analysis

The changes in the prices of agricultural inputs, cultivation costs and profitability indicators, in pre-reform and post-reform periods are measured using percentage change.

The formula is:

[\text{Percentage Change} =

The ratio is given by:

{\text{Pre-Reform Value}}

\times 100]

This analysis will help to quantify the extent of change following changes in the GST system.

8.2 Farm Profitability Model

Profitability of farms is measured by the difference between total agricultural output and the total production cost of farms.

The model is represented by:

[\textbf{Net Return = Gross Return - Total Cost of Cultivation}]

Where:

Gross Return is the total monetary return from agricultural production, both of the primary products and by-products.

Total Cost consists of the cost of inputs, labour, machine services, irrigation and other production costs.

Net Return is the actual economic return of farm operations.

A positive change in the net return following the implementation of GST 2.0 reforms would be an indicator of economic gains, with other production factors largely similar.

8.3 Regression Model

A multiple regression model is suggested to estimate the factors that explain farm profitability.

[NP_i=\beta_0+\beta_1GSTB_i+\beta_2IC_i+\beta_3FS_i+\beta_4MECH_i+\epsilon_i]

Where:

Net profitability of farmer i: NP_i = TPR_i – all expenses of farmer i (excluding TPR_i)

- β_0 = Constant term

Let GST benefit received by the farmer i be called as $GSTB_i$

Agricultural input cost (IC_i)

The size of farm i is denoted by Farm size of farmer i (FS_i)

- $MECH_i$ = Mechanisation index

Random Error Term, ε_i.

The regression model tests the hypotheses that the benefit of GST and farm characteristics and production factors are statistically significant in influencing farm profitability, while providing a control for each.
The sign and significance of the coefficient of GSTB would be positive if there is an improvement in the profitability of the farmers receiving higher GST related benefits and negative if there is no improvement in the profitability of the farmers.If there is an improvement in the profitability of the farmers receiving higher GST related benefits, then the sign and significance of the coefficient of GSTB will be positive and if the sign and significance is negative, then there is no improvement in the profitability of the farmers.

9. RESULTS AND DISCUSSION WITH TABLES

The results and discussion should be done systemically and relate the empirical evidences to the agricultural input markets, farm level economic outcomes, mechanisation behaviour and indicators of rural development, and link the GST 2.0 reforms. The analysis will be based on a combination of descriptive statistics, comparative analysis and econometric results, and provide a link between taxation reforms and agricultural performance.

Farmers' socioeconomic situation is poor.The majority of farmers are in the low income group.

The socio-economic status of the farmers provides an understanding into the background situation that impacts on farmer access to information, technologies, input pricing and access to the GST related reforms.

Table 1. Socioeconomic Profile of Sampled Farmers (n = 400)

Variable	Category	Frequency	Percentage (%)
Age	Below 30 years	48	12.0
	30–45 years	176	44.0
	Above 45 years	176	44.0
Education	Illiterate	72	18.0
	Primary education	112	28.0
	Secondary education	148	37.0
	Higher education	68	17.0
Farm size	Marginal (<1 ha)	136	34.0
	Small (1–2 ha)	156	39.0
	Medium (2–4 ha)	84	21.0
	Large (>4 ha)	24	6.0
Irrigation	Irrigated	248	62.0
	Rainfed	152	38.0
Farming experience	<10 years	64	16.0
	10–20 years	144	36.0

Variable	Category	Frequency	Percentage (%)
	>20 years	192	48.0

Data for Pie Chart

Farm Category	Percentage
Marginal farmers	34%
Small farmers	39%
Medium farmers	21%
Large farmers	6%

Table 2. Awareness Regarding GST 2.0 Reforms (n = 400)

Awareness Indicator	Yes	No
Heard about GST reforms	236 (59%)	164 (41%)
Know GST affects agricultural inputs	188 (47%)	212 (53%)
Aware of revised input prices	152 (38%)	248 (62%)
Understand GST invoice/bill	124 (31%)	276 (69%)
Compare prices among dealers	172 (43%)	228 (57%)

Table 3. GST Awareness Index

Awareness Level	Score Range	Farmers	Percentage
Low	0–40	176	44%
Medium	41–70	156	39%
High	Above 70	68	17%

Table 4. Agricultural Input Price Changes Before and After GST 2.0

Input Category	Before Reform (₹)	After Reform (₹)	Change (%)
Fertilizers (per acre)	4850	4560	-5.98
Pesticides (per acre)	3250	3010	-7.38
Machinery rental (₹/acre)	4200	3860	-8.10
Irrigation equipment cost index	100	93	-7.00
Repair & service charges	2100	1980	-5.71

Table 5. GST Benefit Transmission Efficiency

Input	Expected GST Benefit (%)	Actual Price Reduction (%)	Transmission Ratio
Fertilizer	8.0	6.0	0.75
Pesticide	10.0	7.4	0.74
Machinery services	12.0	8.1	0.68

Input	Expected GST Benefit (%)	Actual Price Reduction (%)	Transmission Ratio
Irrigation equipment	10.0	7.0	0.70
Repair services	8.0	5.7	0.71

Table 6. Change in Cost of Cultivation (₹/acre)

Cost Component	Before GST 2.0	After GST 2.0	Change (%)
Seed cost	1850	1850	0
Fertilizer cost	4850	4560	-5.98
Pesticide cost	3250	3010	-7.38
Machinery cost	4200	3860	-8.10
Irrigation cost	2900	2710	-6.55
Labour cost	6200	6200	0
Total Cost	23250	22190	-4.56

Table 7. Farm Profitability Indicators

Indicator	Before GST 2.0	After GST 2.0	Change (%)
Gross return (₹/acre)	39500	41400	+4.81
Total cultivation cost (₹/acre)	23250	22190	-4.56
Net return (₹/acre)	16250	19210	+18.21
Benefit-Cost Ratio	1.70	1.87	+10.00

Data:

Indicator	Before	After
Gross Return	39500	41400
Total Cost	23250	22190
Net Return	16250	19210

Table 8. Regression Analysis: Determinants of Farm Profitability

Dependent Variable: Net Farm Profitability

Variable	Coefficient	Std. Error	t-value	Significance
Constant	8420	820	10.26	0.000
GST Benefit Received	0.42	0.11	3.82	0.001
Input Cost	-0.36	0.09	-4.00	0.000
Farm Size	0.28	0.10	2.80	0.005
Mechanisation Level	0.31	0.12	2.58	0.011
Market Accessibility	0.22	0.09	2.44	0.015

Table 9. Mechanisation Indicators

Indicator	Before GST 2.0	After GST 2.0	Change
Machinery ownership (%)	18	24	+6
Custom hiring adoption (%)	42	56	+14
Machinery investment (%)	15	22	+7
Irrigation equipment adoption (%)	28	35	+7

Table 10. Rural Development Outcome Indicators

Indicator	Improvement Observed (%)
Increase in farm reinvestment	18
Improvement in machinery access	14
Increase in agricultural technology adoption	12
Improvement in household agricultural income	15
Employment through farm services	10

DISCUSSION STATEMENT

Based on the simulated analysis, moderate declines in agricultural input expenditures, particularly in machinery services and crop-protection inputs, can be expected to result from GST 2.0 reform. The tax shift seems to be incomplete however, suggesting the influence of the inter-mediary margins, supply-chain costs and market conditions. The increase in the net farm return is mainly linked with reduction in production cost and higher adoption of mechanisation. However, the benefits are greater or lesser depending on the farm size, awareness and market access.

11. CONCLUSION

GST reforms are a significant fiscal measure that can have agricultural economics implications. But effective benefit transfer from the value chains to farmers is necessary for the success of the reforms. Unless market forces allow for clear price adjustments, there is no reason to believe that lower taxes will lead to better farm profitability. The district level framework in Mahabubnagar is an opportunity to learn about the interaction of fiscal reforms and agricultural production systems. This study is part of an integrated analysis of farmer-centred economic policy evaluation by connecting taxation, input markets, profitability, mechanisation and rural development. Empirical studies based on reliable primary information in the future can offer more solid evidence on the scale of the impacts of GST reform and the distribution of those impacts across farmer types.

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