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ENERGIZING AGRICULTURE: INVESTIGATING THE IMPACT OF ELECTRICITY SUBSIDY

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Abstract-Agricultural electricity subsidy plays a pivotal role in the Haryana's agriculture landscape. The Agriculture sector of the state contributes significantly in the economy of Haryana and the food production for the nation. Electricity has become an indispensable resource in modern agriculture, and in Haryana, it has transformed the way farmers cultivate their lands. The government of Haryana has implemented agricultural electricity subsidies to support and incentivize farmers, making electricity more accessible and affordable for agricultural activities. This paper focuses on the status of government spending on the agricultural electricity subsidy in Haryana and examines the effects of electricity subsidy. The data were collected from the different government sites and report and other research articles. The spending on the agricultural electricity has been increasing from various years. Analysis implies that the agricultural electricity has a positive impact on the Gross State Domestic Products. But there is need for the target based policies so that subsidy will reach to the needy farmers and it also does not affect the efficiency of the energy utilities.

Keyword: Agriculture, Electricity, Haryana, India, Subsidy.

INTRODUCTION

Haryana is one of the leading states in the agriculture. It has significant contribution in the food production of the country. About 86% area of Haryana is arable and 96% of it is cultivated. Haryana has only 1.5% area of India and contribute about 15% in Agricultural production (GOI). Agriculture sector of Haryana has made substantial progress over the years, contributing significantly to the economy of state and food security in India. Electricity subsidy for the agriculture is provided by the state government (Kumar, 2018). Haryana is naturally blessed with fertile soil and favorable climatic conditions, making it suitable for the cultivation of a wide variety of crops, including wheat, rice, cotton, sugarcane, and vegetables. To harness the full potential of its agriculture, the state government has made significant investments in rural electrification and power infrastructure (Bhargav, 2015). Agricultural electricity in Haryana plays a pivotal role in the state's agricultural landscape. Electricity has become an indispensable resource in modern agriculture (Jain, 2006), and in Haryana, it has transformed the way of cultivation for farmers. Irrigation is the most important component in the crop production. Major

ISSN PRINT 2319 1775 Online 2320 7876

source of irrigation in India, for the crop is ground water (Singh, 2014). Net area irrigated in the country is 71.6 million hectare of which 3.387 million hectare of the state of Haryana (annual report of ministry of agriculture, 2022). Many of researchers explain benefits of the electricity subsidy to the agriculture sector such as it will increase productivity, improve irrigation, crop diversification, reduced drudgery and time saving.

However, it's worth noting that the increasing demand for agricultural electricity in Haryana also poses challenges related to power distribution, infrastructure maintenance, and equitable access. Ensuring a sustainable and reliable supply of electricity to rural areas remains a priority for the state to continue reaping the benefits of electrified agriculture while addressing these challenges. The purpose of the study is to understand the trends in consumption of electricity subsidy in Haryana and understand the effects of electricity subsidy for agriculture.

REVIEW OF LITERATURE

Many researchers have presented their thought on the agricultural subsidies on the national as well as international level through research papers and articles.

Gulati and Narayanan (2000) try to understand the fertilizer and power subsidy in context to the real benefit of subsidies. Authors discussed various policy reforms associated with the subsidy. Conclusion of the study revealed that there are many losses point in the policy implication in respect of these subsidies. Government need to take some strong action, provides technical advanced infrastructure and to ensure that benefits will reach to the end consumer

Kaur and Sharma (2012) analyzed the agricultural subsidies in India for the time period 1980-81 to 2008-09. The subsidy considered for the study were, fertilizer subsidy, electricity subsidy, irrigation subsidy and machinery subsidy. The conclusion revealed that there was increasing trend in the all these subsidies. This shows great financial burden on the center and state government. Study suggested that policy makers should form such type of policy, to increase the efficiency of these subsidies.

Salunkhe and Deshmush (2012) examined the agricultural subsidies and their distribution in India. This study was based on the secondary data. The conclusion of the study revealed that government of India provides many types of subsidies to the agriculture. It also showed that the trends of the investment in agriculture has been increased but at the same time total cultivated area also increased. Authors suggested that policy maker should focus more on the agriculture sector so that growth for the same can be possible.

Singh et al. (2014) analyzed the impact of agricultural electricity subsidies on the water use efficiency and ground water use in India. The study was based on both primary and secondary data. The study suggested that by the use of pro-rata pricing for the electricity for agriculture can manage use of ground water efficiently. The result revealed that the diesel pump owner has highest economic water productivity for all crops.

ISSN PRINT 2319 1775 Online 2320 7876

Bhargav (2015) investigated the revenue gap of the electricity sector. The main purpose behind the study is to find the possibility to provide more benefits to the farmers and other beneficiary. Study was based on the secondary data. The conclusion of the study revealed that there was negative gap between the revenue and the cost of energy sector. it indicate the increasing share of the electricity subsidy. This gap will adversely affect the other operation of the state electricity Board. Author suggested that policy maker should form such type of policy that potential beneficiaries get benefit from these policies.

Bhattacharyya and Ganguly (2017) tried to examine the impact of electricity removal on Indian economy. The study was based on the General Equilibrium model. The findings of the paper shows that the removal of cross subsidy, result in the reduction in the farmers income and increase food inflation. The progressive rate structure can compensate only a small part of negative effects of withdrawal of cross subsidies.

Venkatesha (2019) made an attempt to analyze the trends of public and private investment in agriculture sector of India. Study was based on the secondary data collected from different government reports. Study concluded that the investment ratio between the public to private investment was 1.51 for some state. There was increasing trends for the both investment but the share of the private investment was more than the public investment. Study suggested that government need to form such policy to utilize sources in such a manner that they provide benefits to the farmers and ensure growth of Indian agriculture sector.

Kumar (2020) investigated the impact of agricultural subsidy in India. Study allude both positive and negative impact of agricultural subsidy and explain the importance of the subsidy for agriculture. It was review based study. The conclusion demonstrates some researchers suggest remove subsidy for the financial constraint and some researcher were in the favor of the agricultural subsidy. The main reason given for the agricultural subsidy was to increase farmer income and achieve food sufficiency.

Zarandi and Fakhr (2022) analyzed the effects of electricity subsidy on the ground water. Cost of water was calculated with the engineering economics and accounting methods. The empirical results state that actual price of the water is greater than the tariffs paid by the consumers. Study suggested to increase the price of water but there were negative effects of increased price on the income of the farmers and crop production.

Different studies were conducted for the agriculture subsidy. Some of them were in the favor of the agricultural subsidies and some were not. The electricity subsidy is covering a major part in overall agricultural subsidy so it is important to understand the consumption pattern of the electricity subsidy in agriculture.

ISSN PRINT 2319 1775 Online 2320 7876

OBJECTIVE OF STUDY

The objective the paper is to examine the trends in the consumption and distribution of the electricity subsidy in Haryana and to investigate the effects of electricity subsidy for agriculture sector.

METHODOLOGY

The current study is performed on the secondary data, retrieved from the various government agencies, government budget, research publications and other research articles. The trends is shown with the help of graph and the impact of agricultural electricity subsidy is calculated with the help of regression analysis. Other aspects of the agricultural electricity subsidy are depicted through the contribution of different researchers.

ELECTRICITY SUBSIDY FOR AGRICULTURE

Government provides different type of supports to the farmers. Electricity subsidy is one of the supports to provide assistance to the farmers. Some state provides electricity at very low rate and some provide free electricity for the agriculture purpose. Haryana provide electricity supply at a very low rate. The rate of electricity charged from the farmers is flat rate, based on the tube well Horse Power (HP). Now it is important to know the area irrigated by the tube well. The area irrigated by the tube well is more than the area irrigated by the other source of irrigation. It indicates that the most of the area irrigation is depend on the ground water.

Table1. Area Irrigated by the source, Net Area Irrigated and Gross Irrigated Area (in million hectares)

Year	Canals	Tanks	Tube wells	Other wells	Other source	Net Irrigated Area	Gross irrigated Area
2000-01	16.0	2.5	22.6	11.3	2.9	55.2	76.2
2001-02	15.2	2.2	23.2	12.0	4.3	56.9	78.4
2002-03	14.1	1.8	25.6	8.7	3.7	53.9	73.1
2003-04	14.5	1.9	26.7	9.7	4.3	57.1	78.0
2004-05	14.8	1.7	25.2	10.0	7.5	59.2	81.1
2005-06	16.7	2.1	26.0	10.0	6.0	60.8	84.3
2006-07	17.0	2.1	26.9	10.7	6.0	62.7	86.8
2007-08	16.7	2.0	28.5	9.9	6.1	63.2	88.1
2008-09	16.9	2.0	28.4	10.4	6.0	63.6	88.9
2009-10	15.0	1.6	28.4	10.0	7.0	61.9	85.1
2010-11	15.7	2.0	28.6	10.5	6.9	63.6	89.4
2013-14	16.3	1.8	31.1	11.3	7.5	68.1	95.8

Source: Agricultural Statistic at a Glance 2022.

ISSN PRINT 2319 1775 Online 2320 7876

 Journal Volume 11,Iss 11, 2022

The above table shows the area irrigated by the different source and the net and gross irrigated area in India. The area irrigated by the canals, tanks and other well remains almost constant. But area irrigated by the tube wells has hug increasing trend (22.6 million hectares in 2000-01 to 31.1 million hectares in 2013-14). This indicated that the dependency on the ground water has been increased over the years. As a result of increase tube well dependency consumption of electricity for the agriculture purpose also increased. Gross and net irrigated area also shows the increasing trends.

Table2. Agricultural Electricity Consumption in Haryana (GWh)

Year	Consumption of agricultural purpose	Total Consumption	Percentage share of agricultural consumption to total consumption
2005-06	6447.78	15426.11	41.80
2006-07	6871.92	16642.97	41.29
2007-08	7335.37	18260.5	40.17
2008-09	7365.4	19291.41	38.18
2009-10	9190.03	22809.23	40.29
2010-11	8295.69	24015.06	34.54
2011-12	9471.67	27614	34.3
2012-13	8279.71	26257.62	31.53
2013-14	8535.22	29082.52	29.35
2014-15	9239	31837	29.02
2015-16	9506	35092.26	27.09
2016-17	9708.81	34500.61	28.14
2017-18	10067.34	38215.38	26.34
2018-19	9714.29	41017.42	23.68
2019-20	10371.16	43382.05	23.91
2020-21	10087.5	41943.83	24.05
2021-22	9123.54	46035.71	19.82

Source: Agricultural statistic at Glance various issue and Annual Reports of Haryana Electricity Regulatory Commission.

The above table indicates the electricity consumption for agriculture purpose in Haryana, for the period of 2005-06 to 2021-22. The consumption of agricultural electricity for the year 2005-06 was 6447.78 units, 9471.67 units in 2011-12 to reach 10087.5 units in 2020-21.but when talked about the share of agriculture consumption in total consumption it shows decreasing trends. The share of agriculture in total consumption was 41.8percent in 2005-06 which reduced to 19.82 percent in 2021-22. This shows that share of other sector has increased in the consumption of electricity.

ISSN PRINT 2319 1775 Online 2320 7876

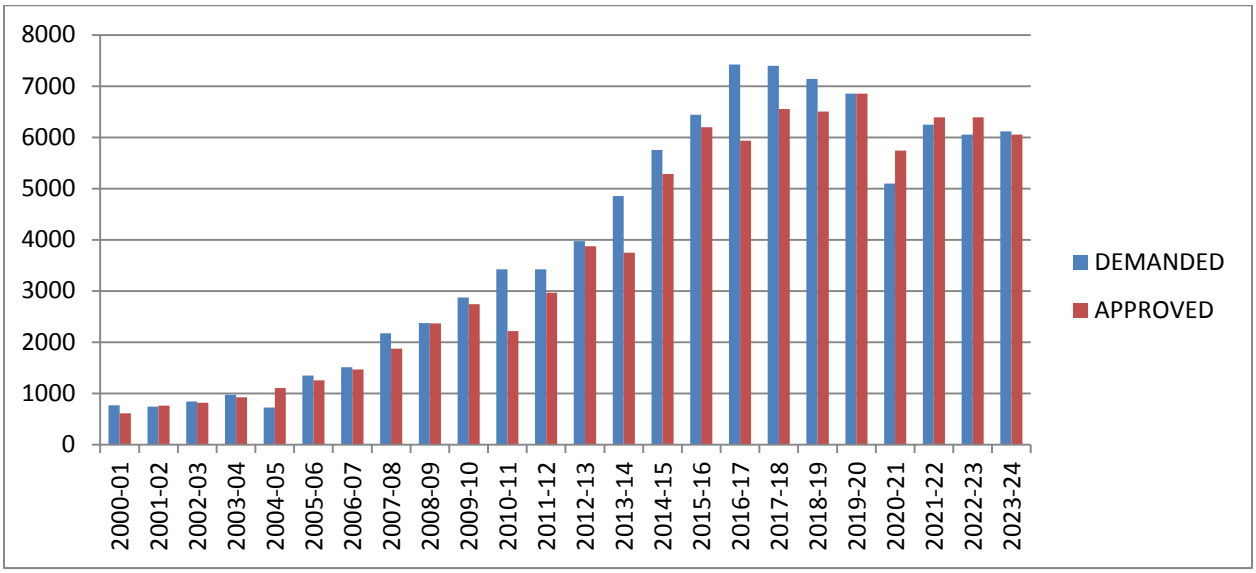

Figure 1: Agricultural Electricity Subsidy in Haryana (in Rs. Crore)

Source: Compiled from HERC Order on True-up for various year.

Above figure depict the trends of electricity subsidy demanded and approved by the state government for agriculture in Haryana. There are increasing trends for the year from 2000-02 to 2015-16, after that it started to decline. Government spend Rs. 613.08 crore in the 2000-01 whereas Rs. 6393.47 crore in the 2022-23. It indicate increasing trend of electricity subsidy in Haryana. There are gaps in the subsidy demanded by the Distribution Companies (DISCOMs) and the subsidy approved by the state government for almost all years. It increased the revenue loss to the distribution companies. To improve the financial efficiency of DISCOMs, state government has to cover all revenue gaps and implement proper estimation technique for the electricity consumption by agriculture.

IMPACT OF AGRICULTURAL ELECTRICITY SUBSIDIES ON AGRICULTURE SECTOR PERFORMANCE.

Agriculture sector of Haryana is a crucial contributor in the overall growth of the economy. Electricity subsidy is provided by the state government of Haryana. To understand the contribution the subsidy on the agriculture sector it is important to investigate how it affects the Gross State Domestic Product (GSTP).To anticipate the impact of agricultural electricity subsidy on the Gross State Domestic Product (GSDP,) regression analysis is perform (other factor remains constant). Here are the results:

ISSN PRINT 2319 1775 Online 2320 7876

 Journal Volume 11,Iss 11, 2022

Table 3: Impact of Electricity Subsidy on GSDP from the Agriculture and Allied activities

Variable	Coefficient	Standard Error	t-statistic	p-value
Intercept	4752.1353	1162.395	4.089	0.001
Electricity subsidy	18.7102	0.521	35.879	0.000
R-squared	0.985			
Adjusted R-squared	0.984			
F-statistic	1284.781	p-value	1.33e-15	

The regression analysis suggests that electricity subsidy has a statistically significant (p-value < 0.001) impact on the Gross State Domestic Product (GSDP) from agriculture and allied activities in Haryana. Specifically, a one-unit increase in electricity subsidy is associated with an 18.71-unit increase in GSDP from agriculture and allied activities, holding all other factors constant. The R-squared value of 0.985 indicates that the regression model explains 98.5% of the variation in GSDP from agriculture and allied activities. The adjusted R-squared of 0.984 takes into account the number of predictors in the model and provides a more conservative estimate of the model's explanatory power. The F-statistic of 1284.781 and its corresponding p-value of 1.33e-15 suggest that the overall regression model is statistically significant, it shows that the independent variable (electricity subsidy) has a significant impact on the dependent variable (GSDP from agriculture and allied activities).

Therefore, the results of this regression analysis provide strong evidence that electricity subsidy is an important factor influencing the agricultural sector in Haryana. These findings can be used to inform policy decisions and guide further research in this area.

EFFECTS OF AGRICULTURAL ELECTRICITY SUBSIDY

Main intend of the agricultural electricity subsidy is to support the farming sector in Haryana. Many times it faces various issues and challenges that affect their sustainability and effectiveness. Here are some issues associated with the agricultural electricity subsidy.

1. **Misallocation of Subsidies:** Subsidy programs may not always effectively target the neediest farmers. Singh (2012) Stated that there was huge inequality in the distribution of the subsidy among the different size group. Wealthier or larger landowners may benefit disproportionately from these subsidies, exacerbating income inequality within the farming community (Jain, 2006)
2. **Budgetary Strain:** Subsidizing electricity for agriculture can place a significant financial burden on governments, especially in developing countries like India. The cost of these subsidies can increase rapidly, straining public finances and leading to budget deficits (Badiani et al, 2012).

ISSN PRINT 2319 1775 Online 2320 7876

3. **Inefficient Energy Use:** Kumar (2018) stated that the subsidies can promote inefficient energy use in agriculture. Illiteracy among the farmers about the subsidy will result in the misuse of the power in agriculture. Farmers may run irrigation pumps longer than necessary or use energy-inefficient equipment, leading to energy waste and higher operational costs.
4. **Environmental Impact:** The use of subsidized electricity for irrigation can lead to increased power consumption and over-extraction of groundwater resources, the Haphazard use of ground water has raised the depletion of water table. This is harming the environment and increasing the misuse of the natural resource (Kumar, 2018)
5. **Fiscal Sustainability:** providing high subsidy to the farmer results in increased the financial burden on the energy utilities. Ensuring the fiscal sustainability of electricity subsidy programs for long term can be challenging. As electricity demand and costs rise, the cost of subsidies may increase. It will put additional pressure on public finances (Gulati and Pahuja, 2015).
6. **Market Distortions:** The main purpose of the electricity subsidy is to provide electricity at affordable rate. Many of the state offers free electricity. These subsidies can distort agricultural markets by lowering production costs for the crops. This can affect the competitiveness of non-subsidized crops, leading to market imbalances (Gautam, 2015).
7. **Administrative Challenges:** Administering and monitoring subsidy programs can be complex and resource-intensive. Ensuring the fairly distribution of subsidies and preventing misuse requires a well organized administrative infrastructure (Kumar, 2020).
8. **Dependency on Subsidies:** free or at a nominal rate of electricity lead to over-reliance on subsidies that can create dependency among farmers, reducing their incentive to adopt more sustainable and energy-efficient farming practices. This can hinder agricultural modernization and productivity (Singh et al., 2014).

CONCLUSION

Haryana is an important state of country for agriculture point of view. Assistance provided in the form of subsidy, by the government plays vital role in the growth of agriculture sector. There is increasing trends in the electricity consumption and electricity subsidy for the agriculture sector in Haryana. The impact of agricultural electricity subsidies is complex and multifaceted. Regression analysis highlights the significant positive impact of the agricultural electricity subsidy on the GSDP from agriculture and allied activities in Haryana, providing a strong justification for the continued support and potential expansion of this policy intervention. While these subsidies can endow short-term relief to farmers and boost agricultural productivity, they also pose challenges related to budgetary sustainability, resource management, and market dynamics. Effective subsidy programs should be carefully designed and targeted to achieve their intended goals while minimizing adverse consequences. Additionally, policymakers should consider alternative approaches, such as promoting energy-efficient technologies and sustainable

ISSN PRINT 2319 1775 Online 2320 7876

farming practices, to address the needs of the agricultural sector more holistically. The strong positive relationship between the electricity subsidy and the GSDP from agriculture and allied activities can serve as a basis for further research and analysis. Researchers can explore the underlying mechanisms and channels through which the subsidy influences the agricultural sector's performance.

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