

# Evaluating the Indian Government's Decision to Subsidise Solar Pumps in the PM-KUSUM Policy

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## Introduction

Agriculture plays a significant role in India's economy. According to a report entitled *India at a Glance*, approximately "70% of the rural households depend on agriculture" ("India at a glance", 2020), highlighting the incredibly important role agriculture plays. Economically, it contributes "about 17% to the total GDP and provides employment to over 60% of the population" (*ibid*). Although this role has been steadily declining over the last couple decades with the gradual development of India, farmers continue to remain the backbone of the agricultural economy and, as such, a lot of the Indian economy. It's surprising to learn, therefore, that most of them currently suffer under the burden of constant debt. The debt crisis for farmers in India has never been worse. Millions of farmers who rely on the agricultural sector for work are currently suffering from extreme poverty as a result of not being able to have sufficient yield – the overpopulation India experiences causing insufficient land split alongside uncharitable government policies. Due to such distress the number of suicides are consistently rising – with data from the NCRB claiming nearly 42,000 farmers and daily wage earners committed suicide in 2019 (The Economic Times). The government realises the scale of the problem and is constantly working on this issue to relieve farmers. Since the release of such statistics, the government is attempting to aid farmers by reducing taxes and providing them subsidies, a sigh of relief for the most vulnerable. One such area where the government is exploring subsidisation is with regards to electricity.

Electricity is an essential component of agriculture. It runs all the activities of the farmlike machinery, tubewells, irrigation pumps and many other important tools which, in total, affect the final yield. Consequently, stable electricity is an important factor to enhance the income of farmers. Agriculture is the primary activity which is seen mostly in rural areas. Additionally, agriculture's environmental impact is fairly high. Soil degradation, deforestation and industrial agricultural waste are massive contributors to increasing the pollution level of India, a problem which Indians have been wrestling with for a while. According to one study, the majority of Indians breathe outside air that is "10 times or more over the WHO safe limit" (WHO). Non-renewable electricity adds to this already unsustainable model of agriculture, worsening the problem. To overcome these challenges, the Indian government is looking to install solar panels.

Solar energy in agriculture is not a new concept, it has been prevalent since old times, with ancient Egyptians using solar energy to power their homes. On a farm, numerous devices or machines require electricity, these devices can be run by the solar panels with the help of solar energy. Solar energy, as described by one source, “*is radiant light and heat from the Sun that is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, solar thermal energy, solar architecture, molten salt power plants and artificial photosynthesis.*” (RSC). Other than solar energy there are alternate forms of sustainable sources of energy. For example, wind energy, tidal energy or geothermal energy all have zero-carbon in it. However, such forms of energy are not always suitable in a field and, hence, this paper will only consider the benefits of solar energy.

### **Solar Panels**

According to *Smestad*, solar panels are the devices which are used to absorb sun's rays and convert them into electricity or heat (Smestad). The solar panel is the amalgamation of solar (Photovoltaic-PV) cells which can be used to generate electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment. These cells traditionally generate a lot more electricity than other forms and, since the source of power is the sun, are renewable forms of energy, decreasing the environmental cost of agriculture. Solar panels were first introduced in India in the year 2010. The advantage of using solar energy over other, more traditional sources of energy are many. To avoid digressing into a lengthy discussion on each one of them, the main findings regarding the benefits of solar energy are summarised as follows (Process Industry Forum):

- *Renewable energy source* – As solar energy uses energy from the sun and is not a mixture of other constituents, solar energy is sustainable and totally inexhaustible. Unlike fossil fuels that are considered finite, solar energy can be harnessed until the sun dies out, which is practically an infinite amount of time
- *Clean and carbon free source of energy* – Solar energy is regarded as the clean source of energy because it does not emit toxic substances or contaminants of the air. The contaminants of air due to pollution can be damaging to the environment, hence solar power is environmentally beneficial as well
- *Reduce electricity bills* – Farm activities, as mentioned, are integral for a good yield. Electricity plays a crucial role in facilitating such farm activities. The normal cost of electricity bill is around Rs. 500 per month. On the other hand, the initial cost of implanting solar panels is high but, comparatively, the running cost of electricity is lower than the usual electricity bills.
- *Diverse applications* – Solar energy has multiple applications such as cars, water pumps, heaters, greenhouse, lights desalination, satellite chilling, dryer solar ponds – all additional to it being used as a primary energy source
- *Low maintenance cost* – Solar panels are firm on their position i.e. they are not mobile. So, they do not require maintenance on a regular basis besides the initial set up
- *Technology development* – The increasing use of solar energy has caused investment and development in a variety of new and exciting technologies such as Photovoltaic solar systems and Bioclimatic design, all potential long-term game changers in the agricultural field

However, a number of factors have been holding back solar panels from becoming a leading source of energy in the world. First, solar panels are weather dependent. Solar panels work efficiently during a clean and clear sky. If the weather is rainy then the solar panels are regarded as useless. To install solar panels, a large field area is needed, which is expensive and often more than the farm's income. So, taking into account the cost of the panels, the yield might reduce. Consequently, farmers' income would also drop. Farmers don't prefer to use solar panels nowadays as it's cost cannot be affordable by marginal farms. As the need for energy in farms was increased, the government felt the need to introduce new sources of renewable energy. The Government of India, with an aim to promote clean energy, launched the Jawaharlal Nehru National Solar Mission (JNNSM) on 11th January 2010, which is one of the eight missions under the National Action Plan on Climate Change (NAPCC-2008). Aimed at installing 100 GW of Solar PV by 2022, this mission has been the basis for many subsequent policy decisions taken by the government (Gomkale and Datta). The major con of solar energy, however, is the cost of purchasing solar panels is extremely high for the average farmers. Therefore, the majority of the policies passed by the government entail some form of subsidy. This paper will explore one such policy, the PM KUSUM policy, and evaluate whether or not such subsidisation is sustainable and effective in achieving the 2022 goal, aiding farmers and helping the environment. Accordingly, government intervention is needed to bring this merit good to the average farmer.

## **PM KUSUM**

Water plays a significant role in farming. One major problem farmers are confronted with is the problem of irrigation. Faulty or unusable irrigation makes it arduous for farmers to supply water to the fields. Major problems encountered by the farmers as a result of insufficient water supply all hinder the eventual yield or the monetary value of the crops the farm grows. This is where PM Kusum comes in. As a part of their multifaceted approach to achieve the 2022 goal of doubling farmers income, the government has made a significant part of PM Kusum about solar energy, specifically about the "installation of 17.50 Lakh stand-alone solar agriculture pumps" (MNRE), tackling the irrigation problem while promoting solar alternatives. To achieve this installation, the government has agreed to give farmers a very large subsidy with respect to the solar pumps. As the government issued notice on PM Kusum put it "*The farmers only have to expend 10% of the total expenditure to install solar pumps. 60% of the cost will be handled by the government and 30% of the total cost as loans to the farmers.*" (MNRE) This is the subsidy that will be analysed from an economic and environmental lens, in an attempt to properly evaluate the policy

## **Economic Analysis of PM Kusum**

### **What does PM Kusum cost the government?**

To evaluate this policy on an economic level, it is first important to understand what the PM Kusum policy costs the government. The government has been very transparent with the money they are looking to dedicate to this scheme. Although it is possible this number is exaggerated or an approximation of the true cost of the scheme, this paper will use the data given by the government as relatively accurate. The information below outlines the split between the farmer, the banks, state government and central finance assistance (CFA). By focussing specifically on

the centre's involvement, we can decide whether or not the money spent by the centre has a significant enough opportunity cost or whether it is a reasonable policy:

*“CFA of 30% of the benchmark cost or the tender cost, whichever is lower, of the stand-alone solar Agriculture pump will be provided. The State Government will give a subsidy of 30%; and the remaining 40% will be provided by the farmer. Bank finance may be made available for farmer's contribution, so that farmer has to initially pay only 10% of the cost and remaining up to 30% of the cost as loan. In North Eastern States, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand, Lakshadweep and A&N Islands, CFA of 50% of the benchmark cost or the tender cost, whichever is lower, of the stand-alone solar pump will be provided. The State Government will give a subsidy of 30%; and the remaining 20% will be provided by the farmer. Bank finance may be made available for farmer's contribution, so that farmer has to initially pay only 10% of the cost and remaining up to 10% of the cost as loan.” (MNRE)*

It becomes apparent by looking at the details that the centre is trying to relieve the subsidy burden from the state governments by taking on some of the burden themselves. This increase in CFA was estimated to be a *“total central financial support of Rs. 34,422 Crore”* (Vikaspedia). For context, India was estimated to spend around 4.1 trillion Indian rupees (4,10,000 Crores) on the entire agricultural sector in 2018, so a 30,000 crore injection over the course of multiple years might not seem as large as the optics might suggest (*“Economic survey 2020-21”*). However, the important question is whether or not the government can successfully utilise this money to achieve their aims and, by increasing farmer's income and the country's GDP in the long run, attempt to make this money back

### **Increase in Farmers Income**

The implementation of solar energy will help farmers in many different ways. Specifically, the PM KUSUM scheme also aims to install 10 GW of decentralized ground mounted grid-connected renewable power plants upto 2 MegaWatt capacity. Such installation will provide a secure and stable source of income for farmers for at least 25 years, including from the uncultivable under-utilized land. Additionally, as one opinion piece put it, the *“generated electricity will be utilized to fulfil the power requirements in the area and reduce the transmission losses. These solar agri-feeders will reduce the agricultural subsidy and infrastructural costs, enhancing access to affordable energy for industrial uses”* (Khabya). Delhi's government also launched a similar scheme aimed at setting up such plants in 9 villages with the specific purpose of increasing farmers income, as well as a solar scheme aimed at increasing the income from ₹20,000-₹30,000/acre every year to up to ₹150,000, highlighting the Indian government's belief in increasing farmers income through solar energy (MNRE). The heavily subsidised solar pumps, however, will be the most important in increasing farmers income. By increasing self-reliance, reducing pollution and saving water, the money farmers end up saving adds substantially to their overall wealth. Installing solar pumps and panels drastically reduces electricity bills as, after the initial cost, maintenance costs are largely negligible. Additionally, fixing the irrigation problem as mentioned earlier will save money on fixing the water systems as well as increase the productive capacity of the farms. Currently, solar pumps also hold great potential to save *“4 billion litres of diesel annually and 5% of total greenhouse gas emissions.”* (Khabya) This sort of reduction in diesel cost, alongside a reduction in pollution and an increase in the productive nature of the farm will increase income. Most importantly, as one paper put it, the solarisation of

agriculture pumps provides a massive opportunity for farmers ("PM-kusum – solarizing agriculture pumps in India"). Farmers can sell excess or surplus power back to the country's grid supply, an excess which they are likely to have due to the intense power output from solar energy. This provides a secondary source of income for the farmers, giving them another avenue to increase their wealth. Therefore, the use of solar energy in agriculture is a potential area in the country and has vast scope to make substantial contributions towards increasing farmers' income by reducing cost of irrigation and enhancing access to irrigation, especially in the remote areas.

### **Increase in the GDP**

By attracting global and domestic investors, deploying renewable energy will have a positive effect on the GDP of our country. As India looks to meet its energy demand on its own, "new investments in the non-conventional energy sector reached \$7.4 billion in the first half of 2018" (The Economic Times). Further, the sector also received a total FDI equity inflow of "\$7.83 billion in the last ten years." Last year, PM Narendra Modi had announced his vision of achieving the target of making India a \$5 trillion economy by 2024-25. The shift to renewable energy in the form of solarisation therefore makes India a very appealing investment for potential investors. Additionally, shifting to renewable energy would significantly aid the job market, both by adding new jobs and providing new training to existing workers. According to the *Renewable Energy and Jobs – Annual Review 2018*, the renewable energy industry accounted for nearly 700,000 jobs at the beginning of 2018. Permanent jobs in this sector don't just benefit the workers with regular pay but also provide training opportunities, healthcare benefits, safety standards and therefore enable people to plan for their family's future. This would also help in reducing income inequalities and in creating a sustainable equitable environment. Moreover, the share of agriculture in GDP increased to 19.9 per cent in 2020-21 from 17.8 per cent in 2019-20 (Kapil). Many skeptics of similar arguments often claim that, as India continues developing as a country, the agricultural sector holds less importance. Accordingly, such skeptics would be hesitant in giving out nearly 30,000 crore in the form of CFA for PM Kusum – they would argue that such money is impossible to make back. One paper tackled this argument as follows:

*"Growth rates of the agriculture sector as a whole and across major crops cultivated in India have deteriorated, as has the importance of agriculture as an income generating activity. However, the sector remains the main source of employment in India. This implies that disparity in income generation between agriculture and other sectors, particularly services, has increased."* ("State of Agriculture in India")

Such analysis highlights the need for farmers' income to rise if the country's gross domestic income and social equity problems are to be solved, an objective which the incumbent government is working toward.

## Conclusion

Currently, farmers are strongly exposed to agricultural risks. Rural electricity is only being provided for 4-5 hours, an insufficient amount to match the needs of farm activities. This shortage of electricity, alongside an unfair system within an overpopulated area has driven many farmers into heavy debt. In turn, debt and its accompanying stresses were rated as significantly higher than fertilizers and crop failure in causing farmer suicide. In a different study in the same region in 2006, indebtedness (87%) and deterioration in the economic status (74%) were found to be major factors for suicide (Vijayakumar). Solving the energy problem could be the first step, therefore, to move India's most important social class out of complete poverty.

Installation of solar energy is one of the solutions for this problem. But, setting up solar panels is expensive, and many of the farmers cannot afford it. A scheme like PM KUSUM aims to fix this problem by offering subsidies for the initial high cost of solar panels. Apart from the PM KUSUM scheme there are other schemes on solar panels such as the Jawaharlal Nehru national solar mission or the UDAY scheme, all offering similar assistance to farmers. As shown by the economic analysis in the paper, both the country's GDP and the farmer's income has risen and is likely to rise given the financial augmentation of more schemes like this. The combined government objectives of helping farmers and economic aid after the impacts of COVID-19 are all going to reach greater fulfilment. Personally, I have seen solar energy greatly help local farmers. A farm in Lokra, Gurugram district near Rewari, Pataudi with a total area of the field is 1.5 acre and had 2 solar panels installed to run the farm activities. The electricity provided by the government would not suffice the needs of the farm and, accordingly solar panels were installed. However, since the initial cost was very high, the farm owner (Colonel Sarjeet) only bought them due to a 5% subsidy from the government, without which the purchase would have been unlikely. Such examples are only likely to increase with the expansion of PM-KUSUM, and provide a mild relief for the most important group in India.

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