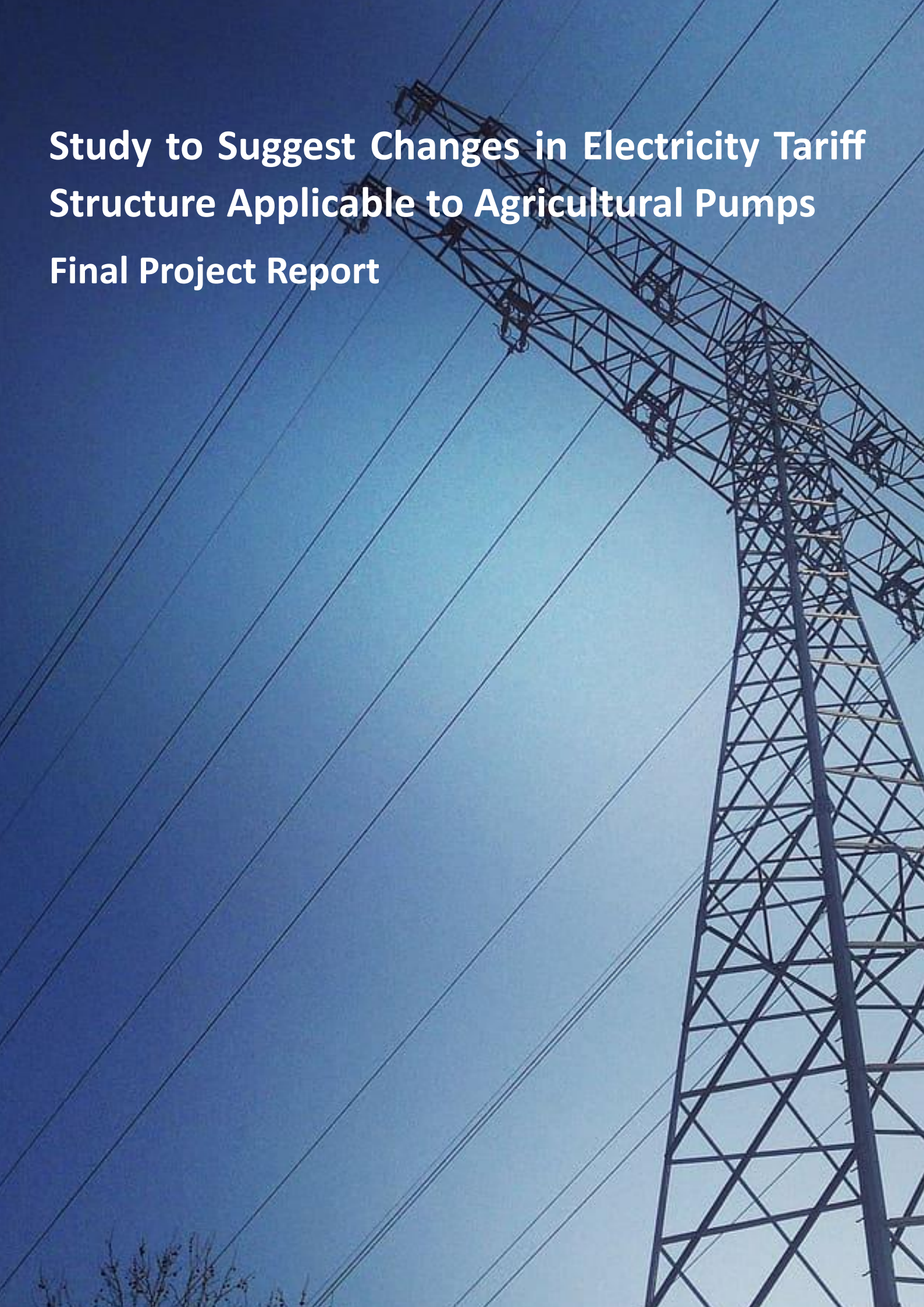
Study to Suggest Changes in Electricity Tariff Structure Applicable to Agricultural Pumps

Final Project Report



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Executive Summary

Irrigation based on groundwater plays a significant role in global agriculture, helping to sustain food production in many regions. Groundwater is a valuable water resource that can be tapped into through wells and pumps, providing a reliable water supply for irrigation purposes. However, sustainable management practices and careful monitoring are essential to mitigate the risks associated with its excessive exploitation, water level depletion and contamination.

Use of ground water for irrigation varies significantly among different countries and regions, depending on water availability, infrastructure, and agricultural practices. In India, the groundwater irrigation is the most dominant form of irrigation and electrically powered agricultural pumps are extensively used by farmers across the country Our unique approach of "Flat Tariff for unmetered connection and often 'free' power supply to the agricultural sector has significantly encouraged a high dependence on groundwater extraction for irrigation in rural areas. This has resulted in exploitation of ground water and inefficient use of electricity leading to technical/commercial losses to power sector stakeholders.

Maharashtra has about 44 lakh AG consumers (for agriculture pump), almost all in Maharashtra State Electricity Distribution Corporation Ltd. (MSEDCL) area, out of which over 15 lakh AG consumers are unmetered and in the case of metered connections, discrepancy is being observed between data with the DISCOM and ground reality. Consequently, this has led to deteriorating power service delivery, losses to electricity companies, declining ground water levels, and stagnant or declining agricultural productivity.

This study undertakes a comprehensive approach while addressing the objective of promoting the efficient use of power in the agriculture sector of the state of Maharashtra. The given final report consists of the As-Is- Analysis of the existing agriculture power landscape of Maharashtra and similar states, challenges in agricultural tariff setting and assessment of influencing agrarian factors and recommendations on tariff structure and efficient use of power in the agriculture sector.

The report analyses the existing power consumption scenario in the agriculture sector of the state to identify key challenges faced by farmers & DISCOMs. It proposes a portfolio of sustainable solutions to have effective tariff structures, efficient use of power and awareness among all the stakeholders. The feasible solutions recommended in this report involve the Solarization of AG power for pumps, a mechanism to provide power subsidy directly to farmers, Group Metering through AG feeders, Incentives in using energy efficient systems and information, Education and Communication strategies to encourage the adoption of meters, renewable/energy efficient practices and long-term benefits of timely bill payment by the farmers.

The Interventions could lead to improved service delivery as well as incentives to the farmers to use electricity and groundwater efficiently. It is also expected to improve the operational and financial performances of power companies while creating the right conditions for improving the rural power supply without aggravating the States' fiscal burden.

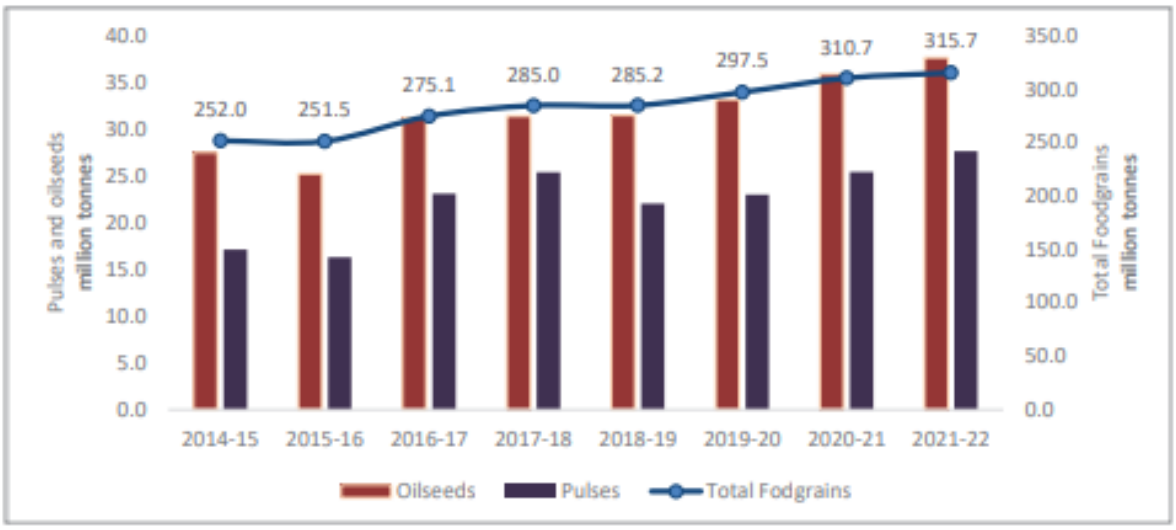
1. Overview of Agriculture (AG) Sector

India is an agrarian country wherein the agriculture sector provides livelihood to two-thirds of the working population and contributes 15% to the Gross Domestic Product (GDP). India's favourable agro-climatic conditions and diverse geography make it one of the world's top producers of cereals, pulses, fruits, vegetables, milk, meat and fish. India is also one of the significant net exporters of global agricultural produce.

The agriculture sector is of immense significance in the country as it contributes significantly to the country's economy and sustains a large portion of the population. With a wide variety of crops grown, including rice, wheat, pulses, oilseeds, sugarcane, and cotton, India is self-sufficient in food production. In 2020-21, India's foodgrain production touched a record 315.7 million tonnes.

The sector has witnessed a sustained growth profile over the years. For the past six years, the sector has been growing at an average annual growth rate of 4.6%. In addition to achieving self-sufficiency in food production for domestic consumption, in recent years, India has emerged as the net exporter of agricultural products. During 2021-22,agrarian exports reached an all-time high of US$ 50.2 billion (EconomicSurvey, 2023).

Figure 1 Sustained Increase in Foodgrains Production In India (million tonnes)



(Source: Economic Survey 2022-23)

This splendid performance of the agriculture could be attributed to range of initiatives taken by the Government in the domain of crop diversification, crop insurance, loan disbursement, supply of inputs, development of agricultural infrastructure and etc.

While Indian agriculture has performed well, the sector is identified with particular challenges such as adverse impacts of climate change, fragmented landholdings, low productivity, disguised unemployment, poor percentage of irrigation, non-judicious use of inputs (water, power, fertilizers, etc.) and thus a re-orientation of interventions is imperative.

Under this study, the factors influencing power (electricity) consumption has been given a significant importance. Accordingly, an overview of the agriculture sector in the major agrarian states of the country (other than Maharashtra) was conducted, covering salient aspects such as majority crops produced, % of the population dependent on agriculture, land under cultivation and significant issues faced by the farmers as well as DISCOMs from the respective states.

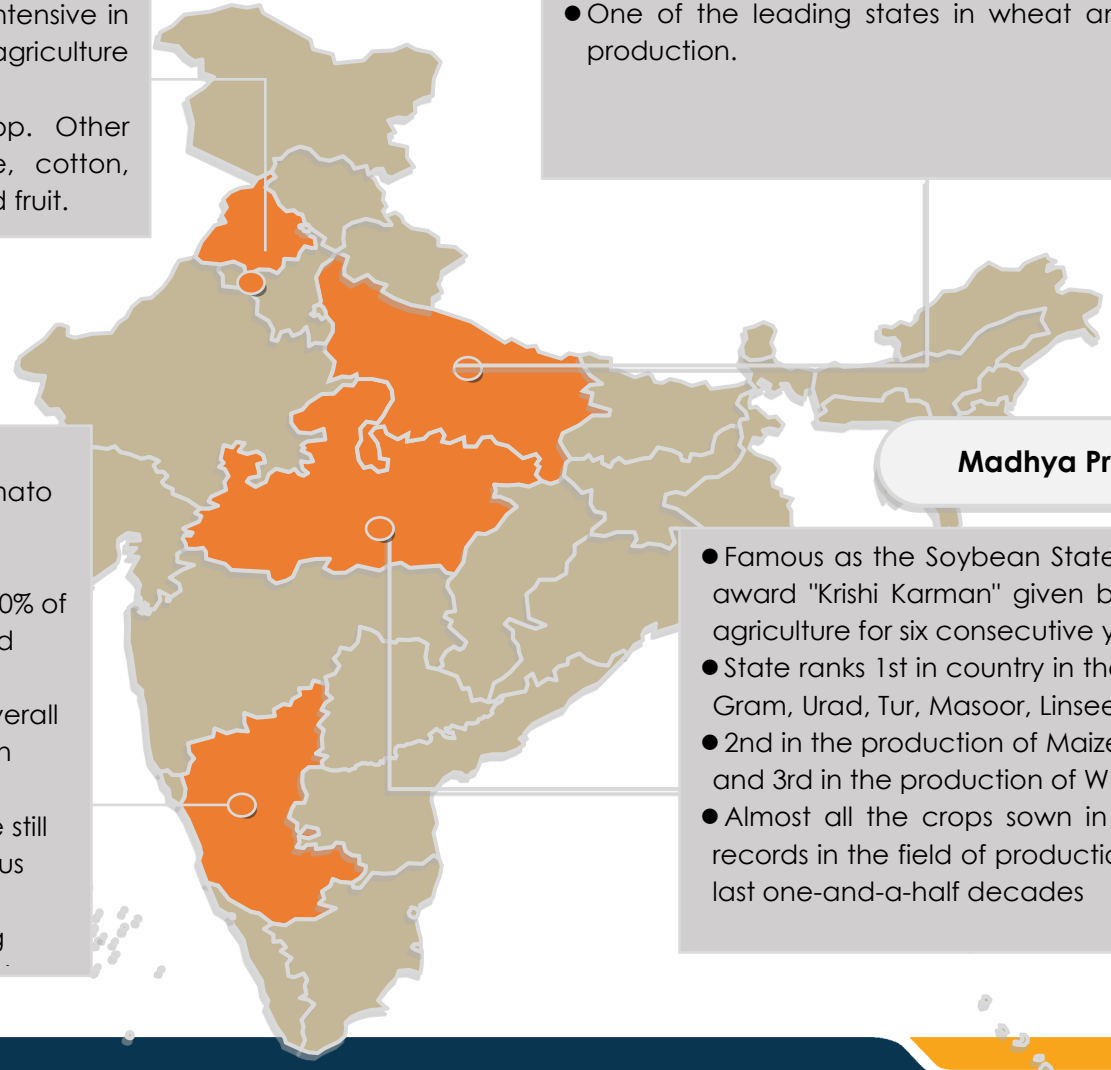
Below images depict central agrarian states in the country along with their salient features.

Punjab

- The State is known as India's breadbasket.
- Out of the total geographical area of the state, around 83% is under cultivation.
- As a "Granary of India", Punjab has been contributing 40 percent of rice and 50-70 percent of wheat for the last two decades.
- Punjab is not only self-sufficient in producing food grains but also contributes around 60% food grains to the central pool.
- The Agriculture in Punjab state is highly intensive in terms of land, capital, energy, nutrients, agriculture inputs and water etc.
- The largest area is under wheat crop. Other important crops of the state are rice, cotton, sugarcane, pearl millet, maize, barley and fruit.

Uttar Pradesh

- The economics of Uttar Pradesh is based mainly on Agriculture.
- Around 65 % of the total population is dependent on Agriculture.
- Approximately 165.98 lac hectare (68.7%) land is used for cultivation.
- Although, the state is identified with wide agroclimatic conditions, food grain production dominated the overall production basket of the state.
- One of the leading states in wheat and sugarcane production.



Karnataka

- The largest producer of coffee, raw silk, sandalwood, ragi (finger millet), sunflower, tomato and India's second largest producer of maize, safflower, grapes, pomegranate and onions.
- Known as Coffee Capital of India producing 70% of India's output. It is the leader in horticulture and floriculture business.
- The contribution of Agriculture sector to the overall GSDP saw an increase from 12.16% to 13.15% in 2020-21 against 2019-20.
- About 30% of the total workers in the state are still engaged in agricultural sector activities (Census 2011)
- The state mainly follows a rice-based cropping

Madhya Pradesh

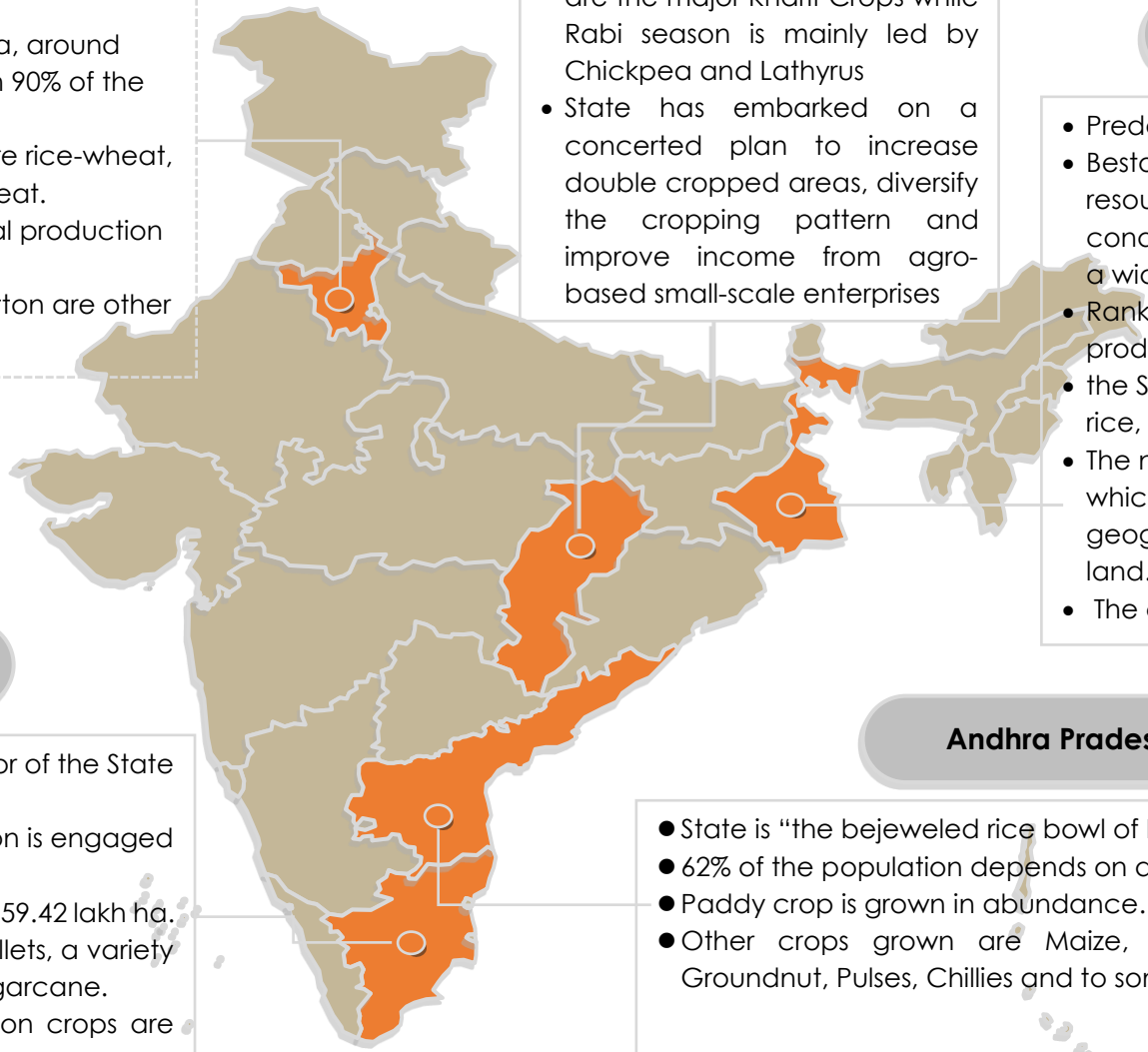
- Famous as the Soybean State, has earned the highest award "Krishi Karman" given by the GOI in the field of agriculture for six consecutive years
- State ranks 1st in country in the production of Soybean, Gram, Urad, Tur, Masoor, Linseed.
- 2nd in the production of Maize, Sesame, Ramtil, Moong and 3rd in the production of Wheat, Sorghum, Barley.
- Almost all the crops sown in the State have set high records in the field of production and productivity in the last one-and-a-half decades

Haryana

- Haryana is primarily an agricultural state wherein About 70% of residents are engaged in agriculture.
- Out of the total geographical area, around 84% is cultivable area out of which 90% of the area is irrigated
- The dominant cropping systems are rice-wheat, cotton-wheat and pearl millet-wheat.
- Contributes 13.3% towards national production of wheat
- Apart from wheat, rice, maize, cotton are other dominant crops in the state

Chhattisgarh

- About 70% population is engaged in Agriculture in the state
- Paddy, Soybean, Urd & Arhar are the major Kharif Crops while Rabi season is mainly led by Chickpea and Lathyrus
- State has embarked on a concerted plan to increase double cropped areas, diversify the cropping pattern and improve income from agro-based small-scale enterprises



West Bengal

- Predominantly an agrarian State.
- Bestowed with diverse natural resources and varied agro-climatic conditions which support cultivation of a wide range of crops.
- Ranks first in paddy and vegetable production in the country.
- the State has a surplus production of rice, vegetables and potato.
- The net cropped area is 52.05 lakh ha which comprises 68% of the geographical area and 92% of arable land.
- The cropping intensity is 184%

Tamil Nadu

- Agriculture -most predominant sector of the State economy.
- Around 60 percent of the population is engaged in Agriculture for their livelihood.
- Total Gross cropped area of around 59.42 lakh ha.
- The major food crops are Paddy, Millets, a variety of Pulses, different oil seeds, and Sugarcane.
- On the other hand, major plantation crops are Cashew, Coffee, Tea, Rubber

Andhra Pradesh

- State is "the bejeweled rice bowl of India"
- 62% of the population depends on agriculture and related sectors
- Paddy crop is grown in abundance.
- Other crops grown are Maize, Jowar, Cotton, Sugarcane, Groundnut, Pulses, Chillies and to some extent Tobacco.

1.1 Electricity consumption in the Agriculture Sector in India

Electricity consumption in Indian agriculture is significant and crucial in supporting agricultural activities. The agriculture sector accounts for a substantial portion of the total electricity consumed in the country. Electricity is primarily used for irrigation, powering water pumps, and running agricultural machinery and equipment. With the expansion of irrigation facilities and the adoption of electric-powered agricultural equipment, electricity consumption in Indian agriculture has increased significantly. As agriculture is a vital sector for India's food security and rural livelihoods, access to reliable and affordable electricity is crucial for farmers.

For certain crops, agriculture is an extremely water-intensive activity. Out of the total electricity consumed in the country, 20% of the electricity is used for agriculture practices, mostly in irrigation. This account of electricity consumed in agriculture can go up to 50% of total consumption in some of the states.[1] As the climatic conditions are turning out to be erratic, demand for irrigation has been increasing which in turn has led to increased consumption of electricity in the AG sector.

Table 1 Consumption of Electricity for AG purposes in the major states of India

#	State	Agriculture (GWh)	Total Energy Sold (GWh)	% Share of Consumption of Agriculture
1	Haryana	10371.16	43382.05	23.91
2	Punjab	11581.56	49168.06	23.56
3	Uttar Pradesh	18200.05	94932.13	19.17
4	Rajasthan	25664.75	61941.93	41.43
5	Chhattisgarh	5082.35	22793.08	22.30
6	Madhya Pradesh	23016.94	58628.43	39.26
7	Maharashtra	29291.23	125644.95	23.31
8	Andhra Pradesh	15338.12	57118.77	26.85
9	Karnataka	21823.07	61130.64	35.70
10	Tamil Nadu	13828.26	95919.07	14.42
11	West Bengal	1398.75	50481.54	2.77

[1] https://www.investindia.gov.in/team-india-blogs/renewable-energy-revolutionizing-farmers-incomes

12	All India	211294.89	1052346.36	20.08

(Source: Agricultural Statistics at a Glance, GOI, 2021)

Power supply to agriculture is a complex domain encompassing social, technical, political, strategic and emotional issues. The sector is identified with critical challenges, which are-

- Insufficient Electricity Infrastructure: In many rural areas, the electricity infrastructure is inadequate, leading to limited access to power for agricultural purposes. Insufficient substations, transformers, and distribution lines result in voltage fluctuations and low-quality power supply, affecting the efficiency of agricultural machinery and irrigation systems.
- Inadequate and Erratic Power Supply: Power supply to agricultural consumers is often inconsistent and unreliable. Frequent power outages and load shedding can disrupt farming operations, particularly during critical stages such as sowing, harvesting, and irrigation. It also hampers the productivity and yields of crops.
- Technical and Commercial Losses: Aggregate Technical and Commercial (AT&C) losses is a major challenge. These losses occur due to technical issues, theft, and billing inefficiencies. High AT&C losses result in reduced power supply to agricultural consumers and financial losses for power distribution companies.
- Limited Metering and Billing Systems: In some regions, metering and billing systems for agricultural consumers are inadequate or inaccurate. It leads to discrepancies between actual power consumption and billed amounts, affecting revenue collection and the financial sustainability of DISCOMs.
- Stressed water resources:-Irregular rainfall pattern, inefficient irrigation practices, depleting water levels and heavy dependence on pump irrigation have led to significant increase in the demand for electricity in the agriculture sector
- Adoption of Energy-Efficient Technologies: The adoption of energy-efficient technologies and practices in agriculture, such as efficient pumps, precision irrigation systems, and renewable energy solutions, faces challenges. Limited awareness, availability, and affordability of these technologies hinder their widespread adoption by farmers.
- Policy Constraints: Populist Policies such as no disconnection of farmers' electricity connections (in the cases of non-payment of electricity bills), have impacted the financials of Distribution Companies severely. Addition to this, Subsidization of electricity tariffs for agricultural consumers, while aimed at supporting farmers, has strained the financial viability of power distribution companies.

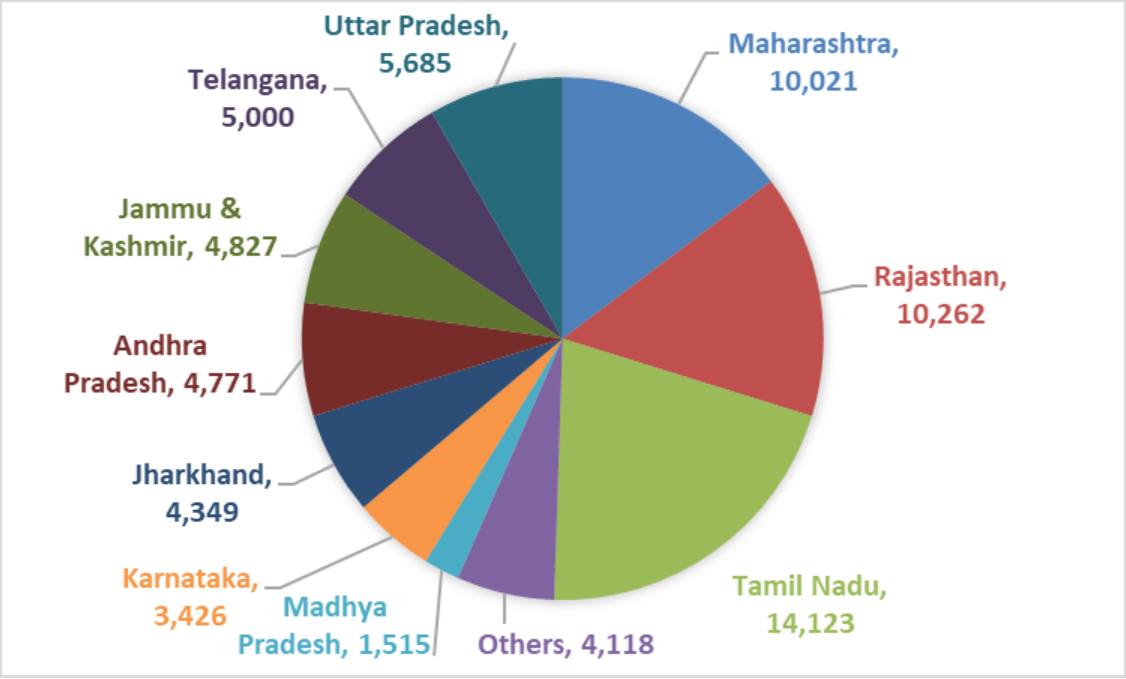
Addressing these challenges requires a multi-faceted approach which will not only address the needs of the farmers but also attempts to resolve problems faced by the Distribution sector.

1.2 Status of DISCOMs

The whole value chain involved in the distribution of power to the AG sector is marred with problems. Based on the nature of these problems, challenges before the DISCOMs can be divided into three categories- Operational & Managerial, Political and Regulatory & Technological (NITIAayog, 2021).

Detrimental to DISCOMs financial health is poor operational performance in metering, billing and collection. Except for a few, the majority of the DISCOMS in the country have a lower percentage of metering, are suffering from inaccurate/random billing practices and have a poor collection efficiency rate. These shortcomings have resulted in debt-ridden DISCOMs in the country, which owe huge dues to the generation companies.

Figure 2 State wise Discoms' Outstanding Dues to GENCOS



Source: NITI Aayog

On the technological front, DISCOMs are faced with challenges due to installed suboptimal infrastructure, which causes frequent breakdowns and higher costs of repair and maintenance. DISCOMs in the country are not immune to socio-political issues and policy measures taken under public pressure have further adversely affected the performance of the DISCOMs.

2. Tariff comparison of States

Power utilities across different states use two standard tariff modes to charge agriculture consumers: flat tariffs, where payments are fixed according to a pump's power capacity (un-metered), and metered tariffs based on units of power consumed (metered). Tariff comparisons for metered and unmetered AG consumers for FY 2022-23 IN 9 different states are shown in below tables.

Table 2 Comparison of Tariff Rates in the different states of India

Metered Connections						
S. No	**State**	**Category**	**Fixed Charges (Rs / HP / Month)**	**Energy Charges (Rs / Kwh)**	**Wheeling Charges (Rs / Kwh)**	**MMC (Rs / HP / Month)**
1	Maharashtra	Metered LT IV(B): LT - Agriculture Tariff – Pump sets	43	`	1.35	-
2.	Rajasthan	Metered (AG/MS/LT-4)				
		(i) General (getting supply in block hours)	30	5.55	-	-
		(ii) All others not covered under items (i) and getting supply more than block hours	70	7.1	-	-
3.	Telangana	Metered Corporate Farmers LT V(A) - Agriculture (DSM Measure Mandatory)	-	2.5	-	-
4.	Karnataka	LT 4 (A) Applicable to IP sets upto and inclusive of 10 HP	Free	Free	-	-
		LT 4 (B) Applicable to IP sets above of 10 HP	90	3.85	-	-
		LT 4 (C) Applicable to Private horticulture, nurseries, Coffee, Tea, Rubber plantation	80	3.85	-	-
5.	Haryana	Metered connections				
		(i) with motor up to 15 BHP	-	6.67 / unit	-	200
		(ii) with motor above 15 BHP	-	6.67 / unit	-	200
6.	Punjab	Metered connections	-	5.66	-	-

7.	Gujarat	Metered LTP- LIFT IRRIGATION - contracting load up to 125 HP for lifting water from surface water sources Metered: irrigation purposes only excluding installations covered under LTP- Lift Irrigation category	20	0.8	-	-
			20	0.6	-	-
8.	Madhya Pradesh	Metered: Connections for agricultural pump				
		a) (i) 0-300 units	58	4.79	-	-
		(ii) 301-750 units	74	5.82	-	-
		(iii) Rest of units in a month	81	6.10	-	-
9.	Uttar Pradesh	Metered supply	70	2.00	-	160
		Energy efficient Pump	70	1.65	-	140

Source: LT Agri tariffs comparison FY 2022-23 for metered connections

Unmetered Connections

S. No	State	Category	Fixed Charges (Rs / HP /Month)	Energy Charges (Rs / Kwh)	Wheeling Charges (Rs / Kwh)
1	Maharashtra	Unmetered: Category 1 Zones - with consumption norm above 1318 hours/ HP/year			
		0-5 HP	359	-	135
		Above 5 HP - 7.5 HP	387	-	135
		Above 7.5 HP	435	-	135
		Category 2 Zones - with consumption norm below 1318 hours/HP/year			
		0-5 HP	277	-	135
		Above 5 HP - 7.5 HP	304	-	135
		Above 7.5 HP	352	-	135
2	Rajasthan	unmetered: Flat (AG/FR/LT-4)			
		(i) General (getting supply in	30	745 / HP / month	-

		block hours)			
		(ii) All others not covered under items (i) and getting supply more than block hours	70	895 / HP / Month	-
3	Haryana	Unmetered connections			
		(i) with motor upto 15 BHP	15	-	-
		(ii) with motor above 15 BHP	12	-	-
4	Punjab	unmetered connections	419	-	-
5	Gujarat	Unmetered: for irrigation purposes only excluding installations covered under LTP- Lift Irrigation category	200	-	-
6	MP	Unmetered Temporary connection	81	6.10	-
7	UP	Unmetered supply	170	-	-

Source: LT Agri tariffs comparison FY 2022-23 for unmetered connections

The above given tables reveal that for metered consumers, energy charges in Maharashtra are lower than other states except Gujarat & Uttar Pradesh. On the other hand, for unmetered consumers, the charges in Maharashtra (except Punjab) are much higher than other states ranging from Rs 12 to Rs 200. There are no separate wheeling charges applicable in any other state except Maharashtra and states such as Uttar Pradesh & Madhya Pradesh are offering rebate on tariff in case of use of energy efficient pumps.

3. Maharashtra: Overview of Agrarian Landscape

Agriculture in Maharashtra is a significant economic activity and plays a crucial role in the state's economy. The average share of the agriculture and allied activities sector in the State economy is 11.9 per cent and around half of the State population depends on this sector for their livelihood (Survey2021-22). With a rich history of cultivation and vibrant cooperative movements, the sector has flourished and diversified in the state. Today, Maharashtra is a one of the leading producers in the country in terms of food crops, cash crops as well as horticulture and plays a critical role in ensuring nation's food security.

In the state, the average share of Crop sector is 63.7% in Agriculture & allied activities and horticulture amounts to about 28.4% of total crop production. Over a few decades, the State has significantly diversified its production base from coarse cereals to high value crops like cotton, sugarcane, soyabean, maize, fruits, vegetables and flowers.[2] Today, for agricultural produces like grapes, onions, Alphonso Mangoes, Maharashtra is known at nationally as well as internationally.

3.1 Farmlands

Maharashtra has around 20 million hectares of land under cultivation which amounts to 66% of the total geographical area of the state. The state has cropping intensity of 144 and gross cropped area is of around 23 million hectares.[3]

Table 3 Region wise Area under Agriculture in the State

Sr. No.	Region	Gross Cropped Area	Cultivable Area	Geographical Area
1	Konkan Division	9707	15809	29789
2	Nasik Division	32541	25189	41653
3	Pune Division	35450	32195	47518
4	Kolhapur Division	21208	19009	26956
5	Aurangabad Division	32616	24379	28488
6	Latur Division	39483	31778	35945
7	Amaravati Division	43338	33143	45697
8	Nagpur Division	24643	23588	51266
9	Maharashtra State	238986	205091	307582

Source: https://krishi.maharashtra.gov.in/

[2] Economic Survey 2021-22 of Govt. of Maharashtra

[3] Annexure जमिन_उपयोगिता_सांख्यिकी_2020_21

3.2 Area and Production of Principal Crops

Identified with 9 Agro-climatic zones, cultivation is carried out in all the three seasons (Kharif, Rabi and summer) in the state of Maharashtra. State is a major producer in some of the Kharif and Rabi crops and witnesses a wide crop diversification. The below table represents production, productivity and area under cultivation for different crops in the state based on final advance estimates for the year 2021-22.

Table 4 Season wise Area, Production and Productivity of Different Crops in the State

		Kharif			Rabi			Summer			Total (Kharif + Rabi+Summer)		
#	Crops	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
1	Rice	1472.78	3132.49	2126.91	NA	NA	NA	102.55	302.97	2954.48	1575.33	3435.46	2180.78
2	Wheat	NA	NA	NA	1132.25	2144.25	1893.80	NA	NA	NA	1132.25	2144.25	1893.80
3	Jowar	339.46	262.46	773.19	1934.55	1878.17	970.86	11.23	9.34	831.42	2285.24	2149.97	940.81
4	Bajra	644.74	599.81	930.31	NA	NA	NA	21.98	18.78	854.31	666.72	618.58	927.80
5	Ragi	81.26	102.64	1262.97	NA	NA	NA	NA	NA	NA	81.26	102.64	1262.97
6	Maize	811.47	2186.29	2694.24	366.91	1285.41	3503.38	72.65	113.25	1558.72	1251.03	3584.95	2865.60
7	Other Cereals	43.69	17.29	395.74	10.99	4.42	402.07	5.58	4.31	772.94	60.26	26.02	431.83
	Coarse Cereals	1920.62	3168.49	1649.72	2312.45	3168.00	1369.98	111.45	145.68	1307.14	4344.51	6482.16	1492.03
	Total Cereals	3393.40	6300.97	1856.83	3444.70	5312.25	1542.15	214.00	448.65	2096.54	7052.09	12061.88	1710.40
8	Tur	1418.92	1649.52	1162.52	NA	NA	NA	NA	NA	NA	1418.92	1649.52	1162.52
9	Mung	415.19	205.27	494.40	NA	NA	NA	24.75	6.20	250.54	439.94	211.47	480.68
10	Udid	379.68	183.58	483.51	NA	NA	NA	0.41	0.22	538.91	380.09	183.80	483.57
11	Gram	NA	NA	NA	2372.18	2715.13	1144.57	NA	NA	NA	2372.18	2715.13	1144.57
12	Other Pulses	78.51	68.04	866.69	129.10	58.14	450.37	2.31	0.91	392.02	209.92	127.09	605.43
	Total Pulses	2292.30	2106.41	918.91	2501.28	2773.27	1108.74	27.48	7.33	266.78	4821.05	4887.01	1013.68
	Total Foodgrains	5685.70	8407.38	1478.69	5945.97	8085.52	1359.83	241.47	455.98	1888.34	11873.15	16948.89	1427.50
13	Groundnut	231.73	268.94	1160.56	NA	NA	#DIV/0!	87.99	132.20	1502.45	319.72	401.14	1254.65
14	Sesamum	16.80	2.77	165.05	2.02	1.37	679.83	8.97	1.67	186.18	27.79	5.82	209.32

15	Niger seed	5.88	0.88	150.23	NA	NA	NA	NA	NA	NA	5.88	0.88	150.23
16	Sunflower	10.55	4.64	439.63	4.10	4.16	1013.53	3.50	2.52	719.26	18.15	11.31	623.24
17	Soyabean	4526.48	5447.15	1203.40	NA	NA	NA	68.55	53.21	776.22	4595.03	5500.35	1197.02
18	Linseed	NA	NA	NA	6.45	2.71	420.18	NA	NA	NA	6.45	2.71	420.18
19	Safflower	NA	NA	NA	27.57	20.66	749.24	NA	NA	NA	27.57	20.66	749.24
20	Other Oilseed	2.92	0.88	300.01	23.43	9.10	388.50	6.54	1.33	203.78	32.89	11.31	343.91
	Total Oilseeds	4794.36	5725.25	1194.17	63.57	38.00	597.74	175.54	190.92	1087.62	5033.47	5954.18	1182.92
21	Sugarcane (Harvested)	1488.77	139159.19	93.47	NA	NA	NA	NA	NA	NA	1488.77	139159.19	93.47
22	Cotton (Lint)	4409.97	7791.08	300.34	NA	NA	NA	NA	NA	NA	4409.97	7791.08	300.34
23	Tobacco	NA	NA	NA	0.53	0.79	1504.50	NA	NA	NA	0.53	0.79	1504.50
	Total	**16378.79**			**6010.07**			**417.02**			**22805.88**		

Source: https://krishi.maharashtra.gov.in/Site/Home/Index.aspx

3.3 Land Holding Pattern

The land holding pattern in agriculture in India is characterized by a complex and diverse landscape. India is predominantly an agrarian country, with a significant portion of its population engaged in farming. However, the distribution of land holdings is highly skewed, with a large number of farmers operating on small and fragmented plots of land. This pattern of small land holdings presents several challenges to the agricultural sector. Limited access to credit and financial resources is a major concern for small farmers, making it difficult for them to invest in modern farming techniques, machinery, and inputs.

Moreover, small land holdings often lack the economies of scale that larger farms enjoy. It can hinder the adoption of advanced agricultural practices, such as mechanization and irrigation systems, which require substantial investments. Additionally, fragmented land holdings further exacerbate the problem. Fragmentation occurs when ancestral land is divided among family members over generations, resulting in smaller and less contiguous plots. This fragmentation leads to inefficient land use, increased transaction costs, and difficulties in implementing modern farming solutions.

Table 5 Pattern of Land Holding in the State

Category	No. of holdings	Farmers in different categories (%)	Area (Ha)	Category wise Area (%)
Marginal (Below 1 Hectare)	7815823	51.13%	3448662	**16.82%**
Small (1-2 Hectare)	4339259	28.39%	5771131	**28.14%**
Semi medium (2-4 Hectare)	2327023	15.22%	6025638	**29.38%**
Medium (4-10 Hectare)	733619	4.80%	4099420	**19.99%**
Large (10 Hectare & above)	69715	0.46%	1161588	**5.66%**

Source: Agriculture Census 2015-16, (Phase-I), Govt. of Maharashtra

3.4 District wise Cultivation

Maharashtra exhibits a diverse agricultural landscape with district wise variations in the cultivation patterns. The state boasts a favourable climate and varied topography, enabling the cultivation of a wide range of crops.

In western Maharashtra, districts like Pune, Satara, and Sangli are known for their rich agricultural practices. These regions have fertile soil and favourable weather conditions, making them suitable for the cultivation of cash crops like sugarcane and vegetables. The region's irrigation infrastructure, including dams and canals, supports a robust agricultural sector.

Moving towards norther Maharashtra, districts like Nashik, Ahmednagar, and Jalgaon are renowned for their vineyards and fruit orchards. Nashik, in particular, has gained recognition as the "Wine Capital of India" due to its thriving grape cultivation and wine production. Additionally, these districts also cultivate onions, tomatoes, bananas and other vegetables.

Table 6 District wise Cultivation in the State

District	Total Geographical Area ('000 ha)	Cultivable Area ('000 ha)	Net area sown ('000 ha)	Gross cropped Area ('000 ha)
Ahmednagar	1,702	1,352	1,059	1,464
Akola	543	449	429	738
Amravati	1,222	814	747	980
Aurangabad	1,008	818	679	1,224
Beed	1,069	932	758	1,022
Bhandara	342	203	176	251
Buldhana	967	729	651	883
Chandrapur	1,092	575	495	564
Dhule	733	440	411	526
Gadchiroli	1,492	254	175	220
Gondiya	586	215	188	240
Hingoli	466	412	347	613
Jalgaon	1,164	873	849	1,152
Jalna	773	716	572	876
Kolhapur	777	507	434	618
Latur	716	645	508	677
Nagpur	986	643	559	657
Nanded	1,033	854	725	964
Nandurbar	705	257	247	321
Nashik	1,563	1,014	860	994
Osmanabad	749	692	413	816
Parbhani	631	575	485	917
Pune	1,562	656	512	822
Raigad	687	311	191	217
Ratnagiri	816	557	251	260
Sangli	861	716	593	782
Satara	1,058	684	535	662
Sindhudurg	504	349	141	159
Solapur	1,488	1,279	937	1,142
Thane	464	216	163	226
Wardha	629	444	346	445
Washim	513	413	384	520
Yavatmal	1,352	952	855	993

(Source: Handbook of Basic Statistics of Maharashtra 2019)

Eastern Maharashtra, including districts like Wardha, Nagpur, and Chandrapur, is characterized by a mix of agriculture and horticulture. Cotton, soybean, pulses, and oilseeds are the primary crops grown in this region. Nagpur oranges, famous for their sweet taste, are a major horticultural produce of the area.

In the southern part of Maharashtra, districts such as Ratnagiri, and Sindhudurg are known for their coastal agriculture. These regions have a suitable climate for cultivating cashew nuts, coconuts, and spices like turmeric and pepper. Rice cultivation is also prominent in the coastal areas.

Table 7 Area and Production of Principal Crops in the State

No.	Crop	Area ('000 ha)	Production ('000 MT)
1	Rice	1465	3276
2	Wheat	834	1249
3	Jowar	2440	1197
4	Bajra	610	332
5	Total Cereals	6427	7947
6	Total Pulses	4002	2674
7	Sugarcane*	1162	89771
8	Cotton (Lint)**	4219	6593
9	Groundnut	244	239
10	Tobacco	0.5	0.8

* The production of sugarcane is in terms of cane and is worked out on the basis of harvested area

** The production of cotton is in ' 000 bales (one bale of 170 Kg. each)

(Source: Handbook of Basic Statistics of Maharashtra 2019)

It is worth mentioning that the agricultural practices and cultivation patterns in Maharashtra are influenced by factors such as soil fertility, rainfall patterns, irrigation facilities, and market demands. Overall, the district-wise agricultural cultivation in Maharashtra showcases the state's agricultural diversity, with each region specializing in specific crops and practices. This diversity not only contributes to the state's economy but also reflects the resilience and adaptability of farmers in Maharashtra.

3.5 Dark shed area in Maharashtra

The increasing uncertainty of monsoonal rainfall in the country has caused increased dependence over the ground water resources instead of surface irrigation in the agriculture. In addition to this, ground water irrigation is being preferred by the farmers due to less issues with the ownership rights, availability of cheap power, cultivation of water-intensive cash crops, efficient and heavy capacity pumps and various subsidy measures by the govt. Consequently, this has led to the exploitation of groundwater causing heavy depletion of water levels.

Nowadays, it has become critical to assess ground water levels to ensure sustainability of resource and in turn sustenance of farming in the region. Based on the water levels areas in

the state are divided into four categories, namely- 'Safe' areas which have groundwater potential for development; 'Semi-critical' areas where cautious groundwater development is recommended; ' Critical' areas; and 'Over-exploited' areas, where there should be intensive monitoring and evaluation and future ground development be linked with water conservation measures.

Below table depicts district wise area under cultivation (in '000' Hectares) in safe, semi critical, critical, and overexploited zones in the state of Maharashtra.

Table 8 District wise Cultivation in Safe, Semi Critical, Critical, and Overexploited zones in the State

S. No	District	Safe Zone ('000'Ha	Semi Critical ('000'Ha	Critical ('000'Ha)	Over-Exploited ('000'Ha)	Power consumption per Ha in Units	% of critical and over exploited area w.r.t. ground water levels
1	Amravati	395	196	0	472	1116.51	44%
2	Ahmednagar	495	448	363	70	3542.33	31%
3	Nashik	527	163	230	0	2915.87	25%
4	Buldhana	131	550	0	150	1284.17	18%
5	Jalgaon	292	520	0	117	2515.39	13%
6	Solapur	316	903	0	158	4370.47	11%
7	Pune	299	508	85	0	7086.32	10%
8	Sangli	649	58	0	0	3048.12	0%
9	Osmanabad	286	86	0	0	2957.31	0%
10	Satara	379	336	0	0	2302.38	0%
11	Nandurbar	346	0	0	0	2289.90	0%
12	Latur	512	55	0	0	2123.03	0%
13	Dhule	300	0	0	0	2094.94	0%
14	Hingoli	384	0	0	0	1940.92	0%
15	Aurangabad	131	628	0	0	1917.84	0%
16	Beed	466	0	0	0	1822.72	0%
17	Kolhapur	700	0	0	0	1761.18	0%
18	Bhandara	323	0	0	0	1515.11	0%
19	Parbhani	525	0	0	0	1490.63	0%
20	Jalna	647	0	0	0	1429.47	0%
21	Gondia	385	0	0	0	1387.36	0%
22	Nanded	822	0	0	0	1356.40	0%
23	Yavatmal	1115	0	0	0	1053.53	0%
24	Washim	420	0	0	0	1045.66	0%
25	Akola	405	61	0	0	996.70	0%
26	Nagpur	510	110	0	0	869.46	0%
27	Wardha	409	45	0	0	640.45	0%

28	Gadchiroli	912	0	0	0	517.91	0%
29	Chandrapur	1049	0	0	0	451.85	0%
30	Palghar	421	0	0	0	419.26	0%
31	Raigad	641	0	0	0	144.36	0%
32	Thane	360	0	0	0	128.25	0%
33	Sindhudurg	405	0	0	0	108.96	0%
34	Ratnagiri	388	0	0	0	56.03	0%

(Source: http://cgwb.gov.in/)

The data in the table above indicates that approx. 1,63,45,000 Ha of the area under cultivation is under the safe zone, 46,66,000 Ha of the area is under the semi-critical zone, 6,77,000 Ha of the area is under the critical zone and 9,68,000 ha of the area is under the overexploited zone.

4. Overview of Power Supply to Agriculture sector in Maharashtra

Maharashtra has one of the largest consumer bases in India with the largest number of agricultural consumers (~44 lakh)[4] and as per the Agricultural Statistics Report 2021, the agriculture sector in the state consumers around 23% of total power consumption of the state (GOI, 2022). Electricity is primarily consumed for the pump irrigation in the state and thus AG consumers/connections are distinguished based on capacities of pumps (measured in HP).

Data sets provided in the chapter give a comprehensive understanding about the overall power consumption in the agricultural, nature of AG connections (metered and unmetered), its impact on overall consumption pattern and revenue recovery, subsidy given to the AG consumers and its overall impact on power consumption in the sector.

Along with this, the chapter highlights policies and interventions undertaken in the state in the domain of AG power sector. The chapter also elaborates insights received from consultations held with some Farmer Producers Organisations.

4.1 Metered and Un-metered connections in AG sector

Landscape of AG power sector in the state is identified with two sets of AG power connections- Metered and Un-metered. The presence of unmetered connections is under severe scrutiny and criticism as it leads to over pumping, energy wastage and incorrect estimation of energy consumption and losses.

Below is the data on number of metered and un-metered consumers (HP wise) in Agriculture sector in Maharashtra from the year 2012-13 to year 2021-22. The data reveals that the number of metered consumers has been increased from 19.30 lacs in 2012-13 to 29.09 lacs in year 2021-22. On the other hand, the number of unmetered connections has remained more or less constant.

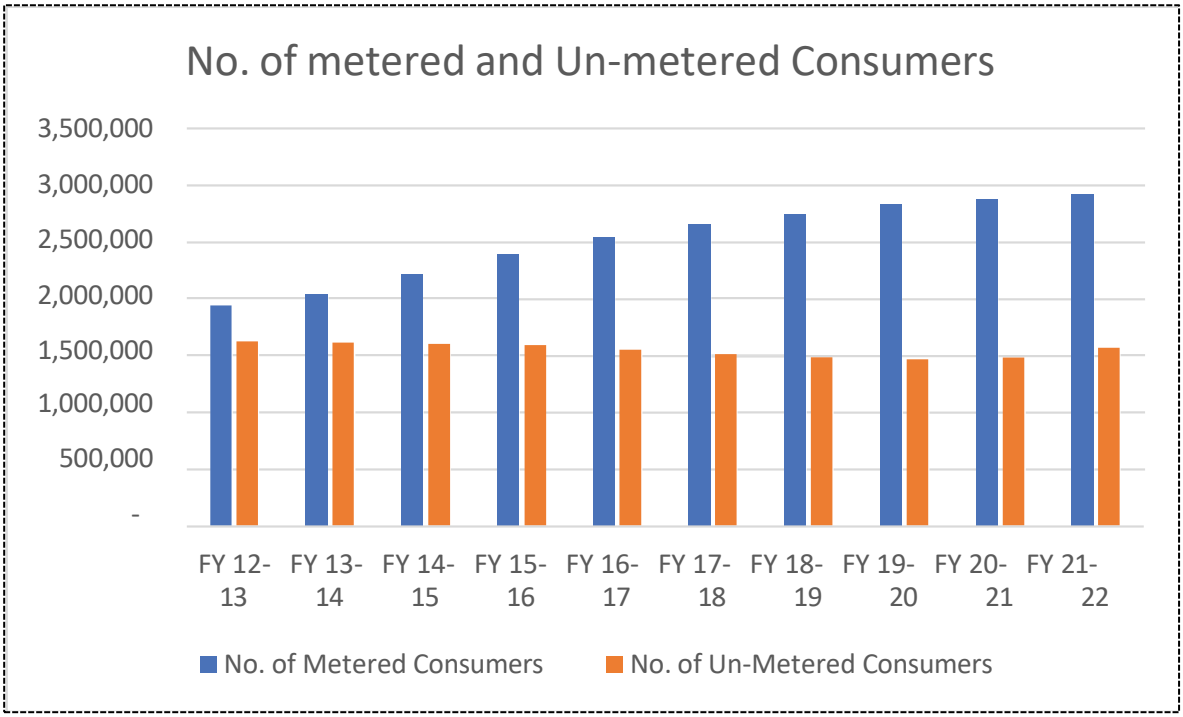
[4] As per data provided by MSEDCL

Table 9 Number of Metered and Un-metered Connections in the AG Sector

	Metered Connections						Unmetered Connections					
Year	up to 3 HP	3-5 HP	5-7.5 HP	7.5-10HP	Above 10HP	Total	up to 3 HP	3-5 HP	5-7.5 HP	7.5-10HP	Above 10HP	Total
FY 12-13	6,43,175	9,92,796	1,71,978	85,347	37,368	19,30,664	3,17,612	10,64,988	1,63,711	60,474	18,004	16,24,789
FY 13-14	7,15,314	10,21,149	1,71,152	91,013	39,141	20,37,769	3,42,689	10,41,344	1,50,237	58,444	17,417	16,10,131
FY 14-15	8,06,707	10,84,197	1,73,606	1,03,592	41,687	22,09,789	3,48,746	10,34,012	1,44,101	58,215	16,773	16,01,847
FY 15-16	8,79,600	11,56,550	1,80,886	1,14,411	43,716	23,75,163	3,41,178	10,32,240	1,42,799	57,858	16,542	15,90,617
FY 16-17	9,25,045	12,17,297	1,86,185	1,56,234	55,391	25,40,152	3,37,150	10,32,636	1,40,539	24,051	6,441	15,40,817
FY 17-18	9,21,964	12,66,302	2,09,212	1,83,935	68,302	26,49,715	3,19,304	10,36,181	1,46,790	2,082	51	15,04,408
FY 18-19	8,96,836	13,05,887	2,70,734	1,94,169	72,211	27,39,837	3,08,613	10,24,617	1,43,455	541	40	14,77,266
FY 19-20	9,03,855	13,49,896	3,04,103	1,97,159	75,276	28,30,289	2,99,739	10,10,641	1,48,336	1,411	76	14,60,203
FY 20-21	9,03,546	13,79,062	3,04,271	2,03,645	81,531	28,72,055	2,81,349	10,17,299	1,64,000	8,479	3,262	14,74,389

(Source: Data from MSEDCL)

Figure 3 Year wise Trend in Metered and Unmetered Connections



Source: Data provided by MSEDCL

The above figures shows that the number of unmetered consumers has decreased from 16.24 lakh in 2012-13 to 15.60 lakh in the year 2021-22. The reason for the decline in the number of unmetered consumers can be attributed to either conversion of unmetered connections to metered connections or the surrender of AG connections.

4.2 Connected Load in AG Sector

Load in the agriculture refers to the electrical power demand generated by various farming activities which mainly includes use of pumps for irrigation. Meeting the load requirements in agriculture is crucial for ensuring efficient and sustainable farming practices, particularly in regions heavily reliant on irrigation for crop cultivation.

The table given below provides HP wise connected load in the state from the FY 2012-13 to FY 21-22.

Table 10 Year wise Connected Load (in HP) for Metered Consumers in the State

Year	Up to 3 HP	3-5 HP	5-7.5 HP	7.5-10 HP	Above 10 HP	Total
FY 12-13	19,80,827	50,29,629	12,81,656	8,18,962	6,15,036	97,26,111
FY 13-14	21,90,347	51,68,195	12,73,869	8,67,918	6,41,460	1,01,41,789
FY 14-15	24,64,533	54,81,956	12,90,652	9,80,828	6,79,837	1,08,97,807
FY 15-16	26,73,968	58,45,097	13,44,733	10,74,886	7,13,612	1,16,52,296
FY 16-17	28,05,985	61,48,496	13,83,778	14,75,003	8,94,489	1,27,07,751

FY 17-18	27,90,528	63,83,226	15,51,998	17,36,111	10,81,649	1,35,43,512
FY 18-19	26,34,860	65,03,393	19,63,974	18,34,241	11,40,003	1,40,76,471
FY 19-20	26,63,571	66,65,468	21,41,201	18,56,661	11,77,395	1,45,04,295
FY 20-21	27,26,965	68,25,374	20,86,293	19,02,239	12,54,550	1,47,95,421
FY 21-22	27,50,185	69,06,671	21,22,959	19,20,740	12,72,055	1,49,72,611

Source: Data provided by MSEDCL

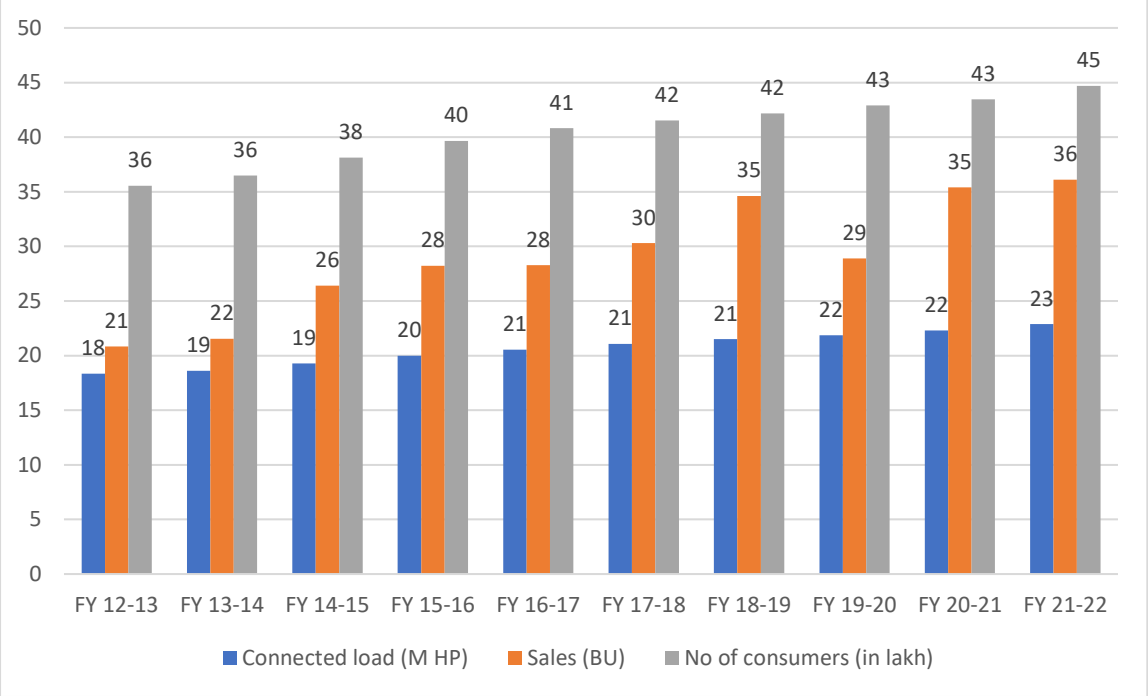
Table 11 Year wise Connected Load (in HP) for Unmetered Consumers in the State

Year	Up to 3 HP	3-5 HP	5-7.5 HP	7.5-10 HP	Above 10 HP	Total
FY 12-13	10,83,021	54,96,382	11,86,155	5,75,272	2,66,924	86,07,754
FY 13-14	11,52,920	53,77,724	11,19,564	5,65,828	2,58,085	84,74,121
FY 14-15	11,71,201	53,38,994	10,73,355	5,63,644	2,47,106	83,94,300
FY 15-16	11,46,032	53,29,950	10,64,169	5,59,261	2,42,605	83,42,017
FY 16-17	11,33,089	53,31,460	10,47,040	2,28,458	92,096	78,32,143
FY 17-18	10,75,411	53,47,952	10,95,005	20,361	887	75,39,616
FY 18-19	10,46,596	52,98,172	10,72,254	5,446	531	74,22,998
FY 19-20	10,23,753	52,22,775	11,06,661	14,127	1,057	73,68,373
FY 20-21	9,52,844	52,30,636	12,08,792	79,303	44,230	75,15,806
FY 21-22	10,42,264	53,95,061	12,51,797	1,44,062	72,129	79,05,313

Source: Data provided by MSEDCL

The tables above depicts that the LT agricultural unmetered connection load in 2013-14 was approx. 86 lakh HP which was reduced to approx. 74 lakh HP in 2019-20 and the LT agricultural metered connection load in 2013-14 was approx. 97 lakh HP which increased to 1.49 crore HP in 2021-22. The data also indicates that the number of metered AG connections has increased in these years and also the conversion from unmetered connections to metered connections has improved in Maharashtra.

Figure 4 Relation in Connected load, Sales and No of AG consumers



Source: Data provided by MSEDCL

4.3 Pump Usage

Agricultural pump usage is influenced by various factors. Below are some of the key factors that affect the usage of agricultural pumps.

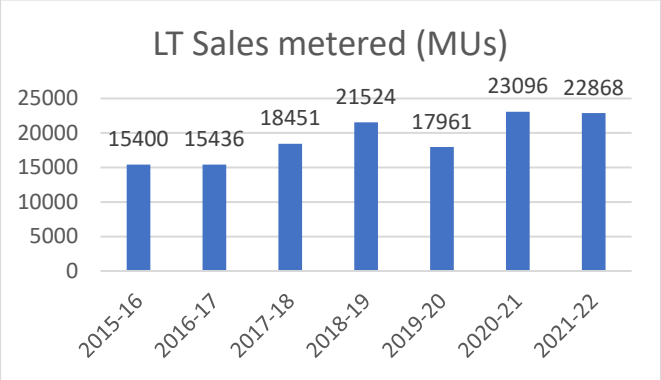
- Irrigation Needs: The primary purpose of agricultural pumps is to provide water for irrigation. The availability and reliability of water sources, such as rivers, canals, wells, or boreholes, influence the usage of pumps. Areas with limited access to natural water sources rely heavily on pumps for irrigation.
- Cropping Patterns: The type of crops cultivated, and their water requirements influence the usage of pumps. Crops that require regular watering or have high water demands may lead to increased pump usage.
- Farm Size: The size of the agricultural landholding plays a role in determining the pump usage. Larger farms often require more pumps to cover a larger area of cultivation.
- Power Availability and Electricity Supply: The availability of electricity and the reliability of power supply infrastructure influence pump usage. Areas with regular and uninterrupted power supply tend to have higher pump usage compared to regions with limited access to electricity.
- Farming Practices and Technology Adoption: The adoption of modern farming practices, such as drip irrigation or sprinkler systems, can affect the demand for pumps. Efficient irrigation systems may reduce the need for pumps or optimize their usage.

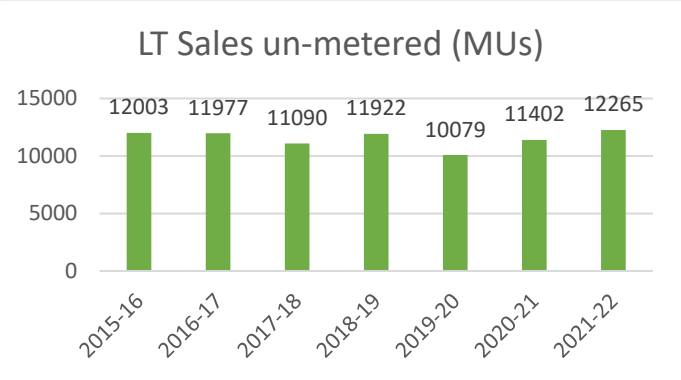
- Government Policies and Subsidies: Government policies and subsidies have a significant impact on pump usage.

As per the report submitted by the Working Group for Agriculture Consumption to MERC, for all the AG feeders in the state, maximum hours of pump usage can be 3000 hrs/ per year and therefore for the further analysis in this study, 3000 hours of pump usage per year has been considered as upper threshold.

4.4 AG Sales and Revenue Collection

Below data figures provide AG sale in million units to different categories of AG consumers.





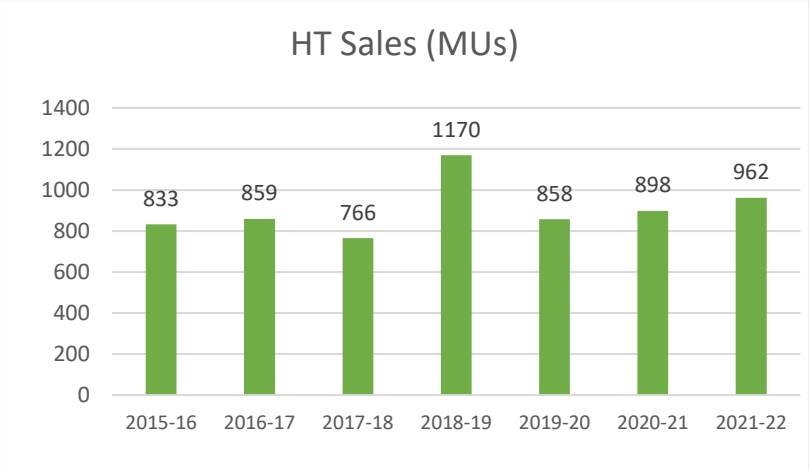
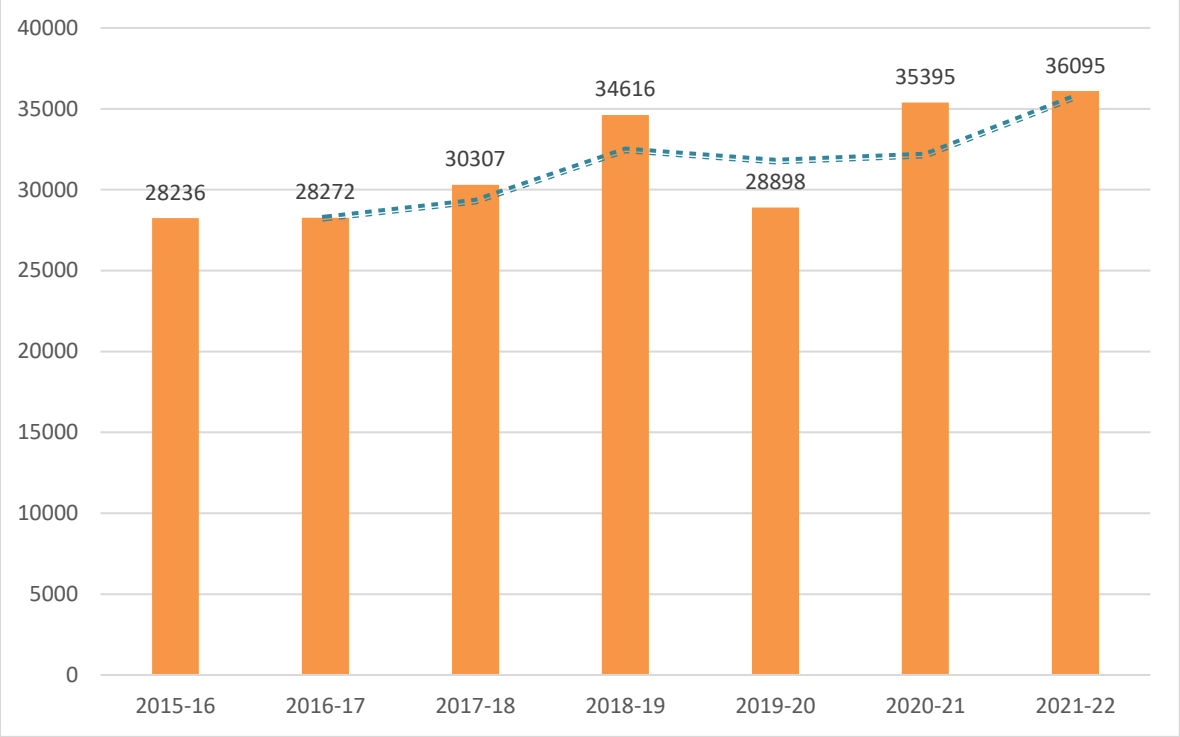


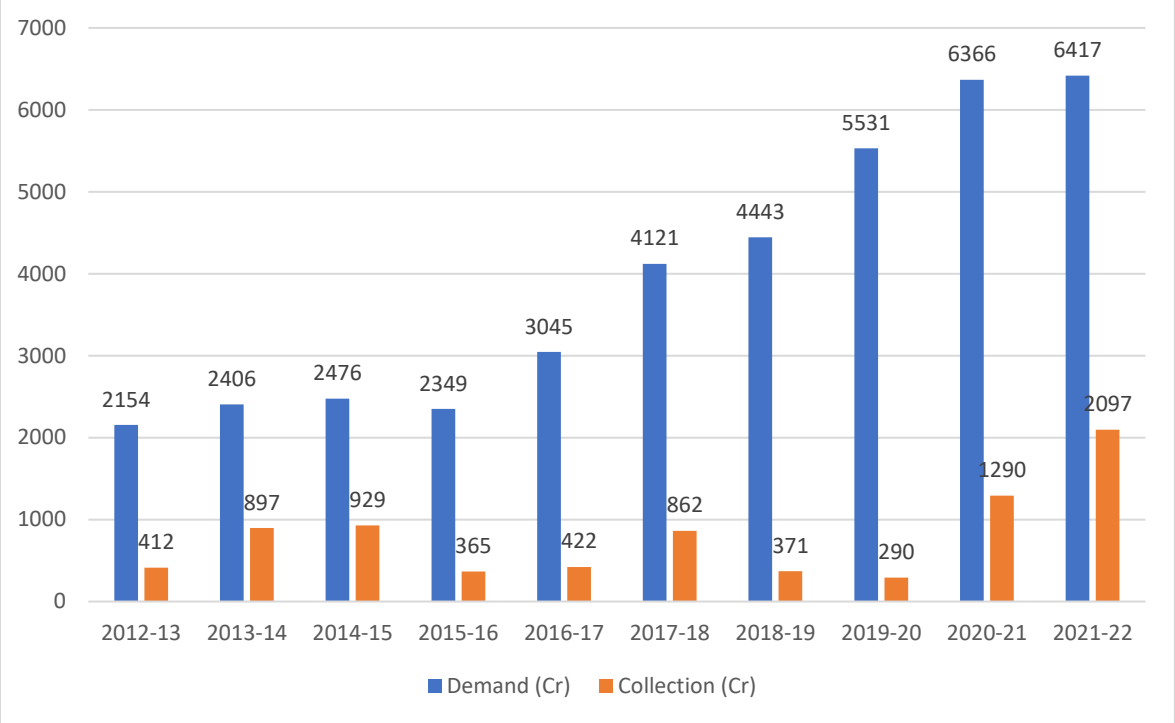
Figure 5 Year wise Total AG Sales in Million Units



Source: Data provided by MSEDCL

Revenue Collection is a critical factor when it comes to financial sustainability of the DISCOM. Below data shows status of demand and revenue collection in the state from the FY 2012-13 to FY 2021-22.

Figure 6 Revenue Expected and Realised in AG Sector



Source: Data provided by MSEDCL

Figure 5 shows that year on year basis, the power conusmption in the AG sector has been increasing and accordingly revenue demand has been increaed, However, despite range of initiatives and actions, over the years, there has not been any significant improvement in revenue collection.

For increasing the billing, collection efficiency and recovery of bad debts various measures have been taken by the DISCOM (MSEDCL) from time to time. Some of them are mentioned below-

- **Allocation of work of Photo meter reading and Bill distribution to Mahila Bachat Gats / Mahila Mandals / Women Welfare Association**
  : As the DISCOM faced difficulties with regards to the delay and inaccuracy in photo meter readings by the existing agencies, in 2009, it decided to allocate this work to local to Mahila Bachat Gats / Mahila Mandals / Women Welfare Association.
- **Nav Prakash Yojana 2016-17**
  : MSEDCL announced 'Nav Prakash Yojana' for Permanently disconnected (PD) Consumers in 2016-17. It was an amnesty scheme for the consumers whose electric meters had been permanently disconnected. On the first anniversary of the scheme, AG consumers were also included under the scheme provisions. Under the scheme, monetary discounts were given to the consumers and monetary incentives were given to the employees of section/subdivision who have taken efforts in recovery of PD arrears.
- **Chief Minister Krishi Sanjivani Yojana**

: It was an amnesty scheme for bill defaulters from the Agricultural Segment in an attempt to recover arrears. Under the scheme, AG consumers, who had defaulted on electricity bill, were allowed to pay arrears in installments over a year.

4.5 Defective Meters

Defective meters have been a persistent issue in the electricity distribution landscape. These meters, which fail to accurately measure electricity consumption, lead to various problems. Firstly, they result in revenue loss for DISCOM, as customers may be undercharged due to faulty readings. Conversely, customers may be overcharged, leading to dissatisfaction and disputes. Inaccurate billing caused by defective meters erodes customer trust and hampers efficient revenue collection. DISCOM faces operational inefficiencies in identifying and replacing faulty meters, requiring additional resources and time. Below table provides MSEDCL's data of defective meters recorded between FY 2013-14 to 2020-21 .

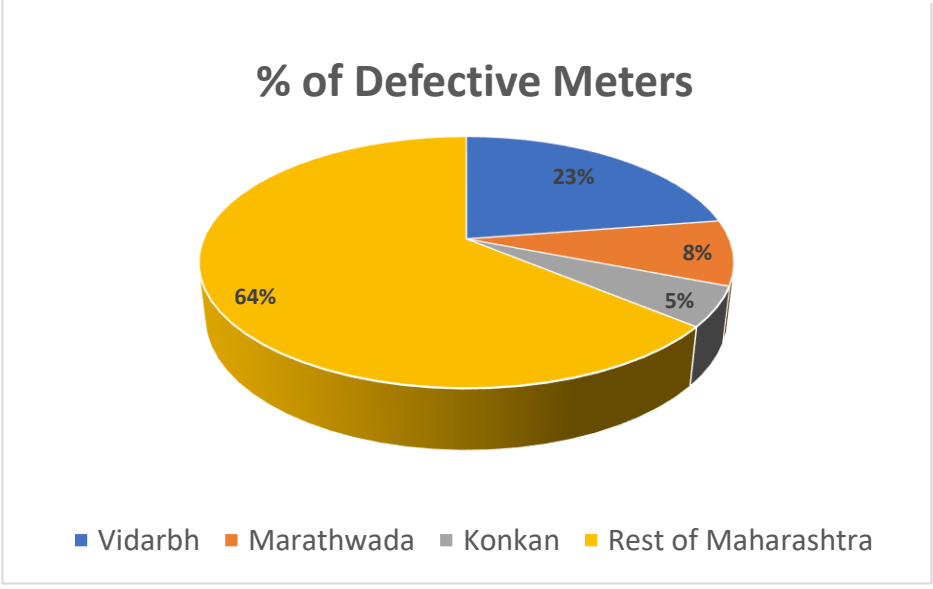
Table 12 Status of Defective Meters in the State

Financial Year	No. of Defective meters in Maharashtra	No. of Metered Consumers	% Of Defective Meters
2013-14	2,01,201	20,37,769	10%
2014-15	1,95,049	22,09,789	9%
2015-16	1,97,554	23,75,163	8%
2016-17	3,54,934	25,40,152	14%
2017-18	3,49,728	26,49,715	13%
2018-19	3,04,040	27,39,837	11%
2019-20	2,93,933	28,30,289	10%
2020-21	3,23,036	28,72,055	11%
2021-22	3,73,390	29,09,873	13%

Source: Data provided by MSEDCL

When assessed region wise, as of March 2022, it was identified that Vidarbha region alone accounts for 23% of total defective meters in the state.

Figure 7 Region wise Defective Meters in the State



Metered AG consumers in Maharashtra in FY 2021-22 were at approximately. 29.09 lakh, while unmetered AG consumers were at approximately 15.60 lakhs.Since unmetered consumers have as pumps of higher capacity (3-5 HP) with almost 68% consumers owning high-capacity pumps in comparison to 48% for metered consumers, it implies that the low collection efficiency for unmetered connection have a profound negative impact on the books of DISCOMs

4.6 Direct and Cross-Subsidy

Farmers often receive subsidies for electricity usage, particularly for agricultural purposes. These subsidies aim to support farmers by reducing the financial burden of electricity expenses. The state government implements various schemes and policies to provide subsidized electricity tariffs to farmers, helping them access affordable electricity for irrigation, mechanization, and other farming activities. These subsidies play a crucial role in promoting agricultural productivity, sustaining the livelihoods of farmers and ensuring food security.

However, on the other hand, subsidy and cross-subsidy regime have caused some challenges such as non-judicious and inefficient use of resources and agricultural inputs, increased cost burden on other sectors such as industrial/commercial and household, fiscal burden on the government, etc.

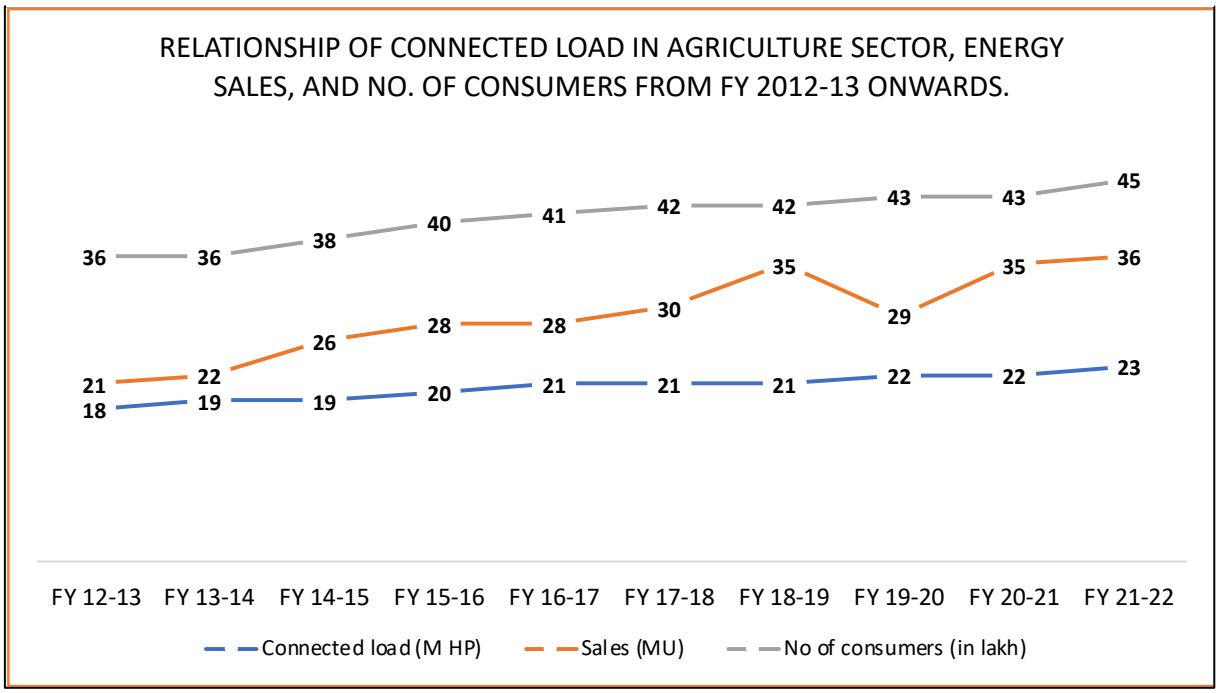
Table 13 Status of Direct and Cross-subsidy given to the AG Consumers in the State

No	Fiscal Year	Direct Subsidy given to AG Power supply by the Govt (Rs. Cr)	Element of Cross Subsidy (Rs. Cr) on AG power supply
1	2015-16	4708	6612
2	2016-17	4510	7556
3	2017-18	4870	7615
4	2018-19	5539	9040
5	2019-20	4580	9616
6	2020-21	6479	9164
7	2021-22	5420	9257

As given in the Table 13, the direct subsidy burden has increase from Rs. 4708 Cr in 2015-16 to The Rs. 5420 Cr in FY 2021-22. Similarly, cross subsidy adjustment in state was Rs. 6612 Cr in Year 2015-16 which has been increased to Rs. 9257 Cr in year 2021-22.

4.7 Relationship among factors- Connected Load, Energy Sales, And Number of Consumers

Figure 8 Relationship among Connected Load, Energy Sales and Number of Consumers



Source: Data from MSEDCL

The Figure 8 show-

- The connected load for metered and unmetered consumers in the year 2012-13 was 18 million HP which increased to 23 million HP in the year 2021-22, exhibiting a CAGR of 2.76%.
- The energy sales for metered and unmetered consumers in the year 2012-13 was 21 million units which increased to 36 million units in the year 2021-22, giving a CAGR of 6.17%.
- The growth rate of energy sales is more than the growth rate of the connected load because the energy sales are computed based on estimation due to low metering in the agriculture sector in Maharashtra. The number of agriculture consumers in the year 2012-13 was 36 Lakhs which increased to 45 Lakhs in the year 2021-22 giving a CAGR of 2.51%. The growth rate of agriculture consumers is in line with the growth rate of connected load from the year 2012-13 to the year 2021-22.

5. Stakeholder Consultations (Discussions with Farmer Producer Organizations)

With respect to the study and the subject matter, it was realized that inputs from the field about the ground reality are of immense importance. Thus, in accordance with the course of the study, consultations were conducted with one of the main stakeholders i.e. farmers. With a defined set of questions mainly focused on issues related to power consumption/supply/requirement as well as the impact on agricultural activities, these consultations were held with two FPOs from Aurangabad and Jalna districts. It is to be noted here that agriculture and agriculture tariffs have socio-political implications.

To maintain the integrity and impartiality of the study and due to paucity of time, widespread consultations with farmers could not be undertaken. However, the two consultations conducted provided important insights about the ground realities and the perception of farmers towards concerned authorities.

Key Characteristics of FPOs

FPO from Aurangabad has 1500 Small and medium farmers with it with land area in the range from 1 acre to 5 acre. The irrigation pumps installed on the fields of the farmers are of 3 HP and 5 HP. Major crops in the area are wheat, jowar, gram.	FPO from Jalna consists of 300 shareholders and 1,500 small and medium farmers associated with it. Irrigation pumps installed on the fields of the farmers are of capacity 3 HP, 5 HP and 7.5 HP. Major crops in the area are soyabean, moong, urad, cotton, bajra and jowar.

Key Questions and Responses

FPOs were asked pre-determined questions regarding agriculture, quality of power supply, expectation, role of DISCOM, etc. Some of the key responses/observations with respect to these specific questions are listed in the table below.

Question	Response/Observation
When farmers are using the power supply from DISCOM (MSEDCL), why are they unwilling to pay the bills?	**Reasons-Billing dispute/Other issues:** • Bills are issued to farmers on a flat tariff basis even during the months when pumps were not operational. • Bills are not issued to farmers on time. • Bills are issued without taking meter readings. Further, faulty meters are not replaced by DOSCOM. • Lack of service and lack of power supply during farming season. • Delay in addressing Electricity faults by DISCOM.

	• Non-circulation of Shutdown Messages • Major disconnection drives are taken during the flowering season, when irrigation is essential for the crops. **Economic factors** • Small farmers have small land holdings, which makes it difficult for them to pay outstanding dues. Farmers are willing to pay the bill if proper billing is done according to the units recorded in the meter. • Lack of awareness about the prevailing agriculture tariff amongst the farmers. **Inadequate power supply Infrastructure** Most of Distribution Transformer centers catering AG load are overloaded and does not have basic protection systems such as switch-Fuse units and distribution boxes. **Low-quality power supply** The quality of power supply is poor because of the low voltage problem. This leads to malfunctioning of motor starters. **Unreliable / irregular power supply** Crops suffer because of irregular power supply. In the Kharif season, the power supply is available mostly during nighttime. Field workers however do not prefer to work at night because of fear of attacks from animals and reptiles.
Why is there resistance amongst farmers towards metering?	For existing metered connections, meter reading is not carried out and instead billing is based on average basis by the DISCOM. Hence, farmers believe that DISCOM may charge exorbitantly in the case of meter-based tariff structure.
What is the problem in getting faulty meters replaced?	Non availability of meters with the DISCOM and even in local area market.
If power consumption is properly recorded in the meters, what is the fear in the minds of farmers for metering?	Certain groups of farmers who have large land holdings are happy with flat tariffs. On the other hand, marginal farmers are more inclined towards metered connections and proper reading.
Do the farmers think that they have to pay more if they opt for metering?	As there is lack of awareness about the prevailing agriculture tariff, farmers fear that they might have to pay high electricity bills, if metering is done on their connections.
Is proper maintenance for meters carried out?	Maintenance is not done on a regular basis because of a manpower shortage at DISCOM. One Linemen looks after about 10 villages. No replacement of faulty meters.
In the opinion of farmers what are the reasons for damage to meters / Is there an installation issue or an overloading issue or is it because of faulty agricultural pumps?	Farmers believe that meters become damaged because of overloading of distribution transformer and low voltage problems.

Are farmers drawing adequate amounts of water from irrigation pumps or are they overdrawing water fearing a drought situation? Is there a way to reduce the water supply through incentive schemes?	The water drawn by farmers from the irrigation pump is appropriate, otherwise there could be a risk of crop damage. Over withdrawal of underground water is typically done by some farmers, who do not pay the electricity bill and overuse power because they see it as free.
Can cropping patterns be changed with crops that use less water and subsidy provided to farmers?	Yes, it can be looked into by farmers. For example, custard apple consumes only 10% of water in comparison to sugarcane or sweet lime crops which require water throughout the year.
Can FPO collect the payment and deposit into MSEDCL account?	Yes, FPO is open to collecting payment from farmers and submitting it in DISCOMS, provided there is a provision for a commission for the FPO and quality services are guaranteed to the farmers. To begin with, a pilot project can be run for a few farmers, in which the meters can be installed on their connections by the DISCOMS. FPOs can handle the project by collecting payments from farmers and submitting it to DISCOMS. If the pilot project is successful, the same can be implemented in the entire FPO area.

Insights from the Stakeholder Consultations

FPOs talked about the challenges they face in metering, billing, bill distribution, and revenue collection. One of the major concerns raised by these representatives of the farmers is billing disputes due to improper meter readings. The meter readers do not take the actual readings and bills are raised on incorrect readings or on an average basis. In addition to billing, reliability, and quality of power supply have been a major cause of concern. FPOs blamed distribution companies who use pressure tactics such as cutting down on power supply when power requirement is of utmost importance for cropping, non or poor maintenance, and delayed grievance redressal.

When asked about the installation of meters either in a group or at an individual level and charging farmers as per actual reading, FPOs registered positive responses about the initiative However, previous experiences present a very different and grim picture. One of the major insights received from these consultations is that there is a serious trust issue between farmers and the distribution company, and this has led to, what appears as, a vicious cycle wherein non-payment of bills led to poor quality of power supply and lack of quality service from the DISCOM in turn results into non-payment of bills. To break this vicious cycle a multidimensional approach has to be undertaken which will not only address technical/procedural aspect but also address the underlying socio-behavioural issues.

It is to be noted that, as mentioned earlier in the chapter, these consultations were limited with very small group of respondents and may not give absolute clarity on ground reality.

However, secondary research through newspaper articles, study reports from NGOs/think tanks, etc. highlights more or less similar issues/challenges with varying gravity.

6. Policy Landscape in the Country

Agricultural power consumption in India is significant due to the reliance on electricity for irrigation and farming activities. Being a tropical country under the influence of monsoon, the agriculture in the state is subjected to the vagaries of weather and thus irrigation and electricity required for the same is a critical factor for sufficient farm produce as well as livelihood of population depended on agricultural.

The government has implemented various schemes and subsidies to support farmers with affordable electricity tariffs, aiming to enhance agricultural productivity and ensure equitable access to power. Efforts are also being made to promote energy-efficient farming practices and the adoption of renewable energy sources to reduce the environmental impact of agricultural power consumption.

Some of the key initiatives undertaken by Central as well as state governments are listed below.

Table 14 Key Initiatives Undertaken by the Central and State Governments in the AG Power Sector

S.No.	Initiator	Name of the Scheme / Initiative	Key Features	Key Observations
1	Govt. of India	PM KUSUM	• Objective is to ensure energy security for farmers in the country while honouring the commitment to increase the share of installed capacity of electric power from non-fossil-fuel as part of Intended Nationally Determined Contributions (INDCs • Scheme aims at setting up of decentralized solar power plants,	• The Scheme Promotes solarized agricultural feeders & grid-connected pumps models to allow farmers to earn additional income by selling solar power to DISCOMS and DISCOMs to procure cheap power close to centres of consumption. • Due to Performance based incentive of Rs.0.40 per unit or 6.6 Lakhs per MW of capacity installed a level playing field is

			replacement of agriculture diesel pumps with solar agriculture water pumps and solarization of existing grid connected agriculture pumps. • Scheme has three components- **A**:10,000 MW of Decentralized Ground Mounted Grid Connected Renewable Power Plants **B**:Installation of 17.50 lakh standalone Solar Powered Agriculture Pumps **C**:Solarization of 10 Lakh Grid-connected Agriculture Pumps	being created for distributed solar plants under Component A. • DISCOMs often find utility-scale solar cheaper than distributed solar due to the latter's higher costs and the loss of locational advantage due to waived Interstate transmission system (ISTS) charges.
2	Maharashtra	Mukhya Mantri Krishi Vahini Yojana	• The GoM vide Government Resolution (GR) dated 14 June, 2017 has issued Policy under "Mukhyamantri Saur Krishi Vahini Yojana" to supply the power to Ag. consumers during day time through Solar Power Projects to be developed by Maharashtra State Power Generation Co. Ltd. (MSPGCL). Subsequently, Vide GR dated 17 March, 2018, GoM has modified the earlier GR dated 14 June, 2017 and appointed MSEDCL as an	• The beneficiaries under the Mukhya Mantri Saur Krishi Vahini Yojana can be farmers group of farmers, co-operative societies, water users' association, sugar factories, lift irrigation schemes, gram panchayat and any other institutions / organizations. • The scheme has multiple benefits such as good quality daytime power supply to farmers, reduced peak energy demand, increase in consumer satisfaction, reduction in T&D losses,

			implementation agency in addition to MSPGCL for flexibility and speedy implementation of this scheme. • The scheme aims at providing daytime power supply to farmers through the installation of solar power projects of capacity 2 MW to 10 MW within 5 km of substations in agriculture dominated areas. • Under the scheme, deemed extension of PPA period to projects achieving early commissioning. • A one-time grant of Rs. 25 Lakh/substation from Green Cess Fund • Rs. 5 Lakh/year to the Gram panchayat for 3 years • Land lease @ Rs. 1,25,000/Ha with 3% escalation for private landowners and farmer • Grouping of private and Revenue land	reduction in MSEDCL's total power purchase cost.
		Mukhya Mantri Saur Krishi Pump Yojana	• The scheme aims at installation of off-grid 3 HP & 5 HP Solar Photovoltaic Water Pumping Systems in a phased manner to facilitate daytime irrigation	• Through Mukhya Mantri Saur Krishi Pump Yojana, farmlands with no power connection have been brought under irrigation,

			to farmers and to promote the use of renewable sources of energy. • In addition to the above, the scheme aims at decoupling of irrigation sector from power subsidy burden, minimizing cross-subsidy burden on commercial and industrial electricity consumers and replacement of diesel pumps to reduce pollution.	• There will be a positive impact on cross-subsidy burden on commercial & industrial electricity consumers. • The scheme is moving in a positive direction to meet renewable power obligation (RPO) of MSEDCL.
3	Punjab	Paani Bachao, Paise Kamao Scheme	• The scheme is an alternative model of DBTE to agriculture as electricity saved by the farmer (agriculture consumer) is monetized and cash transferred to the bank account of the consumer. • Through the scheme, the govt. aims at crop diversification, accurate Energy accounting, accurate accounting of Transmission & Distribution (T&D) Losses and curbing of wasteful energy consumption.	• Innovative approach to reduce inefficient use of water, ensure livelihood of the farmers and encourage metering in the AG sector. • Farmers are aware of the environmental issues and are willing to engage in efforts of the state Government for saving groundwater. However, they have trust issues with Government policies, especially those policies that directly affect farmers livelihood. • As enrolment in the scheme is voluntary in nature, more emphasis to be given on creating awareness about the scheme.
4	Andhra Pradesh	Agriculture Electricity Cash Transfer Scheme 2022	• The main objective of this scheme is to provide free of cost electricity to all the	• Under the scheme, as the money is credited into the accounts of the farmers, farmers will have absolute

			agriculture sectors present in Andhra Pradesh. • Farmers are not required to pay any of the amounts on the monthly Power bill. • The Government will set up smart meters to all the agricultural power connections. • Under the scheme, the farmers will be required to open separate bank accounts. The Government will credit the bill amount directly to these bank accounts. and accordingly, the farmer will pay the same amount to the applicable power distribution company in the area. • The state government will continue the free power scheme for the agriculture sector for next 30 years.	clarity on how much amount is being provided by the govt. This level of transparency acts as a confidence building measure. • In the whole process, the farmers will be receiving amount equal to their electricity bill from Government, and in the next step as farmers will be paying bill to the DISCOM, it creates a sense of ownership and accountability. On the basis of which, farmers will be asking questions to the DISCOM regarding quality of power supply, reliability, etc. • The scheme brings transparency in the power distribution functions.
5	Chhattisgarh	Saur Sujala Yojana	• The objective of Saur Sujala Yojana is to install solar irrigation pumps for the irrigation needs of the farmers. • Under the scheme, the Government will offer between 90% to 95% subsidy to all applicants.	• The scheme reduces burden on the DISCOM and at the same time addresses irrigation need of the farmers. • It also promotes use of renewable energy sources in the AG power sector.

6	Gujarat	Suryashakti Kisan Yojana	• The primary objective of the scheme is to harness solar energy to generate power. The farmers can generate power from solar energy sources and utilize it for irrigation purposes and sell the additional energy that is generated through gird. • The scheme enables farmers to generate electricity by installing solar panels in their farms for their captive consumption and help them in earning from the sale of the surplus power. • For installation of solar panels, farmers will only have to pay 5% upfront of the total cost. The Central & State Governments will provide subsidy of 60% while for the rest 35%, the State Government will provide low-cost loans to the farmers for seven years.	• This scheme will provide a huge relief to the farmers and will also generate additional income. Farmers will be able to recover the cost of investment within the next 8 to 18 months. • Currently, farmers are getting electricity for 8 hours for irrigation purpose. After the successful implementation of this project, farmers will get electricity up to 12 hours. • The scheme also reduced subsidy burden of the govt.
7	Himachal Pradesh	Saur Sinchai Yojana	• Under the scheme, Solar Pump Sets are provided to the farmers for agricultural / irrigation purposes. • The Government also provides financial assistance to the marginalized, small, medium, and big	• The scheme encourages use of renewable energy in the AG sector. • It also reduced distribution and subsidy burden of the state. • The scheme also attempts to provide a sustainable irrigation to the farmers.

			farmers for using Solar PV Pumping systems. • All the farmers having assured water source suitable for erection of DC/AC Solar pump set, for irrigating the crops preferably through Micro irrigation system viz., Drip / Sprinklers will be eligible for availing financial assistance. • Under the scheme, priority is given to a group of farmers / Kisan Vikas Sanghs /Krishak Vikas Sangh/Registered Body of Farmers etc. registered under Society Act-2006.	

**Further details of the scheme/implementation status/etc. are attached in the annexure*

7. Policy of Group Metering

The policy of group metering in the electricity sector is aimed at simplifying the metering process and reducing costs for certain consumer segments. Under group metering, multiple consumers within a common boundary or premises are connected to a single meter, allowing for shared billing and metering .Group metering primarily benefits residential complexes, apartments, commercial buildings, and other multi-tenant premises.

This policy streamlines the billing process, as a single bill is generated for the entire group rather than individual bills for each consumer. It simplifies administrative tasks for both the electricity distribution company (DISCOM) and the consumers. Along with this, Group metering also promotes energy conservation by fostering a sense of collective responsibility among consumers. It ensures timely payment of the electricity bills , reliable power supply to all the consumers , quick addressal of grievances and reduced burden of measurement/billing/collection task for the DISCOM.

To ensure fairness and transparency, regulations and guidelines are in place to govern group metering practices. These regulations focus on ensuring proper metering accuracy, transparent billing mechanisms, and dispute resolution processes. In India, many states such as Haryana, Punjab, Delhi and Telangana have regulations in place to provide electricity at Single Point to Employer's Colonies Group Housing Societies, Residential Colonies, Office cum Residential Complexes and Commercial Complexes of Developers, and Industrial Estates/IT Park/SEZ. The details of these are attached in the annexure 4.

Overall, the policy of group metering provides a cost-effective solution for metering and billing in multi-tenant premises, promoting efficiency, convenience, and shared responsibility in the electricity sector. In India, in most of the states, the group metering concept has been adopted for domestic, commercial or industrial consumers only where it is showing positive results. However, widespread adoption of group metering policy for AG consumers has not been identified during the course of the study.

Policy of Group Metering for AG Pumps

As per Section 55 of the EA, 2003, Licensees are required to supply power to all consumers through correct meters. However, even after more than a decade since the enactment of the act, as many as 15 lakhs out of 42 lakhs (around 35%) agricultural consumers are being supplied through un-metered connections. Further, in the case of metered consumers, dismal state of metering and billing (compared to utility records, meters are present only 27% of metered AG consumers) has been highlighted by MERC AG Working Group Report.

Under the circumstance, the MERC suggested an interim innovative approach using Feeder input-based AG group metering and billing scheme. Said scheme is under implementation for 502 sample feeders that were selected for the study by AG Working Group.

AG metered Tariff is applicable to Feeder Input based Group Metering wherein Input recorded on 11/22 kV Feeder minus Technical Loss of that particular feeder and the consumers connected on that Feeder are billed in proportionate to the sanctioned load of the pump.

8. Overview of International Initiatives in AG Sector

Globally, countries support their agriculture sector in many ways and the nature of support differs as per the country's objectives. Price incentives and fiscal subsidies are the most widely used support measures, especially in high-income countries (e.g., EU nations) but in the last twenty years or so, there has been a decline in support measures. In contrast, in some middle-income countries (e.g China, Colombia, Indonesia, Turkey), support measures such as price incentives and input subsidies for the agriculture sector have become more prominent.

OECD's "Agricultural Policy Monitoring and Evaluation 2020" report[5] found that the 54 countries studied (all OECD, EU countries and 12 key emerging economies) provide support to the agricultural sector which amounts to over $700 billion in a year and majority portion of this goes in the form of payments to producers. Consumer support, enabling services such as infrastructure development, R&D are next beneficiary of this support.[6]

Table Total Estimated Agricultural Supports in 2019

Table 15 Total Estimated Agricultural Supports Globally, 2019

Sr. No.	Country	Amount in ($)
1	China (12.1%)	185.9 billion
2	European Union (19.0%)	101.3 billion
3	United States (12.1%)	48.9 billion
4	Japan (41.3%)	37.6 billion
5	Indonesia (23.3%)	29.4 billion
6	Korea (46.1%)	20.8 billion
7	Russia (9.2%)	7.9 billion
8	Philippines (27.1%)	7.3 billion
9	Turkey (13.5%)	6.7 billion
10	Switzerland (47.4%)	6.2 billion

Source: OECD Data, Agricultural Policy Monitoring and Evaluation, 2020
(Countries ranked by total spend: % of Gross Farm Revenue)

Agricultural subsidies have been on the agenda in discussion on food security, trade distortions and recently about achievements of SDG goals. On the other side, agricultural

[5] *https://www.oecd-ilibrary.org/agriculture-and-food/agricultural-policy-monitoring-and-evaluation-2020_928181a8-en*
[6] *https://www.hinrichfoundation.com/research/article/protectionism/agricultural-subsidies/*

subsidies are a recognition of the unique challenges that the agriculture sector faces. Agriculture requires significant investment in equipment, inputs and labor but because of the sector is vulnerable to weather conditions and natural disasters, return on such investments is not guaranteed. In such a case, these subsidies provide necessary cushion to the agriculture sector to thrive and bounce back. In addition to this, as agriculture produce has direct impact on food security, countries undertake range of policy measures to support the sector.

However, as these support measures vary from country to country, they have an adverse impact on global trade as well as the domestic market, especially on middle and lower-income countries. For e.g. Canadian dairy subsidies has been the biggest pain point for the USA. India's subsidies to the sugar industry have been a sticking point globally. Least developed countries have often complained that these subsidies disproportionately disadvantage their small producers as they cannot compete with heavily subsidized farm produce from richer countries. The exact nature of these agricultural subsidies varies widely country by country depending upon their policy objectives. Below are some of the salient examples.

7.1. China

China is the most populous country in the world, home to almost 20% of the world's population. But, on the other hand it has only 7% of the world's potable water and 10% of the world's agricultural land. In this resource scarce country, agriculture accounts for around 26% of employment and just 8.2 % share in the GDP representing lower labour productivity than the rest of the economy. Although the average farm size remains less than one-hectare, large-scale production has been possible due to the formation of co-operatives and corporate farms, especially in the north and north-eastern provinces, where rapid farm consolidation has been happening.

According to OECD's "Agricultural Policy Monitoring and Evaluation 2020" report, China spends the highest amount when it comes to supporting the agricultural sector through direct and indirect subsidies. Owing to SDG goals and the target of achieving sustainable development, a major shift is seen in China's supporting measures with respect to the agriculture sector. The country is encouraging the adoption of t renewable energy sources to transition from traditional farm produce to green farm produce. According to recent news reports, China is planning to use around $63 billion of government funds towards paying off debt subsidies this year owed to the country's renewable power generators[7]. The plan is to completely pay arrears this year to help strengthen the balance sheet of renewable developers' and give a boost to the country's efforts to peak and eventually zero out emissions.

[7] *https://www.bloomberg.com/news/articles/2022-03-14/china-sets-63-billion-to-pay-subsidies-owed-to-renewables-firms#xj4y7vzkg*

7.2. Brazil

Brazil is the largest country in Latin America in area and population, and one of the ten biggest economies of the world. It is a major agricultural producer and exporter. Between 2000 to 2019, the share of agriculture in Brazil's GDP declined from 5.5 % to 5.3%, while the share in employment has halved during this period to 9.2%. On the other hand, agro-food exports have grown, representing 36% of total exports. Brazil is among the world's leaders in the production of soybeans, poultry, beef, cotton, corn, and orange juice, being the third biggest exporter of agro-food products after the European Union and the United States.

Owing to rising electricity bills and to break dependency on country's energy companies, farmers in Brazil are looking at solar energy as a promising alternative source of energy. In addition to other benefits, solar energy also receives support from the government. The surplus power generated is passed on to the energy companies and farmers receive discounts in electricity bills. Solar energy is perhaps the most promising component in a menu of technologies and strategies that farmers are considering, to contain what appears to be a burgeoning energy crisis for their sector. Wind power and biomass are also in the mix, although they are behind solar in terms of development in the country. Brazil has commissioned 35 photovoltaic solar energy plants with a combined capacity of 1,304 MW. By the end of 2022, it plans to increase the number to 129 plants with combined capacity of 4,828 MW, rising to 617 plants with capacity of 24,747 MW by 2026. Most of these plants will be in the southeast, northeast, and central-west regions of the country.

7.3. USA

The USA is the world's second largest economy and the third largest country by land area and population. Primary agriculture accounts for a small part of the economy - around 0.9% of GDP and 1.6% of employment but agro-food exports account for over 10% of total exports. The US agricultural sector benefits from a large domestic consumer market, as well as abundant arable and pastureland and diverse climatic conditions that support the production of a wide range of commodities. Key industries include grains (maize and wheat), oilseeds (soybeans), cotton, cattle, dairy, poultry, and fruits and vegetables.

For long, agriculture in the USA has attracted federal support and this support has been given in many forms ranging from input subsidies, price support, export subsidies, etc. In fact, as per OECD's "Agricultural Policy Monitoring and Evaluation 2020" report, USA is among the top three nations in providing support to the agriculture sector.

However, negative impacts of these subsidies are evident now. With growing awareness about climate change, resource depletion and sustainable agriculture, measures are being undertaken to increase the use of renewable energy resources in agricultural production. Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Guaranteed Loans & Grants- is one of such initiative. This program provides

guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. Agricultural producers may also apply for new energy efficient equipment and new system loans for agricultural production and processing. The program hopes to increase the USA's independence in the energy sector by improving the supply of renewable energy and at the same time decreasing the demand for energy through energy efficiency improvements.

7.4. Egypt

In Egypt, about 54% of Egypt's working population is employed in the agricultural sector, making agriculture key for the country's development (Energypedia, n.d.). However, the sector faces a series of challenges which includes hot climate, sandy soils , water scarcity , low rainfall and decreasing volume of Nile River. In such a scenario, irrigation is inevitable for agriculture. A diesel-based irrigation system has been widely practiced in Egypt but in recent times it has been challenged due to issues such as rising diesel prices, and scarcity of diesel.

The introduction of solar powered pumps therefore offers an opportunity to get rid of non-sustainable and non-reliable fossil fuel powered generators. Furthermore, the implementation of solar powered irrigation will help in overcoming the risk from fluctuations in both fuel and supply prices, and instead guarantee stable and reliable on-farm energy supply.

Accordingly, Egypt has launched "RaSeed" initiative which aims to promote the use of Photovoltaic (PV) systems in drip irrigation farming in order to support cost-effective and sustainable agriculture. RaSeed targets farm specific optimization of drip irrigation systems that enable maximum fuel savings and water efficiency by taking into account soil compositions and environmental conditions. In order to further the initiative, a Private Public Partnership (PPP) was established with a solar energy firm that is supported by the multi-donor initiative 'Powering Agriculture - an Energy Grand Challenge for Development'.

7.5. Uganda

Owing to increasing number of prolonged droughts and unreliable rainfall leading to a drop in productivity and income for farmers, agriculture in this country is largely dependent on time and labour-intensive manual irrigation system. To address these challenges, a modern irrigation system is required but a lack of capital to bear the costs of irrigation systems has kept famers away from adopting modern irrigation systems. There are other mechanisms such as PAYGo model, but they are mainly available for large and costly pumps, therefore making it inaccessible to small and marginal farmers.

Aptech Africa, a Uganda based company launched a pilot program to provide affordable solar-powered irrigation especially for small scale farmers. Aptech Africa's 'Pay-n-Pump' is a solar PV-powered pump that offers an affordable irrigation solution to low-income subsistence farmers who can't afford high-cost solar systems, potentially increasing their yields and

avoiding the fuel costs of diesel-based pumps[8]. The mobile pay-as-you-go (PAYGo) technology offers farmers the choice between two payment options for the pump systems:

- Use the pump as a pre-paid service with a fee per liter that includes lifetime maintenance and irrigation training.
- Purchase the pump on a lease-to-own basis with an affordable deposit and monthly instalments.

During these field trials, the Pay-n-Pump solution received a receptive and encouraging response from farmers, community groups and other key stakeholders, including Action Against Hunger and the UN's Food and Agriculture Organisation (FAO).

[8] *https://energycatalyst.ukri.org/casestudies/aptech-africa-pay-n-pump-brings-affordable-solar-powered-irrigation-within-reach-for-small-scale-african-farmers/*

9. Summary of Challenges Identified in the AG Power Sector, Maharashtra

8.1 Low % of metering in AG sector

Based on data received from MSEDCL, it was identified that for the fiscal year 2021-22, out of the total AG consumer (around 44 lakhs) 35% consumers are unmetered. In addition to this, data on defective meters provides that for the FY 2021-22 there are total 3,73,390 defective meters.

The situation of metering is further worsened as the report of Working Group on Agricultural Power Consumption (MERC), based on the survey conducted of sample AG connections, stated that out of surveyed 1.33 lakh consumers, in contract to MSEDCL records, only 39% consumers were metered and only 17% of the consumers with meters were actually found during the survey.

Low percentage of metering in the AG sector can be attributed to multiple factor such as technical challenges, procurement issues, resistance and lack of awareness among farmers, historical policy of flat rate tariff, poor network O&M operations by the DISCOM, etc. and consequently, this low percentage of metering leads to negative implications and numerous challenges in estimating and calculating actual power consumption for the agricultural purposes, % of losses occurred, accounting of pilferage, accurate billing to the consumers, collection of revenue and most importantly credibility of DISCOM with respect to its primary function of distribution.

8.2 Low Collection Efficiency

Low collection efficiency has been observed in the state. The average rate of collection in the decade long period (FY 2012-13 to FY 2021-22) has been 21.1% ranging between 5% (lowest) to 38% (highest). This low rate of collection efficiency can be attributed to poor administration and governance at the level of DISCOM in terms of accurate estimation, billing and collection. In addition to this, socio-political factors also have significant impact of collection efficiency leading to poor practice of non-payment of electricity bills by the farmers.

8.3 Reluctance to Pay Electricity Bills

It is observed that a tendency of non-payment of AG bills has been developed among AG consumers and the data given in the table below underscore this.

Table Status of non-payment of AG bills by the farmers in the state[9]

Table 16 Status of Non-payment of AG Bills by the Farmers in the State

Period of non-payment	Number of Farmers	Amount in Crores
Till 1 year	18,40,852	17,465
One to 2 years	6,22,217	5,980
2 to 5 years	4,01,800	4,209
5 to 10 years	7,60,946	9,435
10 to 15 years	4,35,312	6,416
15 years and more	3,23,373	5,216
Total	**43,84,500**	**48,724**

Sourcehttps://www.loksatta.com[10]

The habit of non-payment or reluctance to pay the electricity bills can be traced to many reasons encompassing social, political, technical, administrative and behavioural aspects. Poor and unreliable power supply, Inaccurate methodologies in billing, neglect towards maintenance issues, inadequate redressal of grievances, etc. are some of the reasons can be linked with the DISCOM. On the other hand, government policy of waiver, agricultural distress caused by extremities of the climate, unreliability of pricing in case of agricultural produce, etc. are some of the reasons associated with the AG consumer. In nutshell, a vicious cycle has been developed in the sector which has resulted into non-payment of AG bills by the farmers causing deterioration of financial health of the DISCOM which further affecting its operations and so on so forth.

8.4 High Operational Losses in Rural Distribution System

Rural areas are identified with distribution network design which is basically a low voltage radial distribution system with high-capacity distribution transformers at load centre. Historically approach of mere line extension has been followed for network laying. This creates low voltage pockets at fag end of the network.

On the other hand, low reliability and poor quality of supply attributed to long low voltage lines causes customer's unwillingness to pay AG bills. This further causes snowball effect resulting into numerous issues and challenges.

8.5 Suboptimal Infrastructure and High O&M expenditure

The frequent breakdowns of transformer and distribution network resulting into unavailability of power supply for prolonged hours – is a common scenario in AG power sector and it is attributed to poor state of installed infrastructure, lack of regular preventive maintenance,

[9] https://www.loksatta.com/sampadkiya/features/farmer-electricity-bill-recovery-challenge-for-mahavitaran-electricity-bill-with-farmers-zws-70-3414586/)

[10] https://www.loksatta.com/sampadkiya/features/farmer-electricity-bill-recovery-challenge-for-mahavitaran-electricity-bill-with-farmers-zws-70-3414586/)

etc. In addition to this, understaffed DISCOM is strained to achieve desired service levels leading to delayed repairs and high O&M costs.

8.6 Electricity Theft / Pilferage

Electricity theft is a growing concern. It not only causes loss of revenue to the DISCOM but also affects its capability to provide a quality power supply and extend the service to the unserved population. Electricity theft occurs in many ways such as – billing irregularities, fraud, directly stealing from the pole, etc. As theft/pilferage has multiple ramifications over the sector, it is imperative to dealt with these matters strictly and quickly so that perpetrators are punished, and law-abiding citizens are encouraged.

In conclusion, power consumption in AG sector is identified with range of issues and challenges which trace their origin to technical, administrative, behavioural, socio-political, economic, etc. domains. With reference to the objective of this report and complex nature of issues in the AG power sector, it is to be noted here that there is no single silver bullet achieve resolution of these challenges. Rather, with an open mind, an experimental attitude and a long-term vision, a multi-pronged approach needs to be adopted with sustained efforts. The next section of the report suggests some action points in this regard.

10. Recommendations

"सप्तचरण शेती संवर्धन अभियान"

"Seven step Mission to bring efficiency in power consumption in the agriculture sector and ensure quality power supply to farmers in Maharashtra."

In the state of Maharashtra, the ecosystem of power supply to the agriculture sector is riddled with some fundamental challenges. These challenges include- a low percentage of metering, poor practices in repair and maintenance of meters wherever they have already been installed, questionable quality of power supply, non-payment of electricity bills leading to a low percentage of collection efficiency, inefficient consumer mapping and lack of regular supervision & monitoring by distribution companies.

It has resulted in the poor financial health of the DISCOM, increasing subsidy burden for the exchequer, higher costs of power for residential, commercial and industrial sectors (due to cross-subsidization) and, more importantly, injudicious use of power and precious natural resource-water. Due to these diverse nature challenges (encompassing social, behavioural, technical as well as administrative aspects), it is to be understood that there is no single silver bullet to address this conundrum. Instead, a range of initiatives needs to be undertaken simultaneously and in a phased manner to break the vicious circle and achieve a complete turnaround in the sector of power supply to agriculture.

Accordingly, a seven-step mission (Saptacharan) is proposed, encompassing initiatives aiming at improving service delivery, achieving behavioural change, inculcating the practice of judicious use of natural resources and transitioning from the current exploitative way to a sustainable way.

Step 1

Rationalizing Existing Subsidy Regime

Background

In Maharashtra, farmers are eligible for a subsidy on their electricity bills under the Agricultural Electricity Tariff (AET) policy. Currently, the per Unit cost of power supply is Rs 7 out of which overall subsidy (DS-X& CSS Y) of around Rs. 5/- per unit is provided to AG consumers on their bills. The subsidy is intended to help farmers offset the cost of electricity used for agricultural purposes. To be eligible for the subsidy, farmers must be registered with the Maharashtra State Electricity Distribution Company (MSEDCL) and use electricity exclusively for agricultural purposes.

Currently, subsidized electricity is provided to all the AG consumers without any categorization on economic or any other parameter which defines the ability to afford the electricity bills by the consumer. The eligibility criteria for availing the electricity subsidy should be rationalized to prevent the extra financial burden on the books of DISCOMS.

Proposed Intervention

In the last 5 years, the average annual direct & cross subsidy provided to AG consumers is more than RS. 5000 Crores and Rs. 8000 Crores respectively. Observing the low percentage of timely bill payments by farmers, low collection efficiencies and unmetered consumers, it's important to redress the list of AG consumers who are eligible for direct subsidy by the government.

Keeping in mind the economic and professional parameters of consumers, it is proposed that the Government may consider waiving off any kind of direct subsidy to AG consumers based on the following parameters.

Parameter 1	Constitutional post holders, Former Elected representatives
Parameter 2	All serving employees of Central/state/PSU agencies/department (except MTS/Class IV/Group D)
Parameter 3	All superannuated or retired with pension more than 25,000/-per month (except MTS/Class IV/Group D)
Parameter 4	All person who paid income tax last year,
Parameter 5	Professional doctors, engineers, lawyers, CA, Architects registered with professional bodies for practicing

Key Strategies to Implement Proposed Intervention Regarding Sanitization of Subsidy Regime

As per the data received from the DISCOM, there are around 45 lakhs AG electricity connections in the state and currently all these AG consumers are provided with electricity at a subsidized rate. However, owing to deteriorating financial health of the DISCOM and increased burden of subsidy over the years, the MERC has shown its intentions to revise the AG tariff structure as well as rationalize the subsidy regime. It is an attempt to improve the financial health of DISCOM and bring sustainability in its operations. And on the other hands ensuring continuation of support to the agriculture via directing subsidy to deserving farmers.

In order to do that the total AG connections i.e. around 45 lakhs are categorized into two categories- beneficiaries and non-beneficiaries. The bifurcation of AG consumers in these two categories is based on the 5 parameters as mentioned above. The AG consumers falling under these 5 parameters will be treated as some sort of creamy layer and thus will fall into the category of non-beneficiaries.

To carry out the whole categorization process, multiple strategies and approaches were contemplated. Learnings from other schemes such as '**Mahatma Jyotiba Phule Karj Mafi Yojana'** was studied to identify challenges and best practices adopted. The Government in collaboration with Discom (mainly MSEDCL) may adopt the following strategies to categories AG connections/consumers into beneficiaries and non-beneficiaries.

A. Creation of a Specialized Database

1.1 For all the AG connections, DISCOM may undertake an activity of linking among AG Consumer number, Aadhar No./PAN No. and 7/12 document. An accurate user mapping will be done under this, and a base list of consumers will be created.

1.2 To identify eligible and non-eligible AG consumers, details of state government employees such as Class, Designation, PAN No. etc. can be collected from the Treasury Department. GPF Account holds this information with respect to each government employee and thus this data can be captured. Similarly, data regarding central govt. officials can be collected from respective departments.

1.3 For the data about employees of State PSUs or Organizations such as MSRTC, CIDCO, MHADA, etc. needs to be collected from respective organizations in an excel file with a pre-defined format.

1.4 Income Tax department to be contacted and relevant data on whether Income tax is paid or not can be collected regarding list of consumers identified under point 1.1. Similarly, for points 1.2 and 1.3, data from Income Tax can be used to scrutiny and identify beneficiaries.

1.5 When it comes to professionals such as Doctors, Lawyers, Architects, etc., the data is to be collected from their respective organizations such as for Doctors- Medical Council of India, for Lawyers- Bar Councils of Maharashtra and Goa, so on and so forth.

1.6 Database creation, cross verification and categorization of consumers into beneficiary and non-beneficiary categories, based on 5 parameters, is a tedious and time-consuming task. However, the whole system of imposing revised tariff structure and provision of subsidy is based on this and thus it is of paramount importance that this is completed diligently.

B. Aadhar Number to be Made Compulsory

It is to be noted here that to cross verify and to decide beneficiary of the subsidy, apart from name and other details, Aadhar number needs to be collected. This will make sure that duplication is avoided, and authenticity of the data is maintained.

C. Specialized Software

A tailor-made software tool to be developed which will process these data sets, cross refer and impose required criteria as filters and will provide list of eligible beneficiaries as per the set conditions.

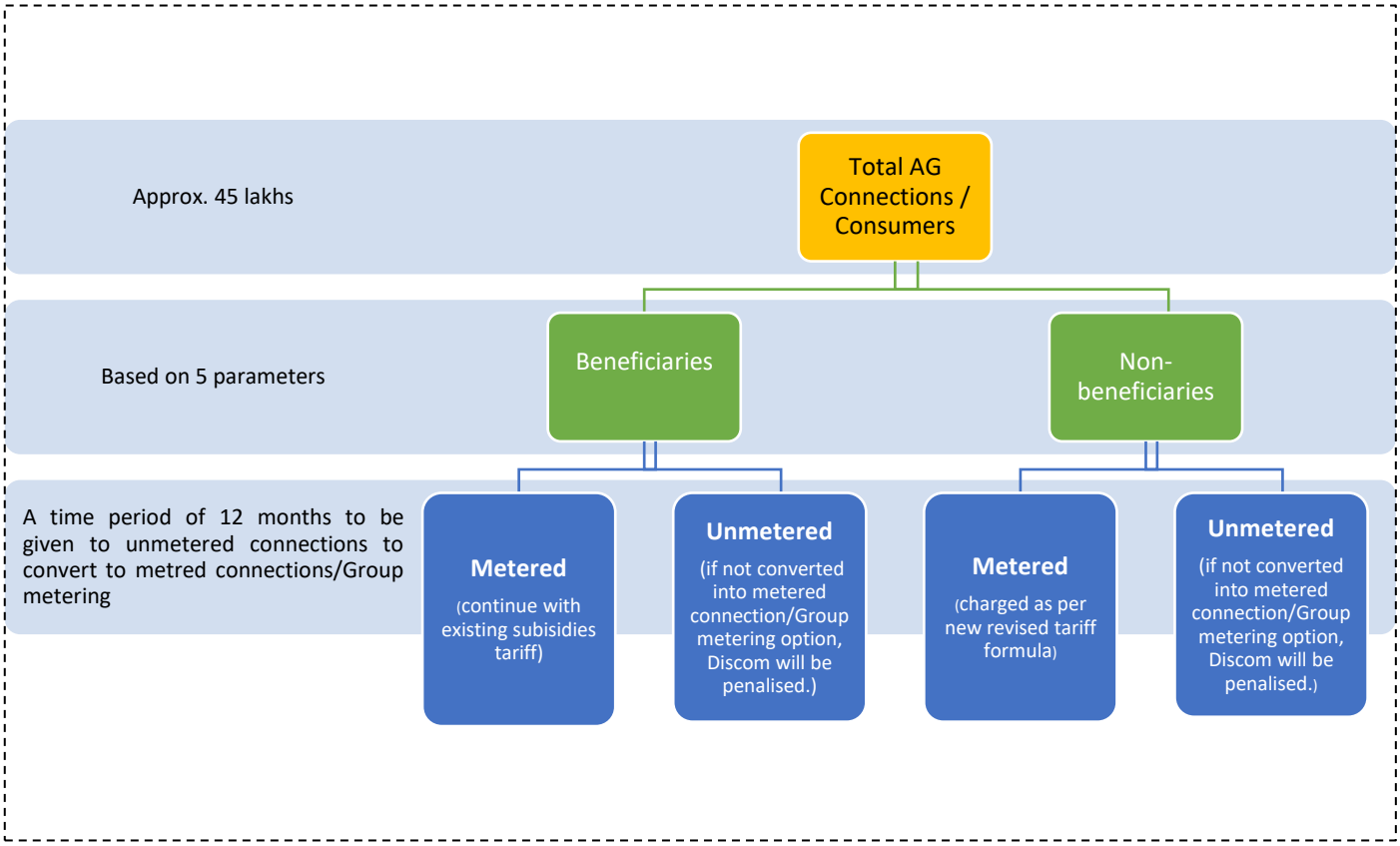
D. DBT Model for Subsidy Disbursement

If the DBT model is to be adopted to transfer subsidies directly to the accounts of the beneficiaries, then further process of bank account authentication shall have to be carried out. For this, once the list of beneficiaries is finalized, the beneficiaries shall have to authenticate (Aadhar linked bank accounts with a process of authentication specifically developed for this purpose) their bank accounts. The said process has to be carried out with the support of banks and to be implemented through Common Service Centres, SETU offices, etc.

E. Self-Declaration

The authorities may undertake an IEC campaign regarding this to reach out to the masses and clarify the intentions behind it. Under this activity, an opportunity to be provided to the AG consumers to self-declare about their status (if they fall under 5 parameters as mentioned above) and in turn excluded from the list of beneficiaries. Government may contemplate taking punitive actions against those who are underserving and yet taking benefit of subsidized tariff regime.

This whole exercise will, eventually, categories all AG consumers as shown below. The details regarding imposition of new rationalized tariff structure and provision of direct subsidy to the deserving ones are mentioned in the respective category. Based on the assumptions, it is expected that this measure will reduce the annual subsidy burden by around 300 cr.



Step 2

"मागेल त्याला सौरऊर्जा योजना"

(Incentivizing Metering Through Solarization of Agricultural Pumps)

Background

Power is one of the most important factors for the economic development of a country including all sectors, be it industrial, agriculture or households. However, rampant, and injudicious use of energy has made it a scarce resource and at the same time the usage of fossil sources to generate power has caused irreversible harm to the environment. Therefore, we urgently need to look towards renewable sources of energy to take care of our power requirements. Apart from global warming issue, India has been grappling with economic sustainability of power sector. DISCOMs in India are finding it difficult to keep their business viable due to multiple issues such as subsidy to certain sections, power theft, technical losses, bill collection inefficiency and other leakages. Distress on account of supply to the agriculture sector has been a major concern as this sector is the most price sensitive, full of uncertainty and prone to political interference.

Hence, making this sector self-sustainable is of paramount importance, which would not only be a long-term solution but would also contribute to the economic development by taking away the burden of cross-subsidy from industrial and household sectors. One of the self-sustainable models presented in the report is- Grid connected solarized pumps. Also, it is important to note that schemes started by the governments regarding adoption of solar power in agricultural activities have received a sluggish response or a non-serious attitude by the farmers. This can be attributed to demand on the farmers to contribute some amount to adopt these solar systems or power supply to the farmers, relatively, at a very low cost or zero cost. To summarize, unaccounted power at very low cost, fear of upward revision in the electricity bills, lack of assured quality power supply, requirement of upfront investment from the

Key Features

- Grid Connected solar power plant (3/5/7KW) without any monetary contribution from farmer.
- Only pre-condition on farmer is to install a meter. This is coupled with assurance from DISCOM that no upward revision in the tariff or electricity bill with fixed flat rate tariff for (5 to 7 yrs.)
- However, Farmers would be given a choice to opt for Flat tariff or unit-based tariff, for both the options, current tariff would be applicable.
- Farmers may form a group or FPOs are encouraged to accept this model.

farmers to adopt solar systems, serious trust issues toward distribution companies, etc. are the prominent reasons for poor adoption of metering as well as Solar installation schemes.

However, lack of metering leads to unaccountable consumption and power pilferage and sets in motion a vicious cycle of revenue loss, theft, misdirected subsidies and schemes, critical financial conditions of DISCOM, poor repair and maintenance work by the DISCOM so on and so forth.

This model envisages installing solar panels in the farmland of individual farmers and supplying power to pump through solar system rather than from DISCOMs and feeding extra power generated to the grid. This not only would take care of the self-requirement of farmers, but surplus energy would also be available for sale. As part of this scheme, the capital expenditure would be made by the State Govt. and farmers would continue paying the subsidized bill as per present tariff for the next 25 years (life of solar system) with nominal increment which may or may not be levied periodically. Also, there is a potential to implement this model in the PPP mode. However, further study and model development is required to validate this. While proposing a multipronged approach to address these issues, some salient points need to be highlighted here.

Expected Outcomes

- Farmers becoming net power generators.
- Increased % of metering which will in turn provide accurate and reliable data on power consumption.
- Considerable savings on Direct Subsidy to Government
- Cross subsidy would not be needed leading to rationalization of power cost for industries.
- Availability of extra power back to the grid will generate an additional source of revenue.
- Reliable power supply to the farmers through solar power plant thus reducing dependence of DISCOM.
- Environmental sustainability and helping the country in meeting renewable energy target.
- Benefit to cost ratio is favorable.

Cost- Benefit Analysis of Scheme

Key Parameters

a) Pumps to be solarised in Maharashtra.

b) Implementation period – 5 Years

c) Capital Expenditure over 5 years – INR 1.23 Lakh Crore

d) Total Solar Energy Capacity generation – 19.66 GW

Total Metered and unmetered consumers (FY 21-22)

Up to 3 HP	3-5 HP	5-7.5 HP	7.5-10 HP	Above 10 HP	Total
12,23,974	24,51,427	4,84,012	2,22,778	88,206	44,70,397

Key Assumptions

a) Solar Panel installation would be equal to HP capacity of Pump.

b) Cost of Solar Panel per KW – INR 60,000

c) Power requirement of pumps increasing at the rate of 2% annually

d) Contingency Cost (Including Installation & Evacuation Cost)– 5%

e) Life of Solar Plant – 25 Years

f) Solar Panel efficiency in Maharashtra – 13%

g) Technical Loss – 15%

h) Collection Efficiency post solarization – 80%

i) Discounting Rate – 8%

****The detailed financial model (excel worksheet) is attached to this report.***

Step 3

Adarsh Feeder Program

Background

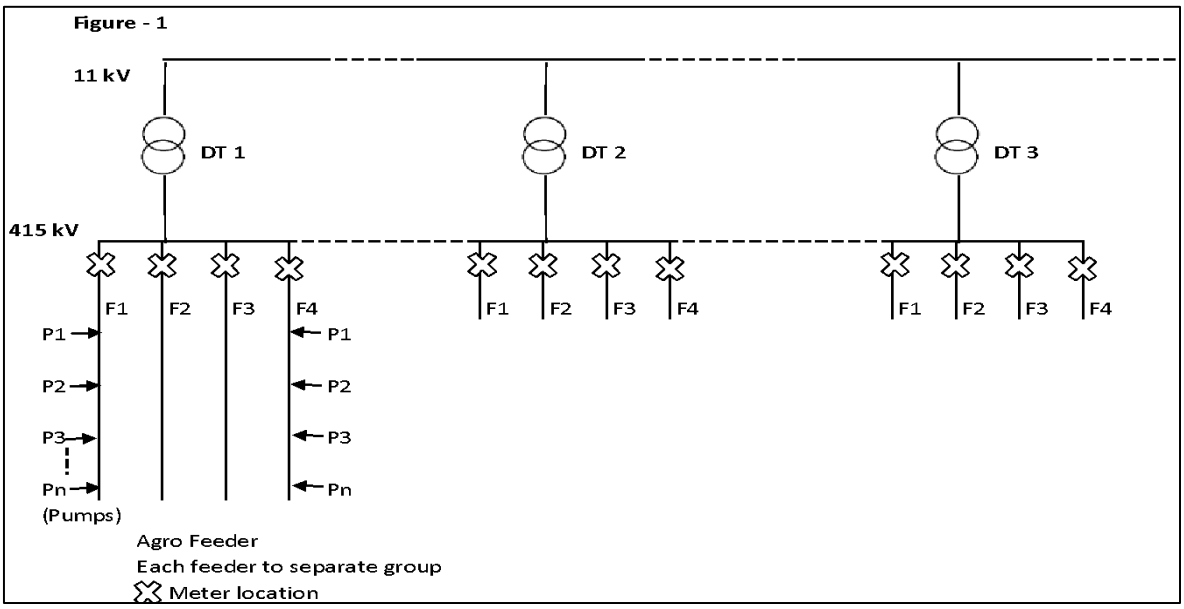
A major concern to be addressed in the area of agricultural power sector is the lack of confidence between DISCOMs and consumers/farmers. The non-payment issue and poor revenue realization has caused severe losses to DISCOMs affecting their efficiency heavily. From a farmer's perspective, they suffer from poor quality of supply, no assurance on reliability and sluggish redressal of grievances.

To address this, the Adarsh Feeder Program may be initiated. The program may start with 502 AG dominated feeders which were under scrutiny in the study conducted by 'Working Group on Agriculture Consumption' appointed by MERC or any other number of AG feeders, the authority may find suitable. With respect to these feeders, following actions may be initiated:

Actions Points-

1.Accurate consumer mapping and calculation of load on each AG feeder with collection of other details such as land holding, cropping pattern, water requirement registered with irrigation department or Water Use Organizations.
2.The single point metering will be at Distribution Transformer's LT side on each outgoing AG feeder (as shown in a representative diagram below).

Figure - 1



After accommodating losses, adopting a weighted average method for billing consumers on the feeders (Sample calculation is shown below).

Energy Meter to be provided on the Distribution Transformer (DT) supplying electricity to a group of consumers.

For example, Distribution Transformer on the agriculture feeder which is supplying power to 5 agriculture consumers with load given in the adjoining Fig A

Now if consumption recorded by the meter during the billing cycle is 3425 KWh. After giving an allowance of 5% LT line losses. The net consumption shall be worked out as (3425 – 175) 3250 units.

The bills shall be raised by the DISCOM on the AG consumers AG-1 to AG-5 with respect to the consumption in proportion to their BHP load respectively i.e. for AG-1 the consumption would be as per Figure B

The bill should be raised for the consumer AG-1 for 750 units at the relevant tariff for AG consumers approved by the Hon'ble Maharashtra Electricity

Figure A

AG-1	7.5 BHP
AG-2	5 BHP
AG-3	5 BHP
AG-4	7.5 BHP
AG-5	7.5 BHP

Figure B

$$\frac{3250 * 7.5}{32.5} = 750$$

1. If anyone on the particular feeder is not fine with the weighted average method of billing and asserts that he/she is judiciously using power, then he/she will be given an option of installing an individual separate meter. Post this, he/she is charged on at actuals while others remaining on the feeder will be charged with the same weighted average method.

2. This whole activity is coupled with assurance from the DISCOM regarding a reliable and quality power supply will be given to the farmers on these specific feeders for assured hours.

3. DISCOM to make commitment that if revenue collection from these individual selected AG feeders is minimum at the level of 80%, the DISCOM will spend a share of the collected revenue (may be 30% to 40% or whatever desired) on the maintenance work of the same feeders. In addition to this, such feeder managers will be appreciated in some r way and these feeders, having revenue efficiency of a minimum 80%, will be always treated on a high priority.

Expected Outcomes

- With this feeder level approach, focus will be on efficient feeder management in terms of supply of power and revenue realization. In addition, assurance to the consumers on a particular feeder about the availability of reliable quality power supply will act as a confidence-building measure.

- Along with this, this approach also attempts to address the social issue of non-payment of electricity bills as it puts part onus on consumers for the assured power supply with a target of a minimum 80% revenue realization.

- If found viable on the ground, this model can be further expanded to include supply power as per 'time of the day' method, tariff structure based on cropping pattern or cropping season, solarisation of a complete feeder and many more.

Step 4

Revised Mechanism for Devising Tariff Formula for Unmetered Consumers

4.1 Background

In the existing tariff deriving mechanism, some of the key consumption defining factors such as cropping pattern, land size, water tables etc. does not taken into consideration and tariffs for metered or un-metered AG consumers kept standardized in their respective categories. This leads to reluctance by farmers in paying the bills since they observe disparity in consumption vs billing scenarios of different farmers.

Cropping patterns, water table and land size can affect the demand for electricity for irrigation purposes. In areas where irrigation is necessary for farming, the type of crops being grown, and the timing of the growing season can affect the demand for irrigation. For example, if a region is primarily agricultural and the main crops are water-intensive, such as rice or Sugarcane, the demand for irrigation and, therefore, electricity, will likely be higher. Similarly, If the water table is low, farmers may need to use more pumps for more hours to access underground water sources, which can increase the demand for electricity. On the other hand, if the water table is high, there may be less demand for irrigation and, therefore, less demand for electricity. In addition to this the land size vis-à-vis pump capacity also affects the electricity consumption.

Considering cropping patterns and the water table when setting electricity tariffs for pump connections can help ensure that the tariffs accurately reflect the costs of providing electricity for irrigation. This can help to ensure that the tariffs are fair and sustainable for both the electricity provider and the farmers using the pump connections.

4.2 Water Table Factor

#	District	Avg. Water Levels in meters						Avg. Head (Mt)	Flow rate (LPS)/3HP pump	Efficiency-cy	Multiplier
		2014	2015	2016	2017	2018	2019				
1	RAIGARH	3.56	3.86	3.61	3.98	0.72	8.08	4.0	**19**	1	1
2	KOLHAPUR	5.35	6.13	4.96	3.07	2.83	3.51	4.3			
3	MUMBAI	4.26	5.29	3.54	4.35	3.52	8.34	4.9			
4	THANE	5.82	5.47	5.84	5.25	1.57	8.33	5.4			
5	MUMBAI SUBURBAN	5.94	6.74	4.12	5.11	3.28	8.34	5.6			
6	CHANDRAPUR	7.65	7.31	6.86	7.59	2.58	3.88	6.0			
7	SINDHUDURG	7.37	8.17	7.96	6.91	3.1	3.47	6.2	18.000	0.947	1.056
8	PUNE	6.11	6.8	6.87	6.43	4.1	6.74	6.2			
9	GARHCHIROLI	8.48	8.08	7.78	7.8	1.96	4.21	6.4			
10	SATARA	6.53	8.58	8.27	5.73	5.37	3.92	6.4			
11	SANGLI	6.49	10.02	7.81	5.89	5.92	3.53	6.6			
12	RATNAGIRI	7.79	8.82	9.18	7.55	3.17	4.26	6.8			
13	GONDIYA	7.34	8.18	8.25	8.55	3.42	5.28	6.8			

14	YAVATMAL	7.76	9.26	8.35	8.84	3.27	3.99	6.9			
15	WARDHA	7.95	9.38	8.22	8.31	3.84	5.3	7.2			
16	NAGPUR	7.93	8.41	9.15	9.19	3.79	5.54	7.3			
17	BHANDARA	8.26	9.65	9.38	9.8	3.13	5.03	7.5			
18	NANDED	9.46	10.68	9.4	9.82	3.87	3.84	7.8			
19	HINGOLI	8.78	10.98	10.07	10.4	3.25	3.62	7.9			
20	SOLAPUR	8.16	10.74	10.11	8.35	6.9	3.58	8.0			
21	OSMANABAD	9.12	11.02	11.1	8.34	4.98	3.64	8.0			
22	BID	9.92	10.47	8.55	9.89	6.37	3.95	8.2	16.400	0.863	1.159
23	WASHIM	8.11	9.53	11.06	11.42	5.36	4.82	8.4			
24	NASHIK	8.78	10.74	8.93	9.43	5.81	8.32	8.7			
25	DHULE	8.49	9.7	9.1	9.66	9.12	8.31	9.1			
26	PARBHANI	11.23	13.92	11.03	10.01	5.29	3.68	9.2			
27	AMRAVATI	8.97	10.68	9.86	11.04	7.51	7.12	9.2			
28	JALNA	11.14	13.47	9.88	9.68	5.41	6.74	9.4			
29	AHMADNAGAR	9.97	12.5	10.11	9.87	8.03	7.32	9.6			
30	NANDURBAR	10.48	11.26	11.14	10.67	7.54	7.88	9.8			

31	BULDANA	10.13	11.31	12.03	11.54	8.23	8.17	10.2	14.500	0.763	1.310
32	LATUR	12.66	16.26	12.36	11.96	6.14	3.7	10.5			
33	AURANGABAD	13.32	13.45	11.42	11.78	7.67	8.3	11.0			
34	JALGAON	11.17	12.93	12.47	13.19	10.16	8.29	11.4			
35	AKOLA	11.65	13.32	13.83	15.51	10.27	8.19	12.1	12.000	0.632	1.583

Source: Data from Groundwater Survey and Development Agency, GoM

****For Pump flow rate datasheet of KBS pump was referred (Attached in the Annexure 3)***

Region	Water Table (Meters below ground level)	Water Table Multiplier Factor
Region 1	Up to 6 Mt	1
Region 2	6 - 8 Mt	1.05
Region 3	8 -10 Mt	1.15
Region 4	10 - 12 Mt	1.31
Region 5	>12 Mt	1.58

For water table factor, we have analysed water table scenarios of all the districts of Maharashtra between 2014 to 2019 and categorized the state in 5 regions based on average heads of water levels. Keeping in mind the 3 HP pump (KDS 314+*, Suc-80mm, Del-80mm, 415 volts) connections (which is the largest consumer category) we have tried to correlate the flow rate, efficiency of pump and depth of water level. Based on the same we have determined water table factors for all the 5 regions. This will be represented as “WTF” in the formula.

4.3 Regional Crop Factor

Since crop pattern is dynamic in nature and its practically very difficult to track each crop sown to impose any crop specific multiplier for every farmer, we have proposed a multiplier factor which is based on weighted average water requirement of any region (the 5 regions identified basis on water tables in earlier section) based on cropping pattern of that region. We have analysed the sown area-vis-à-vis crops (8 types of crops) of each district and mapped the same to 5 regions with respect to average monthly water requirement and power consumption for 3 HP pump consumers. We have considered the lowest consuming region as our base and benchmarked other regions against the same. This region-crop multiplier will denote the monthly power consumption of each region based on the cropping pattern of the region. This will be represented as "RCF" in the formula.

CROP	Crop Cycle (Months)	Avg. Crop Cycle (Months)	Water Requirement (mm)	Average Water Requirement in KL (For overall crop cycle)	Consumption of blue (irrigation) water	Overall power consumption (3HP)	Monthly power consumption
Rice	3 to 5	4	900-2500	9000	65%	192.43	48.11
Wheat	4 to 5	4.5	450-650	8100	85%	226.48	50.33
Maize	4 to 6	5	500-800	5500	50%	90.46	18.09
Sugarcane	9 to 13	11	1500-2500	17000	70%	391.45	35.59
Groundnut	4 to 5	4.5	500-700	4700	45%	69.57	15.46
Cotton	6 to 7	6.5	700-1300	7200	45%	106.58	16.40
Soybean	4 to 5	4.5	450-700	4800	45%	71.05	15.79
Tobacco	4 to 6	5	400-600	2500	85%	69.90	13.98
Tomato & Potato	4 to 5	4.5	600-800	3600	80%	94.74	21.05

Sunflower	4 to 5	4.5	350-500	6600	70%	151.97	33.77
Peas & bean	3 to 4	3.5	300-500	2300	80%	60.53	17.29
Jawar	4 to 5	4.5	450-650	5000	50%	82.24	18.27
Bajra	4 to 5	4.5	450-650	5000	50%	82.24	18.27

(*Source: https://www.fao.org/3/s2022e/s2022e02.htm#TopOfPage)*

District wise Sown Area FY 2018-19

Sr. No.	District	Average Sown Area in (,00 Ha)							
		Jowar	Bajra	Rice	Wheat	All Pulses	Sugarcane	Cotton	Groundnut
1	RAIGARH	0	0	1141	0	123	0	0	2
2	KOLHAPUR	153	0	1069	33	128	1493	0	429
4	Thane+Palghar	0	0	1329	0	138	0	0	0
5	BRIHAN MUMBAI	0	0	0	0	0	0	0	0
6	CHANDRAPUR	33	0	1350	174	1025	1	1533	0
7	SINDHUDURG	0	0	641	0	47	0	0	14
8	PUNE	1985	323	580	553	1070	1417	0	244
9	GARHCHIROLI	13	0	1542	4	296	0	69	0
10	SATARA	1498	515	470	341	819	825	0	411
11	SANGLI	1516	337	154	136	536	899	2	276
12	RATNAGIRI	0	0	761	0	51	0	0	1
13	GONDIYA	0	0	1520	25	212	15	0	0
14	YAVATMAL	161	1	0	346	2455	38	4595	60
15	WARDHA	74	0	0	127	1075	25	2430	10
16	NAGPUR	23	0	982	1278	1247	48	1426	23
17	BHANDARA	0	0	1758	100	479	42	0	0
18	NANDED	1089	0	8	202	2820	233	2409	30
19	HINGOLI	630	0	0	271	1906	112	837	8

20	SOLAPUR	5175	238	19	643	1217	1900	2	35
21	OSMANABAD	1273	88	0	196	1811	572	163	44
22	BEED	869	575	0	72	1356	497	3775	40
23	WASHIM	100	3	0	136	1462	2	197	18
24	NASHIK	44	910	740	635	934	153	624	257
25	DHULE	414	819	69	465	1078	29	2179	186
26	PARBHANI	887	5	0	236	1332	457	1999	2
27	AMRAVATI	165	0	73	269	2323	3	2096	19
28	JALNA	512	124	0	147	1156	378	3027	12
29	AHMADNAGAR	4370	1305	162	462	2684	1345	1299	108
30	NANDURBAR	492	67	261	219	705	155	1111	40
31	BULDANA	316	23	0	274	2300	3	1779	16
32	LATUR	1033	15	19	87	2848	623	59	14
33	AURANGABAD	573	547	0	289	893	263	3854	89
34	JALGAON	901	200	0	415	1502	100	5035	38
35	AKOLA	98	1	0	206	1995	0	1688	15

(Source: Handbook of Basic Statistics of Maharashtra 2019)

Region wise Sown Area for Different Crops in ('00) Ha

Region/Crop	Jowar	Bajra	Rice	Wheat	All Pulses	Sugarcane	Cotton	Groundnut
Region 1	186	0	4889	207	1414	1494	1533	431
Region 2	13437	1502	8435	4222	16041	6126	11933	1156
Region 3	7853	3808	1305	2641	13030	3019	16307	682
Region 4	2823	785	19	1065	7543	989	10727	157
Region 5	98	1	0	206	1995	0	1688	15

Region wise % of sown area for different crops in ('00) Ha

Region/Crop	Jowar	Bajra	Rice	Wheat	All Pulses	Sugarcane	Cotton	Groundnut
Region 1	1.8%	0.0%	48.1%	2.0%	13.9%	14.7%	15.1%	4.2%
Region 2	21.4%	2.4%	13.4%	6.7%	25.5%	9.7%	19.0%	1.8%
Region 3	16.1%	7.8%	2.7%	5.4%	26.8%	6.2%	33.5%	1.4%
Region 4	11.7%	3.3%	0.1%	4.4%	31.3%	4.1%	44.5%	0.7%
Region 5	2%	0%	0%	5%	50%	0%	42%	0%

Region-Crop Multiplier

Basis on Weighted Average water usage as per crop mix	Average Water Requirement in per month in KL	Monthly power consumption (3HP pump)	Region Multiplier basis crop mix (lowest one is base)
Region 1	1073	35.30	1.89
Region 2	774	25.46	1.37
Region 3	637	20.96	1.12
Region 4	586	19.26	1.03
Region 5	566	18.63	1.00

Farmers' Category based on Land Holdings

Category	No. of holdings	Farmers in different categories (%)	Area (Ha)	Category wise Area (%)
Marginal (Below 1 Hectare)	7815823	51.13%	3448662	16.82%
Small (1-2 Hectare)	4339259	28.39%	5771131	28.14%
Semi medium (2-4 Hectare)	2327023	15.22%	6025638	29.38%
Medium (4-10 Hectare)	733619	4.80%	4099420	19.99%
Large (10 Hectare & above)	69715	0.46%	1161588	5.66%

(*Source: Agriculture Census 2015-16, GoM)*

4.4 Concept Formula

Bills for metered connections are based on actual electricity consumption proportional to farming and land conditions of respective consumers. We can benchmark the un-metered connection tariff against the metered connection tariff to arrive at the close to accurate figures for monthly bills. In order to derive the tariff formula for un-metered connections, we have considered determining multiplier factors based on crop water consumption and water table of different regions which could be multiply to current rate of subsidized or un-subsidized tariff for metered consumers and lastly with land holding category of farmers to achieve a base tariff on Ha/HP (Subsidized Category) basis for each region.

Tariff Formula for un-metered AG consumers = Current Subsidized Rate * Region-Crop Factor (RFC) * Water Table Factor (WTF) * Land Holding Factor(LHF)

Assumptions:

Avg. Annual Running Hours for Pump	1300
Conversion factor from HP to KW	0.75
Standard Unit Rate in Rs	4.17
Subsidized Rate in Rs	2.37

The base rate has been considered as per current tariff structure, crop wise power consumption factor for sugarcane and regional water tables factors to arrive at region-vis-à-vis crop wise monthly base rate per HP per Hectare. If average annual pump running hours are considered as 1300 hrs and standard unit rate of electricity is Rs 4.17 then the monthly base rate should be Rs 338.81 per HP/per Ha/Month. If the subsidized tariff of Rs 2.37/- per unit is considered, then the monthly base rate should be Rs 192.56 per HP/per Ha/Month.

	Approximate bill for Un-Metered Consumers (Un-Subsidised) Rs	**Approximate bill for Un-Metered Consumers (Subsidised) Rs**
Base Rate (Rs/HP/Ha/Month)	338.81	192.56

Below is the matrix developed for region and crop wise tariff on per HP-per Hectare-per Month basis for subsidized categories and land holding factors.

Region 1/ Multiplier	**Water Table Factor**	**Region-Crop Factor**
Region 1	1.00	1.89
Region 2	1.05	1.37
Region 3	1.15	1.12
Region 4	1.31	1.03
Region 5	1.58	1.00

Category	**Land Holding Factor**
Marginal (Below 1 Ha.)	1
Small (1-2 Ha)	1.1
Semi medium (2-4 Ha)	1.3
Medium (4-10 Ha)	1.6
Large (10 Ha & above)	2.0

Base Tariff/Ha/HP (Subsidized Category), with land holding Multiplier, basis water usage by crop-mix.

Consumer Category	Region 1	Region 2	Region 3	Region 4	Region 5
Marginal (Below 1 Hectare)	365	276	249	261	304
Small (1-2 Hectare)	401	304	274	287	335
Semi medium (2-4 Hectare)	474	359	324	339	396
Medium (4-10 Hectare)	584	442	399	417	487
Large (10 Hectare & above)	730	553	498	522	608

Punitive Multiplier

It has been observed that there is a punitive multiplier on un-metered connections in comparison to subsidized metered connections. Use of similar or higher punitive multiplier on base rate to discourage unmetered connections is possible as per the requirements.

	Approximate bill for UN-Metered Consumers (Subsidised) (Rs)	Flat Tariff for Unmetered Consumers as per current GR	Punitive Multiplier (Subsidized rates)
Base Rate (Rs/HP/Ha/Month) Base Crop - Sugarcane Base Region - 1	192.56	351	1.82

Step 5

Direct Benefit Transfer for Electricity Scheme

After assessing the DBTE models of different neighboring states, there are three models of DBTE that are proposed in the context of Maharashtra. All three models require that consumers are metered, there is a pre-determined allocation of electricity to consumers, and consumers have payment discipline. The models differ in their applicability of electricity tariff, allocation of electricity, the timing of incentive payments, and cash incentive paid for electricity saved.

5.1 Unsubsidized Tariff Model:

The amount of cash transfer is calculated by multiplying the allocation with the difference between unsubsidized tariff and subsidized tariff.

a. The electricity bill is generated at the end of each billing cycle at unsubsidized tariff and the consumer pays for the entire consumption.

b. If consumption is less than the allocation, the excess cash is retained by the consumer.

c. If consumption is more than the allocated kWh, the consumer pays unsubsidized tariff for the excess consumption, thereby theoretically creating a strong incentive for efficiency in the use and conservation of electricity.

Illustrative Calculation

Units allocated per month	1000	Kwh
Unsubsidized tariff	5	per Kwh
Government subsidy	-4	per Kwh
Subsidized tariff	1	per Kwh
Farmer will be paid subsidy per month of	1000 * (5-1) = 4000	Rs
Farmers will be billed at unsubsidized tariff	5	Rs. / Kwh

Scenarios

S- 1	**If consumption is less than allocation say**	**600**	**units per month**
	Billable amount	600 * 5	3000
	Subsidy received	1000*(5-1)	4000
	Consumer can retain excess cash of	4000-3000	1000

S-2	**If consumption is more than allocation say**	**1200**	**units per month**
	Billable amount	1200 * 5	6000
	Subsidy received	1000*(5-1)	4000
	Consumers pay for excess consumption @ unsubsidized tariff	200*5	1000

S-3	**If consumption is equal to allocation say**	**1000**	**units per month**
	Billable amount	1000 * 5	5000
	Subsidy received	1000*(5-1)	4000
	Consumer will pay Rs. 5000 / - out of which he will receive subsidy of Rs 4000 /-		

5.2 Subsidized Tariff Model

An upfront cash transfer is made to the consumer before the billing cycle. The amount of cash transfer is calculated by **multiplying the allocation with the subsidized tariff (**that the consumer was already paying).

a. The electricity bill is generated at the end of each billing cycle—subsidized tariff for allocated units and unsubsidized tariff for excess consumption.

b. If the consumption is less than the allocation, the consumer retains the excess cash.

c. The consumer pays for excess consumption at unsubsidized tariff while receiving incentives at subsidized tariff.

Illustrative Calculation –

Units allocated per month	1000	Kwh
Unsubsidized tariff	5	per Kwh
Government subsidy	-4	per Kwh
Subsidized tariff	1	per Kwh
Farmer will be paid subsidy per month of	1000 * 1	Rs.
Farmers will be billed at subsidized tariff	1	Rs / Kwh

Scenarios –

S-1	**If consumption is less than allocation say**	**600**	**units per month**
	Subsidy received by farmers	1000*(1)	1000
	Billable amount	600 * 1	600
	Subsidy received	1000*(1)	1000
	Consumer can retain excess cash of	**1000-600**	400

S2	**If consumption is more than allocation say**	**1200**	**units per month**
	Subsidy received by farmers	1000*(1)	1000
	Consumer will be billed at subsidized tariff for allocated units and at unsubsidized tariff for excess units		
	Billable amount	1000 * 1 + 200 *5	2000
	Subsidy received	1000*(1)	1000
	Consumer pays for excess consumption @ unsubsidized tariff	200*5	1000

S-3	**If consumption is equal to allocation say**	**1000**	**units per month**
	Subsidy received by farmers	1000*(1)	1000
	Billable amount	1000 * 1	1000
	Subsidy received	1000*(1)	1000
	No outstanding for farmer		

5.3 Cash Incentive Model

a) A predetermined allocation of electricity, seasonally adjusted, is calibrated by the government.

b) Any consumer who uses less electricity than allocation is paid a cash incentive.

c) The rate of the incentive is not linked to the tariff rate.

d) The rate must be attractive enough to incentivize the farmer to consume less electricity.

e) The DISCOM/Government can decide to place an extra charge on the consumption of electricity more than the allocation.

Comparison of proposed DBTE Tariff Models

#	Parameters	Model		
		Unsubsidized Tariff	**Subsidized Tariff**	**Cash Incentive**
1	Electricity allocation	A consumer level electricity allocation (kWh) is determined and announced beforehand		
2	Tariff for Agriculture Supply	Tariff for agriculture supply is determined by the Regulator and referred to as 'unsubsidized tariff'. The 'subsidized tariff' is tariff payable by the agriculture consumer.		
3	Amount of subsidy	Difference between the unsubsidized and subsidized tariff, multiplied by the allocated amount of electricity	Subsidized tariff multiplied by the allocated amount of electricity	No upfront subsidy payment
4	Timing of cash transfer to consumer	Upfront disbursement prior to billing cycle	Upfront disbursement prior to billing cycle	Cash transfer at the end of billing cycle for electricity saved
5	Tariff applicable to consumption	Unsubsidized tariff	Subsidized tariff for the allocated amount of electricity, and unsubsidized tariff for consumption beyond the allocation	No tariff is applied since electricity supply is free
6	Incentive for electricity savings	At the rate of the unsubsidized tariff	At the rate of the subsidized tariff	Incentive rate is not linked to tariff. It is decided by the government and

				announced beforehand
7	Consumer metering	Yes		
8	Billing Rate	At unsubsidized tariff irrespective of consumption levels	At subsidized tariff up to allocated amount, after which at unsubsidized tariff	No billing as electricity is free, with energy savings and incentive earned communicated by SMS / through mobile app
9	Collection	Needs high payment and collection discipline	Needs high payment and collection discipline	No collection required from consumer; incentive paid into consumer's bank account
10	Financial integrity	Energy accounting needed to monitor for theft and malfeasance on feeders		
11	Cash flow/ budget requirement	Highest of the three models	Less than the unsubsidized model	Lowest, as no upfront payments required and ex-post cash transfers only in the event of savings
12	Stakeholder engagement	Need to justify tariff increase to consumer	Need to justify tariff increase to consumer	No change in status-quo for consumer, only the benefits of the scheme need to be explained to consumers

Step 6

Defining Power Consumed for Agriculture

It is imperative to reemphasize the definition of agriculture and in accordance the power consumed for the purpose of agricultural activities.. Various studies and reports suggest that agricultural land is being diverted to industrial use, but power consumption is continued at the subsidized tariff rates. This has serious implications on the overall power requirement for the agriculture sector, subsidies given and tariff rate for non-agricultural uses.

MERC in its Tariff Order has elaborated on tariff applicability. MERC has categorized Agricultural Tariffs in two sub categories namely (A) AG Pump Sets (B) AG others, which includes Agri businesses such as Poultry farms, Hatcheries, Aquaculture, Sericulture, Cattle Breeding Farms etc. Along with this, Section 126 of the Electricity Act, 2003 also contains the provisions for curbing unauthorized use of electricity.

According to Section 126:

1. Any person who consumes, uses, or otherwise takes electricity without a proper meter, tampering with the meter, or any other form of unauthorized usage, shall be considered as an unauthorized consumer.
2. The distribution licensee (the entity responsible for distributing electricity in a particular area) has the right to disconnect the supply of electricity to an unauthorized consumer after providing a notice and an opportunity to be heard.
3. If an unauthorized consumer is found guilty of the offense, they may be liable to pay the charges for the electricity consumed during the unauthorized period, along with any other penalties as prescribed by the respective State Electricity Regulatory Commission.
4. The distribution licensee has the authority to remove or disconnect any electrical line or electrical plant that is being used without authorization.

Strict monitoring and review mechanisms need to be put in place to contain the pilferage of power supply for non-agricultural purposes. As it has serious implications for the DISCOM, it is highly important for the DISCOM to carry out vigilance drives on regular basis.

With the advent of technology and changing circumstances, new innovations, pilot programs and experiments are being carried out in the agriculture sector. This has led to use of agricultural land which is different than what has been traditionally considered as land used

for agricultural activities. It is of immense importance that along with the strict monitoring and vigilance, the definition of power consumed for agricultural activities need to be revisited. A revised/updated understanding about power consumption for agricultural activities will promote not only innovations in the agriculture sector but will also ensure that electricity is consumed in a fair and legal manner.

Step 7

Information, Education and Communication Campaign

India's unique policy of an 'unmetered' and often 'free' power supply to the agricultural sector has resulted in a high level of dependence on groundwater supply for irrigation purposes. Stakeholders such as DISCOMs, farmers, and other power users suffer from deteriorating power service delivery, losses to electricity companies, declining groundwater levels, and stagnant or declining agricultural productivity. Similarly, non-payment of electricity bills by agricultural consumers has affected the cash-flows of M/s MSEDCL significantly. It was observed that except in a couple of zones, more than half of AG consumers have not paid any bills in the last five years.

During our stakeholder consultations we observed that some of the primary reasons for reluctance in paying bills or adopting metered connections are inadequate/low quality of power supply, billing disputes, over/borrowed use of power without metering etc. In addition to this, because of free and unmetered supply of electricity, many consumers consider power supply as a free utility and don't want to pay for it. Having said this there are large groups of farmers or FPOs who are willing to adopt meters and pay the bills:

- If the benefits and practices are made evident to them
- If the benefits of timely payment, metering, and renewable/sustainable energy practices can be incentivized, and fiscal and economic savings from energy-efficient behaviors and technologies were made evident.

Given these findings, it is necessary that an IEC plan should be developed which must address the following imperatives to be effective:

- Emphasize the tangible benefits of metering, timely payment of bill and renewable/sustainable energy while communicating specific actions that farmers need to take.
- Make farmers conscientious about their energy consumption and its impact on their communities, livelihood, and the nation.
- Harness social influence to motivate individuals and communities to encourage metering, payments of bills, and renewable/sustainable energy practices.
- Engage influential stakeholders such as famous personalities, media, self-help groups, FPOs, mandis, and other government line departments to promote information on metering, timely payment of bills, and energy efficiency behaviors and technologies.
- Familiarize them with their individual roles in achieving goals and targets both at local, national, and individual levels.

Strategies And Communication Methodology

1	STRATEGY - Publicity & Awareness
	ACTION PLAN Awareness about benefits of metered connections, bill payments and renewable/sustainable energy agriculture practices. Brand Ambassador Handouts Brochures Videos Documenting Success Stories Publication of Success stories in Marathi Language Advertisement on news papers Radio Talks Social Media campaigns Leveraging local influencers such as big farmers, elected representatives, celebrities to create awareness.
2	STRATEGY - Recognition and awards
	ACTION PLAN Awards to top 500/1000 individual farmers who have metered connections and have paid electricity bills for six consecutive months. Award to the top 500 Individual farmers who have opted for new metered connection and paid bills for three consecutive months. Award to the top 10 FPOs who have adopted the franchise model and performed their duties effectively. Award to 50 villages/gram panchayats who have collected the maximum percentage of bill generated. The citizen engagement program of Prime Minister “Man Ki Baat” should be leveraged to share success stories of individuals/FPOs/Villages who are doing well with respect to the adoption of renewable/sustainable energy practices.
3	STRATEGY - Joint Awareness Campaign
	ACTION PLAN Line Department officials will conduct joint campaigns in villages to understand on the ground problems and provide clarifications, answers, and information on the benefits of metering, bill payments, and the use of renewable/sustainable energy practices.
4	STRATEGY – Community Collaboration / Appointment of Urja-Doot
	ACTION PLAN Identification of volunteers who are willing to volunteer and do some service to villages comprising of lead farmers, opinion farmers, retired teachers,

	government servants, and women SHGs for Community Change Group. They can serve as one simple umbrella unit for all the activities, which can satisfy different KPIs of IEC activities. 'Awareness Creation' about the benefits of metering, adoption of renewable/sustainable energy practices, optimum water use, etc.

A dedicated IEC action plan should be prepared keeping in mind the geographical zones and target audience. Farmers who are the biggest stakeholders should be appraised about the long-term benefits of adopting metering, paying bills on time, and renewable/sustainable energy practices by the use of IEC strategy.

11. Annexures

Annexure 1 District wise production of principal crops in the state for the FY 2018-19

Annexure I			jowar		Bajra		All Cereals		Rice		Wheat		All Pulses		Sugarcane		Cotton		Groundnut	
District	*Total Geographical Area ('000 ha)*	*Gross cropped Area ('000 ha)*	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)	Area'00 ha	Production '00 tonne)
Brihan Mumbai	38	0	0	0	0	0														
Thane	464	226	0	0	0	0	584	1,423	549	1,395	0	0	43	31	0	0	0	0	0	0
Palghar	470	269	0	0	0	0	935	1,483	780	1,383	0	0	95	41	0	0	0	0	0	0
Raigad	687	217	0	0	0	0	1,206	3,293	1,141	3,241	0	0	123	39	0	0	0	0	2	10
Ratnagiri	816	260	0	0	0	0	913	2,626	761	2,410	0		51	35	0	0	0	0	1	2
Sindhudurg	504	159	0	0	0	0	661	1,915	641	1,884	0	0	47	28	0	0	0	0	14	37
Konkan Div	**2,979**	**1,131**	0	0	0	0	4,299	10,740	3,872	10,313	0	0	359	174	0	0	0	0	17	49
Nashik	1,563	994	44	27	910	579	4,408	7,880	740	1,265	635	1,117	934	594	153	14,613	624	308	257	243
Dhule	733	526	414	329	819	471	2,532	3,289	69	93	465	806	1,078	704	29	2,047	2,179	2,105	186	98
Nandurbar	705	321	492	577	67	48	1,668	2,081	261	225	219	375	705	426	155	13,549	1,111	1,202	40	25
Jalgaon	1,164	1,152	901	1,320	200	156	3,332	5,572	0	0	415	555	1,502	1,095	100	6,894	5,035	9,052	38	29
Ahmednagar	1,702	1,464	4,370	552	1,305	841	6,879	3,582	162	67	462	877	2,684	1,005	1,345	1,27,762	1,299	484	108	56
Nashik Div	**5,867**	**4,457**	6,221	2,805	3,301	2,095	18,819	22,404	1,232	1,650	2,196	3,730	6,903	3,824	1,782	1,64,865	10,248	13,151	629	450
Pune	1,562	822	1,985	610	323	379	3,857	4,104	580	1,062	553	1,108	1,070	724	1,417	1,32,333	0	0	244	227
Satara	1,058	662	1,498	1,243	515	269	3,197	4,095	470	1,090	341	705	819	580	825	80,382	0	0	411	459
Sangli	861	782	1,516	785	337	79	2,676	2,608	154	406	136	309	536	194	899	91,788	2	3	276	290
Solapur	1,488	1,142	5,175	1,843	238	32	6,698	3,208	19	2	643	569	1,217	414	1,900	1,40,936	2	1	35	20
Kolhapur	777	618	153	211	0	0	1,507	4,078	1,069	3,289	33	82	128	120	1,493	1,24,918	0	0	429	624
Pune Div	**5,745**	**4,026**	10,327	4,692	1,413	759	17,935	18,093	2,292	5,849	1,706	2,773	3,770	2,032	6,534	5,70,357	4	4	1,395	1,620
Aurangabad	1,008	1,224	573	180	547	249	1,836	1,384	0	0	289	373	893	367	263	13,277	3,854	3,743	89	37
Jalna	773	876	512	239	124	43	1,232	1,034	0	0	147	155	1,156	396	378	20,016	3,027	3,473	12	14
Parbhani	631	917	887	580	5	3	1,186	913	0	0	236	307	1,332	735	457	19,194	1,999	3,273	2	2
Hingoli	466	613	630	205	0	0	927	571	0	0	271	353	1,906	1,153	112	7,840	837	1,637	8	4
Beed	1,069	1,022	869	242	575	155	1,664	518	0	0	72	52	1,356	509	497	17,651	3,775	1,352	40	7
Nanded	1,033	964	1,089	805	0	0	1,452	1,276	8	12	202	369	2,820	2,452	233	7,457	2,409	3,649	30	24
Osmanabad	749	816	1,273	806	88	11	1,878	1,139	0	0	196	150	1,811	777	572	28,392	163	83	44	24
Latur	716	677	1,033	722	15	4	1,281	827	19	4	87	33	2,848	1,449	623	37,741	59	50	14	5
Aurangabad Div	**6,443**	**7,109**	6,866	3,779	1,354	465	11,456	7,662	27	16	1,500	1,792	14,122	7,838	3,135	1,51,568	16,123	17,260	239	117
Buldhana	967	883	316	268	23	3	1,014	1,125	0	0	274	321	2,300	1,398	3	140	1,779	3,090	16	15
Akola	543	738	98	134	1	0	312	410	0	0	206	273	1,995	1,451	0	10	1,688	4,196	15	18

Washim	513	520	100	50	3	0	258	171	0	0	136	105	1,462	1,045	2	88	197	356	18	15
Amravati	1,222	980	165	118	0	0	603	682	73	29	269	400	2,323	2,352	3	145	2,096	6,260	19	15
Yavatmal	1,352	993	161	56	1	0	527	401	0	0	346	325	2,455	2,629	38	2,296	4,595	8,441	60	60
Amravati Div	**4,597**	**4,114**	840	626	28	3	2,714	2,789	73	29	1,231	1,424	10,535	8,875	46	2,679	10,355	22,343	128	123
Wardha	629	445	74	31	0	0	206	250	0	0	127	217	1,075	1,275	25	1,695	2,430	6,552	10	13
Nagpur	986	657	23	10	0	0	2,295	4,202	982	2,033	1,278	2,154	1,247	1,151	48	2,644	1,426	3,247	23	13
Bhandara	342	251	0	0	0	0	1,858	3,960	1,758	3,822	100	138	479	361	42	2,821	0	0	0	0
Gondiya	586	240	0	0	0	0	1,546	3,939	1,520	3,908	25	31	212	143	15	1,028	0	0	0	0
Chandrapur	1,092	564	33	21	0	0	1,567	2,621	1,350	2,365	174	230	1,025	894	1	38	1,533	3,225	0	0
Gadchiroli	1,492	220	13	5	0	0	1,580	2,807	1,542	2,772	4	5	296	172	0	10	69	148	0	0
Nagpur Div	**5,127**	**2,376**	142	68	0	0	9,051	17,779	7,152	14,901	1,709	2,775	4,333	3,996	131	8,236	5,458	13,172	33	26
Maharashtra State	**30,758**	**23,212**	24,395	11,973	6,096	3,322	64,273	79,466	14,650	32,758	8,344	12,492	40,022	26,739	11,628	8,97,705	42,187	65,931	2,442	2,386

(Source: Handbook of Basic Statistics of Maharashtra 2019)

Annexure 2 District wise AG connections, Load and AG Sale

Sr.No.	2021-22	Total Metered in MUs	Total UN-METERED in MUs	Total MUs	Total Metered in Consumers	Total Un Metered in Consumers	Total Metered Load in HP	Total Un-Metered Load in HP	*Total Geographical Area ('000 ha)*	*Gross cropped Area ('000 ha)*
1	AHMEDNAGAR DISTRICT	2171.40	1703.15	3874.55	187004	199119	1031533.27	947954	1702	1464
2	AKOLA DISTRICT	377.80	70.75	448.55	55458	10732	288451.61	51928	543	738
3	AMARAVATI DISTRICT	608.89	199.57	808.46	106963	31742	534830.71	173904	1222	980
4	AURANGABAD DISTRICT	664.97	840.33	1505.30	92405	136521	512931.01	689414	1008	1224
5	BEED DISTRICT	668.12	906.22	1574.34	71708	105754	339538.44	505352	1069	1022
6	BHANDARA DISTRICT	249.57	2.01	251.58	48683	1519	178119.41	4541	342	251
7	BULDHANA DISTRICT	807.57	323.92	1131.49	118962	45726	547662.84	231258	967	883
8	CHANDRAPUR DISTRICT	169.63	4.81	174.44	55400	2228	213468.33	7267	1092	564
9	DHULE DISTRICT	481.87	345.00	826.86	51493	45607	273529.3	208387	733	526
10	GADCHIROLI DISTRICT	100.69	3.90	104.60	20710	1357	74144.76	4337	1492	220
11	GONDIA DISTRICT	233.31	6.06	239.37	36440	2797	121552.45	8274	586	240
12	HINGOLI DISTRICT	479.50	317.66	797.16	42983	33590	217691.98	169689	466	613
13	JALGAON DISTRICT	1334.21	708.72	2042.93	117586	91741	826892.16	483488	1164	1152
14	JALNA DISTRICT	481.59	593.62	1075.22	60226	72989	278461.11	369142	773	876
15	KOLHAPUR DISTRICT	612.07	21.64	633.71	145622	8950	989880.42	40457	777	618
16	LATUR DISTRICT	747.58	487.82	1235.40	74134	56643	426643.09	300016	716	677
17	NAGPUR DISTRICT	406.74	29.61	436.35	89763	6816	412074.17	28546	986	657
18	NANDED DISTRICT	741.51	547.85	1289.35	71768	59691	346564.05	269230	1033	964
19	NANDURBAR DISTRICT	399.37	167.36	566.73	35151	19707	207778.16	99015	705	321
20	NASHIK DISTRICT	1892.48	778.82	2671.29	229146	112728	1148828.9	537100	1563	994
21	OSMANBAD DISTRICT	519.52	838.51	1358.03	57238	95297	365012.61	635906	749	816
22	PARBHANI DISTRICT	464.32	391.10	855.43	52641	45030	266837.84	229756	631	917
23	PUNE DISTRICT	2686.62	886.83	3573.45	207547	101972	1309177.58	460142	1562	822
24	RAIGAD DISTRICT	18.31	0.49	18.80	18326	360	42752.89	870	687	217
25	RATNAGIRI DISTRICT	9.53	0.00	9.54	14507	5	38533.1	7	816	260
26	SANGLI DISTRICT	1567.18	119.34	1686.53	221029	22044	1218848.07	101064	861	782
27	SATARA DISTRICT	1148.48	61.69	1210.17	179334	18563	983349.54	78780	1058	662
28	SINDUDURG DISTRICT	14.05	0.01	14.06	26175	8	58919.62	13	504	159
29	SOLAPUR DISTRICT	2538.59	1521.02	4059.61	193071	179746	1379836.67	1019704	1488	1142
30	THANE DISTRICT	18.52	0.52	19.04	5322	291	17379.72	883	464	226
31	WARDHA DISTRICT	179.39	3.70	183.09	74794	1626	279496.9	6376	629	445
32	WASHIM DISTRICT	382.62	92.10	474.72	50355	13152	236130.56	59697	513	520
33	YAVATMAL DISTRICT	633.99	289.90	923.89	85073	35824	405713.38	181046	1352	993
	Total	23810.00	12264.04	36074.04	2897017.00	1559875.00	15572564.65	7903543.68	30253.00	22945.00

No.	2020-21	Total Metered in MUs	Total UN-METERED in MUs	Total MUs	Total Metered in Consumers	Total Un Metered in Consumers	Total Metered Load in HP	Total Un-Metered Load in HP	*Total Geographical Area ('000 ha)*	*Gross cropped Area ('000 ha)*
1	AHMEDNAGAR DISTRICT	2093.47	1465.59	3559.06	183995	189967	1016512	904188	1702	1464
2	AKOLA DISTRICT	380.19	67.76	447.95	54493	10072	284307	48690	543	738
3	AMARAVATI DISTRICT	651.34	208.47	859.81	104509	30536	522296	167650	1222	980
4	AURANGABAD DISTRICT	714.00	832.99	1546.98	90111	134268	504065	677090	1008	1224
5	BEED DISTRICT	680.87	893.70	1574.57	70691	104216	335436	497821	1069	1022
6	BHANDARA DISTRICT	295.72	0.10	295.82	47790	168	175521	523	342	251
7	BULDHANA DISTRICT	820.63	245.98	1066.61	118341	44501	545129	225605	967	883
8	CHANDRAPUR DISTRICT	198.05	0.58	198.63	55185	479	213391	1611	1092	564
9	DHULE DISTRICT	482.28	319.98	802.26	50196	43218	270119	197643	733	526
10	GADCHIROLI DISTRICT	101.63	0.20	101.82	20625	99	72752	311	1492	220
11	GONDIA DISTRICT	352.12	0.77	352.89	36316	716	121005	2128	586	240
12	HINGOLI DISTRICT	561.61	315.86	877.47	42518	33080	215284	166940	466	613
13	JALGAON DISTRICT	1456.22	708.83	2165.05	115036	88404	816842	464644	1164	1152
14	JALNA DISTRICT	503.01	583.49	1086.50	58826	71585	272106	362511	773	876
15	KOLHAPUR DISTRICT	671.95	12.23	684.18	143467	5564	982578	24818	777	618
16	LATUR DISTRICT	723.23	445.77	1169.00	73295	54654	423161	288698	716	677
17	NAGPUR DISTRICT	413.01	24.66	437.67	89607	5283	411678	22723	986	657
18	NANDED DISTRICT	709.16	536.36	1245.51	69690	58989	337285	265553	1033	964
19	NANDURBAR DISTRICT	457.01	167.04	624.05	34895	18708	206764	92934	705	321
20	NASHIK DISTRICT	1941.41	738.52	2679.93	226617	106124	1139158	510084	1563	994
21	OSMANBAD DISTRICT	557.69	835.35	1393.04	55862	93348	357839	625019	749	816
22	PARBHANI DISTRICT	456.57	435.28	891.85	51830	44612	263031	227595	631	917
23	PUNE DISTRICT	2300.30	684.22	2984.51	206379	89495	1297840	409274	1562	822
24	RAIGAD DISTRICT	28.74	0.01	28.75	17860	52	43231	160	687	217
25	RATNAGIRI DISTRICT	11.38	0.00	11.38	13953	0	37556	0	816	260
26	SANGLI DISTRICT	1533.78	91.67	1625.45	217116	16751	1203088	77391	861	782
27	SATARA DISTRICT	1191.96	38.25	1230.22	174921	11674	930625	48921	1058	662
28	SINDUDURG DISTRICT	15.58	0.00	15.58	24447	11	56445	16	504	159
29	SOLAPUR DISTRICT	2337.63	1376.07	3713.70	190903	169707	1369892	969758	1488	1142
30	THANE DISTRICT	22.02	0.01	22.03	7070	21	22933	73	464	226
31	WARDHA DISTRICT	213.33	0.58	213.91	74628	463	278596	1921	629	445
32	WASHIM DISTRICT	401.67	84.96	486.63	49386	12555	231700	55579	513	520
33	YAVATMAL DISTRICT	657.01	286.39	943.40	83848	34964	401051	177571	1352	993
	Total	23934.56	11401.66	35336.22	2854406.00	1474284.00	15359211.65	7515441.02	30253.00	22945.00

	2019-20	Total Metered in MUs	Total UN-METERED in MUs	Total MUs	Total Metered in Consumers	Total Un Metered in Consumers	Total Metered Load in HP	Total Un-Metered Load in HP	*Total Geographical Area ('000 ha)*	*Gross cropped Area ('000 ha)*
1	AHMEDNAGAR DISTRICT	1541.29	1426.87	2968.17	181147	188526	1004443	895733	1702	1464
2	AKOLA DISTRICT	265.88	52.30	318.19	53736	9973	280221	48124	543	738
3	AMARAVATI DISTRICT	503.47	181.15	684.61	102957	30720	512848	169021	1222	980
4	AURANGABAD DISTRICT	483.78	659.70	1143.47	88766	134079	496828	675627	1008	1224
5	BEED DISTRICT	428.47	692.54	1121.01	68519	104157	326055	497074	1069	1022
6	BHANDARA DISTRICT	250.42	0.00	250.42	46708	0	172354	0	342	251
7	BULDHANA DISTRICT	554.49	226.03	780.52	117387	44311	540130	225754	967	883
8	CHANDRAPUR DISTRICT	160.40	0.00	160.40	54353	1	210466	2	1092	564
9	DHULE DISTRICT	375.58	285.26	660.84	48596	43108	263513	198829	733	526
10	GADCHIROLI DISTRICT	69.15	0.00	69.15	20370	0	71237	0	1492	220
11	GONDIA DISTRICT	277.85	0.00	277.85	36041	1	120170	3	586	240
12	HINGOLI DISTRICT	409.40	311.28	720.68	41097	33058	208072	166996	466	613
13	JALGAON DISTRICT	1139.08	625.05	1764.14	112712	88235	792114	464670	1164	1152
14	JALNA DISTRICT	348.00	458.25	806.25	56870	71477	270681	362551	773	876
15	KOLHAPUR DISTRICT	625.47	11.28	636.74	142142	3728	976462	15107	777	618
16	LATUR DISTRICT	522.75	375.68	898.43	72286	54463	418938	286660	716	677
17	NAGPUR DISTRICT	415.30	23.33	438.62	88709	4961	407507	21380	986	657
18	NANDED DISTRICT	492.29	437.21	929.50	67733	58735	325395	262292	1033	964
19	NANDURBAR DISTRICT	327.73	155.65	483.37	33923	18761	199374	92446	705	321
20	NASHIK DISTRICT	1526.69	709.65	2236.34	222955	105628	1125646	510683	1563	994
21	OSMANBAD DISTRICT	317.49	653.48	970.97	53781	93187	349592	626975	749	816
22	PARBHANI DISTRICT	395.37	341.80	737.17	51156	44544	259635	227229	631	917
23	PUNE DISTRICT	2178.38	707.33	2885.71	205771	86955	1304279	395046	1562	822
24	RAIGAD DISTRICT	24.94	0.00	24.94	17820	1	43168	3	687	217
25	RATNAGIRI DISTRICT	11.84	0.00	11.84	17496	0	46544	0	816	260
26	SANGLI DISTRICT	1391.25	100.74	1491.99	213912	16020	1181353	73612	861	782
27	SATARA DISTRICT	875.81	44.11	919.92	171585	10273	901904	40824	1058	662
28	SINDUDURG DISTRICT	16.62	0.00	16.62	24228	0	55892	0	504	159
29	SOLAPUR DISTRICT	1738.53	1208.69	2947.22	187942	168170	1270164	876376	1488	1142
30	THANE DISTRICT	20.09	0.00	20.09	6827	0	23672	0	464	226
31	WARDHA DISTRICT	201.21	0.00	201.21	74124	0	277190	0	629	445
32	WASHIM DISTRICT	295.54	76.22	371.75	48603	12415	227233	54748	513	520
33	YAVATMAL DISTRICT	588.92	314.90	903.82	82447	34712	395573	180592	1352	993
	Total	18773.47	10078.49	28851.97	2812699.00	1460199.00	15058655.81	7368354.68	30253.00	22945.00

	2018-19	Total Metered in MUs	Total UN-METERED in MUs	Total MUs	Total Metered in Consumers	Total Un Metered in Consumers	Total Metered Load in HP	Total Un-Metered Load in HP	*Total Geographical Area ('000 ha)*	*Gross cropped Area ('000 ha)*
1	AHMEDNAGAR DISTRICT	2036.49	1714.83	3751.32	175511	188555	959822	877706	1702	1464
2	AKOLA DISTRICT	355.83	71.75	427.58	51336	9975	268319	48132	543	738
3	AMARAVATI DISTRICT	593.47	240.56	834.03	99868	31606	497601	173447	1222	980
4	AURANGABAD DISTRICT	542.57	759.64	1302.21	86545	134194	483140	676153	1008	1224
5	BEED DISTRICT	531.31	850.31	1381.62	66820	104214	319068	497345	1069	1022
6	BHANDARA DISTRICT	266.66	0.00	266.66	45164	0	167732	0	342	251
7	BULDHANA DISTRICT	583.28	252.71	836.00	113784	44319	525210	225786	967	883
8	CHANDRAPUR DISTRICT	223.66	0.01	223.66	52072	2	202932	5	1092	564
9	DHULE DISTRICT	502.76	358.26	861.02	47953	43073	260925	198701	733	526
10	GADCHIROLI DISTRICT	90.63	0.00	90.63	19612	0	68747	0	1492	220
11	GONDIA DISTRICT	260.82	0.00	260.82	34410	0	115214	0	586	240
12	HINGOLI DISTRICT	387.95	285.55	673.50	38816	33061	196381	167011	466	613
13	JALGAON DISTRICT	1384.37	751.20	2135.57	110724	88326	782700	465198	1164	1152
14	JALNA DISTRICT	359.79	457.87	817.66	54332	71678	262197	363570	773	876
15	KOLHAPUR DISTRICT	743.87	20.49	764.35	139941	4033	963239	16529	777	618
16	LATUR DISTRICT	625.79	452.71	1078.50	70157	54558	408614	287137	716	677
17	NAGPUR DISTRICT	463.38	22.65	486.03	86896	4992	400683	21520	986	657
18	NANDED DISTRICT	531.09	452.30	983.39	66250	58748	318691	262343	1033	964
19	NANDURBAR DISTRICT	385.89	179.71	565.61	32354	18804	190786	92629	705	321
20	NASHIK DISTRICT	1739.99	767.65	2507.65	216080	105649	1094107	510798	1563	994
21	OSMANBAD DISTRICT	439.83	781.54	1221.37	52928	93191	345328	627013	749	816
23	PARBHANI DISTRICT	359.18	363.78	722.95	49374	44548	251155	227252	631	917
24	PUNE DISTRICT	2804.20	823.99	3628.19	201466	86976	1275600	393614	1562	822
25	RAIGAD DISTRICT	27.57	0.00	27.57	17873	1	42269	3	687	217
26	RATNAGIRI DISTRICT	14.06	0.00	14.06	17518	0	46637	0	816	260
27	SANGLI DISTRICT	1637.56	169.97	1807.53	204018	23350	1135155	106817	861	782
28	SATARA DISTRICT	1128.22	103.55	1231.78	159684	18011	851155	71819	1058	662
29	SINDUDURG DISTRICT	15.36	0.00	15.36	23975	0	55444	0	504	159
30	SOLAPUR DISTRICT	2445.42	1649.71	4095.13	181553	168266	1233783	877092	1488	1142
31	THANE DISTRICT	20.90	0.01	20.90	7027	0	24262	0	464	226
32	WARDHA DISTRICT	221.58	0.01	221.60	72895	1	267627	3	629	445
33	WASHIM DISTRICT	318.53	83.00	401.54	46157	12415	216283.16	54748	513	520
34	YAVATMAL DISTRICT	592.14	308.63	900.77	79231	34718	383145.85	180618	1352	993
	Total	22634.15	11922.42	34556.57	2722324.00	1477264.00	14613952.94	7422988.20	30253.00	22945.00

Annexure 3 Performance chart for three phase AC Pumps

PERFORMANCE CHART FOR 'KDS+ / KDS++ / GMC' SERIES, 2 POLE, MONOBLOC PUMPS, AT RATED VOLTAGE, 50 Hz FREQUENCY, THREE PHASE A.C. POWER SUPPLY																						
S. No.	Pump Model	Power Rating		Pipe Size (mm)		Rated Voltage (Volts)	TOTAL HEAD IN METRES															
							6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	40
		kW	HP	SUC.	DEL.		DISCHARGE IN LITRES PER SECOND																
1	KDS0510*	0.37	0.5	50	40	415	3.4	2.6	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	GMC-112	0.75	1.02	50	50	415	6.9	5.5	3.9	2.0	-	-	-	-	-	-	-	-	-	-	-	-	-
3	GMC-116++*	0.75	1.02	50	40	415	5.4	5.0	4.6	4.2	3.6	3.0	2.0	-	-	-	-	-	-	-	-	-	-
4	GMC-123+*	0.75	1.02	32	25	415	-	-	4.0	3.6	3.2	2.7	2.2	1.6	0.9	-	-	-	-	-	-	-	-
5	GMC-128+*	0.75	1.02	40	40	415	-	-	-	-	1.9	1.8	1.7	1.5	1.4	1.1	0.8	0.4	-	-	-	-	-
6	GMC-134	0.75	1.02	25	25	415	-	-	-	-	-	1.7	1.6	1.5	1.4	1.2	1.0	0.9	0.7	0.4	-	-	-
7	GMC-1.514+	1.1	1.5	50	50	415	-	8.3	7.1	5.7	3.6	-	-	-	-	-	-	-	-	-	-	-	-
8	GMC-1.522++	1.1	1.5	50	40	415	-	6.3	5.9	5.5	5.1	4.5	3.9	3.1	1.8	-	-	-	-	-	-	-	-
9	GMC-1.525+	1.1	1.5	50	40	415	2.6	2.6	2.5	2.5	2.4	2.3	2.2	2.1	2.0	1.8	1.6	-	-	-	-	-	-
10	GMC-1.540	1.1	1.5	32	25	415	-	-	-	-	-	-	-	-	2.0	1.9	1.7	1.6	1.5	1.3	1.1	0.9	0.6
11	KDS-212+	1.5	2	80	80	415	14.1	12.4	10.5	7.5	-	-	-	-	-	-	-	-	-	-	-	-	-
12	KDS-216++*	1.5	2	65	50	415	-	11.0	10.0	8.8	7.1	4.0	-	-	-	-	-	-	-	-	-	-	-
13	KDS-225++**	1.5	2	50	40	415	-	5.3	5.1	4.9	4.7	4.5	4.2	3.9	3.5	3.1	-	-	-	-	-	-	-
14	KDS-235+	1.5	2	50	40	415	-	-	4.1	4.1	4.1	3.7	3.5	3.4	3.2	3.0	2.5	2.2	1.8	1.3	0.5	-	-
15	KDS-314+*	2.2	3	80	80	415	19.0	18.0	16.4	14.5	12.0	-	-	-	-	-	-	-	-	-	-	-	-
16	KDS-318++**	2.2	3	80	65	415	-	13.4	12.6	11.7	10.7	9.2	7.5	-	-	-	-	-	-	-	-	-	-
17	KDS-325++**	2.2	3	65	50	415	-	-	9.2	8.8	8.4	7.9	7.4	7.0	6.4	5.8	4.9	-	-	-	-	-	-
18	KDS-335++*	2.2	3	50	40	415	-	-	-	5.7	4.9	4.8	4.7	4.6	4.4	4.2	4.0	3.8	3.6	3.2	2.7	2.0	-
19	KDS-515+*	3.7	5	100	100	400	32.8	31.0	28.0	24.2	19.0	12.5	-	-	-	-	-	-	-	-	-	-	-
20	KDS-520+*	3.7	5	80	80	400	24.0	23.0	22.0	20.8	19.5	17.9	16.0	14.0	11.0	-	-	-	-	-	-	-	-
21	KDS-527++**	3.7	5	80	65	400	-	-	-	-	-	14.3	13.5	12.5	11.6	10.3	8.7	6.4	-	-	-	-	-
22	KDS-538+**	3.7	5	65	50	400	-	-	-	-	-	-	-	8.5	8.4	8.3	8.1	7.8	7.6	7.1	6.5	5.8	-
23	KDS-822++*	5.5	7.5	100	100	400	-	-	-	27.3	25.6	24.0	22.2	20.1	17.6	14.5	-	-	-	-	-	-	-
24	KDS-830++*	5.5	7.5	80	65	400	-	-	-	-	-	19.0	18.2	17.3	16.4	15.4	14.2	12.7	11.1	-	-	-	-
25	KDS-837	5.5	7.5	65	65	400	-	-	-	-	-	-	-	-	-	12.6	12.5	12.2	11.8	11.1	10.3	9.0	-
26	KDS-1030++**	7.5	10	100	100	415	-	-	-	32.0	31.0	29.8	28.5	27.0	25.0	23.5	21.0	18.0	-	-	-	-	-
27	KDS-1040+*	7.5	10	80	65	415	-	-	23.5	23.0	22.6	22.2	21.6	20.9	20.3	19.5	18.7	17.9	17.0	15.7	14.6	13.4	9.6
28	KDS-1331+*	9.3	12.5	100	100	415	-	-	37.5	36.5	35.5	34.5	33.4	32.0	30.5	29.0	26.5	23.8	19.8	12.0	-	-	-
29	KDS-1537+*	11	15	100	100	415	-	39.0	38.5	38.0	37.2	36.5	35.3	34.5	33.0	31.6	30.0	28.0	25.0	22.0	17.5	-	-
30	KDS-2030+	15	20	125	125	415	-	-	-	-	-	49.0	47.0	45.0	42.0	39.0	35.0	30.0	21.0	-	-	-	-

Annexure 4 Regulations on Group Metering

Haryana

The Haryana Electricity Regulatory Commission framed regulations, Haryana Electricity Regulatory Commission (Single Point Supply to Employers' Colonies, Group Housing Societies and Residential or Residential cum Commercial/ Commercial Complexes of Developers and Industrial Estates/ IT parks/SEZ) Regulations, 2020. The provision under the same are mentioned below:

•Under the Regulations Employers' Colonies, Group Housing Societies, Developers' Commercial Complexes/ shopping malls/Industrial Estate/IT Parks/ SEZ covered are supplied electricity at single point at an appropriate voltage level and the distribution to individual consumers within such complex is done by the Users' Associations of these complexes. The function of meter reading, billing, bill distribution and collection of payment is performed by the User's Association. The payment of electricity received at single point meter is done by the Users' Association to the DISCOM.

•The Employer/GHS/ Developer/ Appropriate Government/Users' Association install, operate & maintain all infrastructure, including substations/transformers, meters required for distribution and supply of electricity within the premises of Employer/GHS/Developer/Users Association at his own cost. Employer / GHS / Developer/ Users Association shall be responsible for all liabilities & obligations including individual metering, billing, and collection of charges from individual users and payment of energy bill for Single Point Supply to the Distribution Licensee.

•The resident /users are charged for their consumption as per tariff approved by the Commission for respective category of consumers. if the Employer/GHS/ Appropriate Govt. Developer/Users Association, so require, the operation and maintenance may be done by the distribution licensee on payment of the O&M Charges @1.5 % of the cost of internal electrical infrastructure.

Punjab

The Punjab State Electricity Regulatory Commission has drafted the following regulations laying down the procedure for supply of electricity at a Single Point to Co-operative Group Housing Societies and Employers providing supply to their employees. These Regulations are called the Punjab State Electricity Regulatory Commission (Single Point Supply to Co-operative Group Housing Societies/Employers) Regulations, 2008.

•Distribution Licensee gives supply of electricity to a Housing Society and an Employer, who owns the premises, for residential purposes at a Single Point for making electricity available to the members of such Society /employees residing in the same premises/ Employers' colony.

•The Distribution Licensee give supply of electricity at a Single Point only to a Housing Society/ Employer having building plans approved by the Competent authority.

•The Distribution Licensee supply electricity to the Housing Society/Employer at a Single Point at 11KV or higher voltage.

•The Housing Society/Employer will install, operate & maintain all infrastructure, including step down substation, required for distribution of electricity within the premises of the Housing Society/Employers' colony at its/his own cost.

•The Housing Society/Employer is eligible for a rebate of 12% in addition to any other rebate on electricity consumption charges as admissible under General Conditions of Tariff and Schedules of Tariff approved by the Commission.

Delhi

Delhi Electricity Regulatory Commission vide its Regulation DERC (Supply Code and Performance Standards) Regulations, 2017 has made provision for Single point Supply as under:

•The Licensee gives single point supply, to the premises with multiple consumers/beneficiaries such as, multi storied buildings, Residential and Residential cum commercial complex developed by a developer and approved by an appropriate authority, Group Housing Societies, Commercial or Industrial Complex, Residential Complex constructed by any employer for his employees

•Supply shall be provided by the developer or registered association to the individual beneficiaries and for common service by installing separate meters.

•In such case the developer or registered association, collect the charges as per applicable Tariff Order from individual beneficiaries and remit the charges for the entire electricity availed at such single point of supply as per the bill.

•The maintenance of internal distribution network and providing services to individual beneficiaries shall be the responsibility of the developer or registered association, as the case may

Telangana

Several group housing societies and residential cum commercial complexes are being developed in different parts of Telangana. These complexes are developing their own distribution, infrastructure within their premises. Handing over this distribution infrastructure to distribution licensee for operation and maintenance is a complex issue. Further, in order to address the issue of sub-distribution of electricity by the owner of such premises to the consumers within the premises, the Telangana State Electricity Regulatory Commission (TSERC) has made the following regulation by amending the Regulation No. 4 of 2013, dealing with the provision of supply for single point connection.

•Buildings including multi-storied, domestic, commercial or industrial complex and residential complex constructed by any employer for his employees or by a panchayat or a co-operative society or a registered association of users with a minimum contracted load of 1 MVA on HT supply are eligible to apply for a single point of supply to distribution licensee.

•The single point supply consumer shall be categorized and billed for energy recorded in the meter at Single Point Supply based on the activity of the consumer at the tariff applicable for that category as notified by the distribution licensee in terms of determination made by the Commission

Annexure 5 PM KUSUM Yojana

Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM KUSUM), a Government of India Scheme is aimed at supporting the agriculture sector through setting up of decentralized solar power plants, replacement of agriculture diesel pumps with solar agriculture water pumps and solarization of existing grid connected agriculture pumps. The objective is to ensure energy security for farmers in the country while honouring the commitment to increase the share of installed capacity of electric power from non-fossil-fuel as part of Intended Nationally Determined Contributions (INDCs).The scheme aims to add solar and other renewable capacities of 25,750 MW by 2022 with the total central financial support of Rs 34,422 crore including service charges to the implementing agencies.

The scheme consists of three components:

- Component A: 10,000 MW of Decentralized Ground Mounted Grid Connected Renewable Power Plants of individual plant size up to 2 MW.
- Component B: Installation of 17.50 lakh standalone Solar Powered Agriculture Pumps of individual pump capacity up to 7.5 HP.
- Component C: Solarization of 10 Lakh Grid-connected Agriculture Pumps of individual pump capacity up to 7.5 HP.

Implementation Status as on 31.05.2022

Component A

S No	State	Total Sanctioned Solar Capacity (MW)	Total Installed Solar Capacity (MW)
1	Andhra Pradesh	0	0
2	Arunachal Pradesh	0	0
3	Assam	50	0
4	Chhattisgarh	30	0
5	Delhi	62	0
6	Gujarat	500	0
7	Goa	50	0
8	Haryana	65	2.25
9	Himachal Pradesh	20	16
10	Jammu & Kashmir	5	0

11	Jharkhand	50	0
12	Karnataka	500	0
13	Kerala	40	0
14	Ladakh	0	0
15	Madhya Pradesh	300	0
16	Maharashtra	500	0
17	Manipur	0	0
18	Meghalaya	5	0
19	Nagaland	0	0
20	Odisha	500	0
21	Puducherry	7	0
22	Punjab	220	0
23	Rajasthan	1200	35
24	Tamil Nadu	75	0
25	Telangana	500	0
26	Tripura	5	0
27	Uttar Pradesh	225	0
28	Uttarakhand	0	0
29	West Bengal	0	0
	Total	4909	53.25

Source : PM-KUSUM MNRE Govt Portal

Component B

S No	State	Total Sanctioned Standalone Pumps Installed (Nos)	Total Installed Standalone Pumps (Nos)
1	Andhra Pradesh	0	0

2	Arunachal Pradesh	50	0
3	Assam	1000	0
4	Chhattisgarh	20000	0
5	Delhi	0	0
6	Gujarat	3424	459
7	Goa	200	0
8	Haryana	37000	35040
9	Himachal Pradesh	950	322
10	Jammu & Kashmir	5000	253
11	Jharkhand	11000	6717
12	Karnataka	10500	314
13	Kerala	100	0
14	Ladakh	600	0
15	Madhya Pradesh	57000	7234
16	Maharashtra	100000	2595
17	Manipur	150	28
18	Meghalaya	200	35
19	Mizoram	2000	0
20	Nagaland	50	0
21	Odisha	5700	821
22	Puducherry	0	0
23	Punjab	12000	9074
24	Rajasthan	65000	40081
25	Tamil Nadu	6100	1187
26	Telangana	0	0
27	Tripura	3100	695
28	Uttar Pradesh	20000	6842

29	Uttarakhand	338	0
30	West Bengal	0	0
	Total	361462	111697

Component C

S No	State	Total Sanctioned Standalone Pumps Installed (Nos)	Total Installed Standalone Pumps (Nos)
1	Andhra Pradesh	0	0
2	Arunachal Pradesh	500	0
3	Assam	500	0
4	Chhattisgarh	0	0
5	Delhi	550	0
6	Gujarat	7000	0
7	Goa	11000	0
8	Haryana	0	0
9	Himachal Pradesh	0	0
10	Jammu & Kashmir	0	0
11	Jharkhand	500	0
12	Karnataka	0	0
13	Kerala	100	21
14	Ladakh	0	0
15	Madhya Pradesh	20000	0
16	Maharashtra	0	0
17	Manipur	0	0
18	Meghalaya	0	0
19	Nagaland	0	0
20	Odisha	0	0

21	**Puducherry**	**0**	**0**
22	**Punjab**	**0**	**0**
23	**Rajasthan**	**12500**	**1026**
24	**Tamil Nadu**	**20000**	**0**
25	**Telangana**	**0**	**0**
26	**Tripura**	**2600**	**0**
27	**Uttar Pradesh**	**0**	**0**
28	**Uttarakhand**	**200**	**0**
29	**West Bengal**	**700**	**0**
	Total	**76150**	**1047**

Annexure 6 Mukhya Mantri Krishi Vahini Yojana, Maharashtra

The Mukhya Mantri Krishi Vahini Yojana scheme was launched by the Government of Maharashtra on June 14 2017 to provide daytime power supply to farmers through the installation of solar power projects of capacity 0.3 MW to 10 MW within 5 km of substations in agriculture dominated areas. MSEDCL is implementing the scheme by directly connecting solar projects at 11 kV bus of AG-dominated substation through private solar projects developers such as Energy Efficiency Services Limited (EESL) & Maharashtra State Power Generation Company Limited (MSPGCL).

The scheme has multiple benefits such as good quality daytime power supply to farmers, reduced peak energy demand, increase in consumer satisfaction, reduction in Transmission & Distribution (T&D) losses, reduction in MSEDCL's total power purchase cost and Renewable Purchase Obligation (RPO) fulfilment.

Features

- Facilitation to farmers to lease their surplus land
- The lease rate for Government land will be Rs 1 for a period of 30 years.
- For private lands, lease rate will be Rs 30,000 per acre per year (with a yearly 3% increment)

Implementing Agency

M/s Maharashtra State electricity Distribution Company Limited (MSEDCL) is implementing Mukhyamantri Saur Krishi Vahini Yojana (MSKVY) by installing decentralized grid connected solar power projects for giving daytime power to farmers. MSEDCL is implementing the scheme by developing 0.3 to 10 MW solar projects in 5 km area of agriculture dominated sub-stations and directly connecting at 11 kV bus of agriculture dominated substation through private solar projects developers, EESL & MSPGCL.

Beneficiaries of the Scheme

The beneficiaries under the Mukhya Mantri Saur Krishi Vahini Yojana can be farmers group of farmers, co-operative societies, water users association, sugar factories, lift irrigation schemes, gram panchayat and any other institutions / organizations.

Eligibility Criteria

- The land must be between 3 acres to 50 acres
- The land nearer to MSEDCL 33/11 KV S/Stn (i.e., within 5 Km area)

- Landowner to give clear title land to MSEDCL on lease basis
- Proposed land must be free from any type of encroachment, mortgage, loans and liabilities free from any other institutes/organizations etc
- Landowner to provide and fix the boundaries of the land to be handed over the MSEDCL as per Mojani Nakasha

Benefits Offered

- The scheme has multiple benefits such as good quality daytime power supply to farmers, reduced peak energy demand, increase in consumer satisfaction, reduction in T&D losses, reduction in MSEDCL's total power purchase cost and RPO fulfilment.
- The lease rate for Government land is Rs.1 per acre for a period of 30 years
- For private lands lease rate will be Rs. 30,000/- per acre per year (with yearly 3% increment).
- Ceiling tariff for Solar Developers is in the range from Rs. 3 / Kwh to 3.15 / Kwh

Implementation Status

MSEDCL has contracted total 1472 MW capacity under MSKVY and around 516 MW capacity is commissioned as of July 22nd 2022 Since October 2nd 2020 day time power supply has been made available to approximately 76068 farmers on around 183 distribution feeders.

Solar Projects Developed by EESL:

The scheme is being implemented in two phases through the MoU route with tariffs of Rs 3.00 per unit for both the phases. In phase- 1 solar plants worth capacity of 200 MW are being implemented and in phase-2, solar plants worth capacity of 300 MW are being implemented. Projects are being developed on spare substation or Govt. Land.

Solar Projects Developed by M/s. MSPGCL:

MSPGCL have executed Power Purchase Agreement (PPA) with the grid connected solar projects developer and Power Sale Agreement (PSA) with Maharashtra State Electricity Distribution Company Limited (MSEDCL).

Total 600 MW Solar projects under MSKVY are planned to be executed by MSPGCL.

Projects executed under Mukhya Mantri Saur Krishi Vahini Yojana

S No	Name of Solar Developer	Contracted Capacity (MW)	Rate (Rs/kWh)
1	Nisagra Renewable Energy Pvt. Ltd	70	3.15
2	M/s Juniper Green Energy Pvt Ltd	30	3.15
3	M/s Atnu Solar Power Ltd	70	3.09 - 3.15
4	M/s Aurinko Energy Pvt. Ltd	10	3.11
5	Vijay m Mankari Proprietor Mankari Petroleum	2	3.29
6	Ask Green Energy Pvt Ltd	2	3.29
7	Dinesh D Mane partner Satya saibaba Construction	2	3.29
8	Venkat M Garje Proprietor Garje Steel Industries	2	3.29
9	Laxman N More propreitor Ganga Mauli Solar Energy	2	3.29
10	Vivek M reddy proprietor Reddy Construction	2	3.29
11	Harikishan R malu proprietor Shrihari traders	2	3.29
12	Ramprasad B Ghodke Partner M/s R B Ghodke	2	3.29
13	Ramesh N Amberkhane proprietor Ganesh Dall Industries	2	3.29
14	M/s Waacox	2	2.94
15	M/s Waacox	2	2.97
16	M/s Waacox	16	3.05
17	M/s Gro-Solar	7	3.1
18	M/s EESL	132	3.00
	Total	**357.2**	

Source : https://www.mahadiscom.in/solar-mskvy/commisioned_projects.php

District-wise implementation status of Mukhyamantri Saur Krishi Vahini Yojana for last 5 years as per data received from MSEDCL.

S No	District Name	No of Solar Plants installed under this Scheme	Solar Plant capacity installed (MW)	No of agriculture feeders linked with Solar Plants under the Scheme
1	Aurangabad	10	20.95	7
2	Jalna	9	51.87	4
3	Latur	25	43.1	28
4	Beed	13	25.69	11
5	Dhule	8	49.67	16
6	Osmanabad	9	15.31	7
7	Nanded	7	12.56	2
8	Hingoli	8	12	11
9	Parbhani	6	8.88	11
10	Bhandara	0	0	0
11	Gondia	1	0.59	0
12	Gadchiroli	1	1.52	0
13	Wardha	8	8.99	2
14	Nagpur	4	3.76	3
15	Amravati	6	30	6
16	Yavatmal	7	14.33	0
17	Washim	5	21.44	0
18	Akola	2	1.11	0
19	Nasik	11	55.69	27
20	Kolhapur	3	1.89	0
21	Sangli	3	4.66	1
22	Satara	5	8.34	3
23	Solapur	13	54.54	21

24	Pune	9	10.33	0
25	Ahmednagar	10	41.82	18
26	Nandurbar	2	2.59	0
27	Jalgaon	1	10	5
28	Ratnagiri	4	2.52	0
29	Palghar	1	1.6	0
30	Chandrapur	0	0	0
31	Buldhana	0	0	0
	Total	**191**	**515**	**183**

Source: Data from MSEDCL

Under the Mukhya Mantri Saur Krishi Vahini Yojana, 191 ground mount solar plants have been installed with a cumulative capacity of 515 MW. District Jalna, Nashik and Solapur have installed ground mount capacity of more than 50 MWs. About 183 agricultural feeders have been linked under this scheme in the state of Maharashtra.

Annexure 7 Mukhya Mantri Saur Krishi Pump Yojana, Maharashtra

In order to facilitate daytime irrigation to farmers and to promote the use of renewable sources of energy, the Government of Maharashtra has asked 'Mukhyamantri Saur Krushi Pump Yojana' (MSKPY) to install off-grid 3 HP & 5 HP Solar Photovoltaic Water Pumping Systems in a phased manner. In this scheme, as no electrical network is present, interruptions due to breakdown transformer failure etc. will not be faced by the farmers. Also, no electricity bills will be generated.

Features

The Government of Maharashtra has targeted the deployment of 1,00,000 nos. of off-grid Solar Powered Agricultural pumps under the "Mukhyamantri Saur Krishi Pump Yojana" in a phase wise manner.

- First Phase – 25000
- Second Phase – 50000
- Third Phase – 25000

The prime objective of this scheme is to provide daytime power availability for agriculture pumping, decoupling irrigation sector from power subsidy burden, and minimizing cross-subsidy burden on commercial and industrial electricity consumers and replacement of diesel pumps to reduce pollution.

Implementing Agency

M/s Maharashtra State Electricity Distribution Company Limited (MSEDCL) is the implementation agency.

Beneficiaries and Eligibility Criteria

1. **For 3 & 5 HP Solar Pump**
    a. Farmers who have farmland with an assured source of water.
    b. Farmers with no conventional electricity connection.
    c. Farmers with farmland up to 5 acre are eligible for 3 HP pump and farmers who have farmland above 5 acres are eligible for 5 HP & 7.5 HP pump.
    d. Farmers who are not electrified through any scheme previously.
    e. Priority will be given to farmers from remote & tribal areas.

f. Farmers from villages which are not electrified yet due to NOC from forest department.

g. Farmers who have applied for new electricity connection for agriculture pump.

2. For 7.5 HP Solar Pump

a. The water source must be a well or tube-well. Solar pump will not be given on well & tube well coming under over-exploited, exploited & partially exploited villages defined by GSDA.

b. Solar pump will be given to beneficiaries coming under villages in safe watersheds with stage of development/extraction less than 60%,

c. Solar pumps will not be given on bore wells coming under rock area.

d. The depth of the water source must not be more than 60 meters.

Category wise Beneficiary Contribution

S No	Category	Beneficiary Contribution	3 HP Beneficiary Contribution	5 HP Beneficiary Contribution	7.5 HP Beneficiary Contribution
1	General	10%	Rs. 16560/-	Rs. 24710/-	Rs. 33455/-
2	SC / ST	5%	Rs. 8280/-	Rs. 12355/-	Rs. 16728/-

Source : https://www.mahadiscom.in/solar/beneficiary-selection-criteria.html

Funding Arrangement

Phase	Beneficiary Share (Cr.)	Govt. Share (Cr.)	TOSE (Cr.)	Total (Cr.)
Phase-I	40.66	127.23	286.82	454.71
Phase-II & III	134.23	419.94	946.87	1501.04
Administrative Charges @ 2% of Project cost	-	-	39.12	39.12
Total	**174.89**	**547.17**	**1272.81**	**1994.87**

Source: Data from MSEDCL

Category wise allocation of Pumps

Phase	Gen	SC	ST	Total
Phase-I	19711	2953	2336	25000

Phase-II & III	59138	8858	7004	75000
Total	**78849**	**11811**	**9340**	**100000**

Source: Data from MSEDCL

Implementation Status

For installation of 25,000 solar AG pump of 3 HP & 5 HP capacity under phase I, Letter of Empanelment (LoE) have been issued to vendors on 07.03.2019. Target of installation of 25000 solar pump under Phase-I is completed.

The Govt. of Maharashtra vide G.R. No. Solar Project-2019/ C. No. 159/ energy-7 Dt. 11.09.2019 declared to implement Mukhyamantri Saur Krushi Pump Yojana (MSKPY) Phase-II & III together to install 75,000 Off-Grid 3 HP, 5 HP & 7.5 HP Solar Photovoltaic Water Pumping Systems. Target of installation of 75000 solar pump completed.

3 HP & 5 HP Ag Solar Pumps (67,500 Pumps)

Letter of Empanelment (LoE) have been issued to vendors on August 19, 2019, for the installation of 67,500 Nos. of solar pumps of 3 HP & 5 HP capacity.

7.5 HP Ag Solar Pumps (7,500 Pumps)

Letter of Empanelment (LoE) have been issued to vendors on October 26, 2020, for installation of 7,500 Nos. of solar pumps of 7.5 HP capacity.

Phase wise progress as of June 30, 2022

Phase	Target	Application Received	Application Approved	Quotation Paid	Vendor Selection	JSR Rejected	Pump Installed	% Pump Installed w.r.t Target
Phase -I	25000	26250	26250	26250	26250	1250	25000	100
Phase -II & III (3 & 5 HP)	67500	199889	100263	70916	70378	2878	67500	100
Phase -II & III (7.5 HP)	7500	34325	8595	7821	7794	294	7500	100

Phase	Target	Application Received	Application Approved	Quotation Paid	Vendor Selection	JSR Rejected	Pump Installed	% Pump Installed w.r.t Target
Total	**100000**	**260464**	**135108**	**104987**	**104422**	**4422**	**100000**	**100**

Source: Data from MSEDCL

District-wise implementation status of Mukhyamantri Saur Krishi Pump Yojana for last 5 years

S No.	District Name	Solar Agriculture Pumps Installed till 30.06.2022	Installed Capacity of Solar Agriculture Pumps (HP)	Area Covered (Hectares)
1	Akola	1314	4374	1774
2	Amravati	1971	7475	6540
3	Buldhana	4345	16396	6909
4	Washim	5941	22042.5	8892
5	Yavatmal	2197	7633	3749
6	Aurangabad	6832	23290	16714
7	Beed	8606	29033	92255
8	Hingoli	4954	16505.5	5949
9	Jalna	16960	62342	33505
10	Latur	1329	5280.5	2308
11	Nanded	2613	9005	4420
12	Osmanabad	4303	15204	55713
13	Parbhani	5483	19554	7803
14	Palghar	337	1216.5	2421
15	Raigad	250	874	505
16	Ratnagiri	697	2507.5	48757
17	Sindhudurg	266	988.5	811

18	Thane	132	533.5	395
19	Bhandara	2032	6376	2003
20	Chandrapur	1057	3550	2014
21	Gadchiroli	1832	5920.5	2117
22	Gondia	1057	3209	687
23	Nagpur	1767	6051	2636
24	Wardha	733	2569.5	1151
25	Ahmednagar	3742	15457	5538
26	Dhule	1111	4662.5	2207
27	Jalgaon	2976	10300	37752
28	Nandurbar	3035	12915	32082
29	Nashik	5020	17324	7767
30	Kolhapur	893	2928	23780
31	Pune	1926	6549	3246
32	Sangli	420	1397	424
33	Satara	1241	4125.5	13163
34	Solapur	2628	10235.5	6235
	Total	**100000**	**357824**	**442223**

Source: Data from MSEDCL

Annexure 9 Pani Bachao, Paise Kamao Scheme, Punjab

In order to arrest the rapid deterioration of groundwater levels and to ease the fiscal burden on M/s Punjab State Power Corporation Ltd, the Department of Power, Government of Punjab launched the “Paani Bachao Paise Kamao Scheme” on June 14 2018, which is a Direct Benefit Transfer for electricity (DBTE) for the agriculture consumers in the State of Punjab. The scheme is an alternative model of DBTE to agriculture as electricity saved by the farmer (agriculture consumer) is monetized and cash transferred to the bank account of the consumer. Through implementation of Direct Benefit Transfer for Electricity (DBTE) scheme, the Government of Punjab aims at Crop diversification, accurate Energy accounting, accurate accounting of Transmission & Distribution (T&D) Losses and curbing of wasteful energy consumption.

Features of the Scheme

The scheme is not compulsory for all farmers. The interested applicants can register under this scheme voluntarily. Once any agricultural worker enrolls in this project, it will be the responsibility of the Punjab government to install meters on the pumps. Consumers would be given a fixed electricity entitlement (KWh) based on their feeder and Pump size.

Any consumption measured from individual meters lower than the fixed entitlement would be reimbursed @ Rs.4.00 per KWh. In case any farmer consumes more than the specified electricity amount, the state will not take any additional fee from them. No bills will be issued to the farmers.

The farmers will be intimated through an SMS about their savings bi-monthly and electricity consumption fortnightly. The amount will be transferred directly to the consumer's bank account. Therefore, it is mandatory for farmers to have bank accounts. The power supply to the feeders under Pilot Project would be given in daytime schedule only and continue to be supplied as per the prevailing practice. If 80% of farmers on the feeder opt for this scheme, supply hours to that feeder could be increased by two hours.

Implementing Agency

M/s Punjab State Power Corporation Ltd., which is the electricity distribution company of the State Government of Punjab is the implementing agency for this scheme.

Beneficiaries

Only consumers with an agricultural electricity connection is eligible to participate in the scheme. To enroll under this scheme enrolment application as per Annexure-2 needs to be filled, signed, and submitted at the respective sub-divisional office of the Punjab State Power Corporation Limited (PSPCL).If the consumer lives out of the town/city/state or country, it is the liability of the cultivator of the farm to ensure that enrolment application form is filled and submitted by the consumer. In the case where the consumer is not alive anymore, the rightful heir of the connection can apply for a change of name of the electricity connection with Punjab State Power Corporation Limited (PSPCL) and would be eligible for monetary benefit under the scheme after the connection is changed on his/her name.

Benefits offered

Any consumption measured from individual meters lower than the fixed entitlement would be reimbursed @ Rs.4.00 per KWh and an excess of consumption above the fixed entitlement would attract no charge from the farmers. If 80% farmers on the feeder opt for this scheme, supply hours to that feeder could be increased by 2 hours.

The financial benefit for the agriculture consumer can be understood from the following example.

Considering the below mentioned details of DBTE Entitlement for 11 KV Sunder Pura feeder in district Fatehgarh Sahib

Feeder Name	Season	KWh / BHP / Month
11 KV Sunderpura feeder in Sub-Urban Sirhind Subdivision, District Fatehgarh Sahib	Paddy Season	180
	Non – Paddy Season	50

Source: Department of Power, Govt of Punjab, Order No 1/18/2017-EB (PR)/751

Implementation Status

As per the data received from M/s PSPCL out of a target of 52,222 farmers, 2509 farmers have enrolled under the phase-1 and phase-2 of the pilot project. The scheme has an enrollment of 4.8%, which is primarily due to the ongoing COVID-19 pandemic, which has limited mass enrollment drives, door to door campaigns and working with community organizations.

As per PSPCL data	Enrolled Farmers	Target	Enrolled %
PBPK Pilot Phase-1	309	942	33%
PBPK Pilot Phase-2	2200	51280	4%

According to the studies conducted by the World Bank in collaboration with the International Water Management, PBPK enrolled farmers have used less groundwater in comparison to those not enrolled.

World Bank Study in 3 No PBPK Pilot - 1 Feeders (June 2018 to Feb 2021)	
Total Consumers on 3 feeders	569
Consumers enrolled in PBPK	186
Meters Installed	186
Electricity allocation (KWh)	1711503

World Bank Study in 3 No PBPK Pilot - 1 Feeders (June 2018 to Feb 2021)	
Electricity saved (KWh)	717476
Electricity saved (%)	42%
Water Saved (KL)	5574443
Carbon Saved (tons)	588
Incentive Paid (INR)	2869906

From the above table it can be seen that for a sample study on three feeders with a total of 560 consumers, about 186 consumers have enrolled under the scheme, and 42% savings in electricity consumption has been observed from June 2018 to February 2021. Simultaneously, for the rest of Punjab electricity usage has increased for 2019-20 in comparison to 2018-19 and an increase of 13% for 2020-21 in comparison to 2019-20.

Financial Year	AP Consumption (MU's)	% increase / decrease
2018-19	11226.74	-
2019-20	11537.64	3%
2020-21	13050.83	13%

Effectiveness of the Scheme

With the implementation of this scheme, a saving of 42% in electricity consumption was observed.

Annexure 10 जमिन_उपयोगिता_सांख्यिकी_2020_21

Scheme For Timely Reporting Of Agril. Intelligence Land Utilisation Statistics 2020-21 (Estimated)

(Area in '00' ha)

Sr. No.	District	Forest	Barren & unoult. Land	Land Under Non- Agril use	Culturable Waste Land	Permanent Pasture	Misc.Trees & groves	Current Fallow	Other Fallow	Net Area Sown	Area Sown more than once	Gross Cropped Area	Geographical Area	Cropping Intensity	Cultivable Area
1	2	3	4	5	6	7	8	9	10	11	12	13 = (11+12)	14 = (Add of 3 to 11)	15= (col13/col11*100)	16=(6+8+9+10+11)
1	Mumbai Sub	15	73	286	0	6	0	0	0	0	0	0	380	0	0
2	Palghar	1942	186	411	186	395	15	63	76	1422	0	1422	4697	100	1763
3	Thane	1464	206	610	154	211	215	31	106	1643	630	2274	4640	138	2149
4	Raigad	1567	1460	590	380	425	229	138	459	1619	177	1797	6868	111	2825
5	Ratnagiri	53	2244	145	1309	136	99	281	1362	2534	89	2623	8164	104	5585
6	Sindhudurg	331	998	205	661	20	254	144	1022	1405	187	1592	5040	113	3486
	Konkan Div	**6372**	**5167**	**2247**	**2890**	**1193**	**813**	**867**	**3026**	**8823**	**1084**	**9707**	**29789**	**113**	**15809**
7	Nasik	3128	2051	448	198	226	20	1046	290	8228	1600	9828	15634	119	9782
8	Dhule	1990	546	245	32	178	12	139	105	4082	1339	5421	7330	133	4370
9	Nandurbar	3734	332	105	30	325	7	11	66	2441	1198	3639	7050	149	2654
10	Jalgaon	1559	1047	163	63	388	28	97	49	8245	5408	13653	11639	166	8483
	Nasik Div	**10411**	**3876**	**961**	**323**	**1118**	**67**	**1293**	**610**	**22996**	**9545**	**32541**	**41863**	**142**	**25189**
11	Ahmadnagar	1684	1318	140	210	366	33	1468	1219	10582	4845	15428	17020	146	13513
12	Pune	1902	2428	3261	482	1998	161	595	249	4545	3418	7963	15620	175	6032
13	Solapur	368	925	184	374	749	70	1462	1291	9454	2605	12058	14878	128	12651
	Pune Div.	**3854**	**4671**	**3585**	**1066**	**3113**	**264**	**3525**	**2758**	**24581**	**10868**	**35450**	**47518**	**144**	**32196**
14	Satara	1479	1234	340	412	740	79	286	682	5329	1369	6698	10580	126	6788
15	Sangli	434	367	505	143	153	162	389	475	5984	2006	7990	8610	134	7152
16	Kolhapur	1469	435	382	367	411	68	98	204	4331	2189	6520	7766	151	5069
	Kolhapur Div	**3382**	**2036**	**1227**	**922**	**1303**	**309**	**772**	**1361**	**15644**	**5564**	**21208**	**28958**	**136**	**19009**
17	Aurangabad	903	216	609	146	325	78	529	103	7166	5996	13162	10076	184	8023
18	Jalna	49	72	203	186	271	115	959	221	5650	3590	9240	7726	164	7132
19*	Beed	226	348	598	372	289	14	820	452	7567	2648	10214	10686	135	9225
	Aurangabad Div	**1179**	**636**	**1410**	**706**	**884**	**207**	**2308**	**776**	**20383**	**12233**	**32616**	**28488**	**160**	**24379**
20	Latur	18	200	266	383	231	233	366	331	5129	2080	7208	7157	141	6442
21	Osmanabad	44	71	216	496	241	22	1065	1261	4068	3258	7326	7485	180	6912
22	Nanded	793	186	515	339	273	70	810	188	7158	2705	9862	10331	138	8565
23	Parbhani	64	81	288	233	131	13	376	259	4866	4039	8904	6311	183	5746
24	Hingoli	229	63	102	104	155	1	408	131	3468	2714	6182	4661	178	4113
	Latur Div	**1148**	**602**	**1387**	**1555**	**1030**	**338**	**3026**	**2171**	**24888**	**14795**	**39483**	**35945**	**180**	**31778**
25*	Buldhana	1125	585	632	277	423	7	271	305	6045	3981	10027	9671	166	6905
26	Akola	301	111	376	29	166	11	107	62	4268	3226	7493	5429	176	4476
27	Washim	363	74	280	68	286	6	202	109	3743	1460	5203	5131	139	4127
28	Amravati	2919	194	449	92	332	60	337	182	7652	2328	9981	12217	130	8324
29	Yavatmal	2402	441	655	227	709	116	393	248	8327	2307	10634	13519	128	9311
	Amravati Div	**7110**	**1405**	**2392**	**692**	**1916**	**200**	**1310**	**906**	**30038**	**13302**	**43338**	**46967**	**144**	**33143**
30	Wardha	595	96	379	211	630	95	512	188	3484	1197	4681	6289	134	4590
31	Nagpur	1541	338	994	345	554	78	215	217	5580	1014	6594	9864	118	6436
32*	Bhandara	613	54	420	116	385	83	46	9	1693	797	2490	3420	147	1947
33	Gondia	2074	132	556	150	967	16	54	36	1874	768	2642	5859	141	2130
34	Chandrapur	3902	247	977	339	47	211	111	114	4969	702	5671	10918	114	5744
35	Gadchiroli	10784	153	723	231	514	41	455	65	1950	616	2566	14916	132	2742
	Nagpur Div	**19510**	**1021**	**4049**	**1392**	**3088**	**623**	**1493**	**830**	**19550**	**5093**	**24643**	**51298**	**126**	**23688**
	Maharashtra State	**52088**	**18513**	**17259**	**9346**	**13863**	**2722**	**14383**	**12140**	**186602**	**72484**	**238888**	**307682**	**144**	**206091**

Note:- * From Beed and Bhandara Districts information of LUS is not received so Last years figures taken .

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