Agricultural Load Consumption of AG Feeder: A Detailed Analysis

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Abstract- This paper aims to find a reliable and efficient method to analyses agricultural load consumption. The greater goal of this effort is to end the ambiguity in the unmetered agricultural consumption figure. Amdapur AG feeder circuit is considered here for detail analysis of agricultural consumption. The crop data, motor data, meter data and electricity parameters are measured and collected for detail analysis from 80 farmers of 4 different DTC of amdapur AG feeder. Efficient metering and clarity in supply to agriculture will to lead better health of the distribution utility and hence better supply to rural consumers.

Keywords- *Distribution system, Agricultural load consumption,Analysis.*

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I. INTRODUCTION

Today farmers are facing the problems of low voltage, load shedding and higher electricity tariff. So in this paper analysis of agricultural consumption according to crop, land area of crop, electric motors (pump) and energy meters are made. This will help to develop efficient methodology to determine agricultural consumption. Managing agricultural load is increasingly becoming a challenge for electricity utility in India. Agricultural consumption has ambiguity in numbers, stated could be higher than actual. In Maharashtra it is the data shown that 26% of total electricity is used for agriculture and it is much greater than actual consumption. This leads to calculation of lower losses than exist and government giving 65% of subsidy on agricultural load. Means government is subsidizing the losses. There is also lots of ambiguity in metering and unmetering figure. Currently metered supply consumption extrapolated to unmetered, even metered consumers data is not reliable. The objective of this paper is to find and analyze the data of unmetered and metered consumer. In this paper detail study of amdapur ag feeder is done to analyze the metered, unmetered data and load data according to HP ratings of pump motors.

II. METHODOLOGY

Amdapur AG feeder is selected for study.Feeder leveldata is collected from monthly and daily ledger record. 4 DTC are selected which are spread at long distance from each other.20 Consumers from each DTC are selected and detail data is collected from all farmers. Three types of forms are generated for survey the data

- Feeder level survey form
- DTC level survey form
- Farmer survey form

In feeder survry form the data related to feeder like meter number,energy reading from monthly and daily ledger record have collected. In DTC survey forms data related to dtc like DTC number,meter number,working condition, CT&PT ratios and kWh readings have collected. In Farmer survey form data of crop,pump usage time, HP rating of motor,meter data,voltage,current,power factor readings have collected.

In this study:

- Find electricity usage for various crops.
- Field level checks of data for e.g. power consumption as recorded and actual power consumption.
- Check energy outflow on feeders.
- Check status of metering on the ground.

From the data collected:

- Compare ideal crop-water requirements to real usage.
- Analyze the pattern of connected load as per MSEDCL records to actual loads.
- Analyze the dependence of the above two results to the energy outflow on the feeder.
- Estimate variation in water usage across consumers on a DT / on a feeder .

III. FEEDER STUDIED

Amdapur AG feeder is selected for analysis of agricultural load consumption according to instructions of IIT,Bombay. Amdapur AG feeder belongs to Amaravati Zone, Buldhana Circle, Buldhana Division, Chikhli Subdivision, 33/11 Kv Amdapur Substation.

On record total AG Consumers on Amdapur AG feeder are 1344.Out of this 1126 are metered consumers. From Feeder survey form , average monthly use of energy is 120 kWh.Peak value is obatined in month of october. But as meter on this feeder is slow the obtained data from feeder survey form is not accurate.

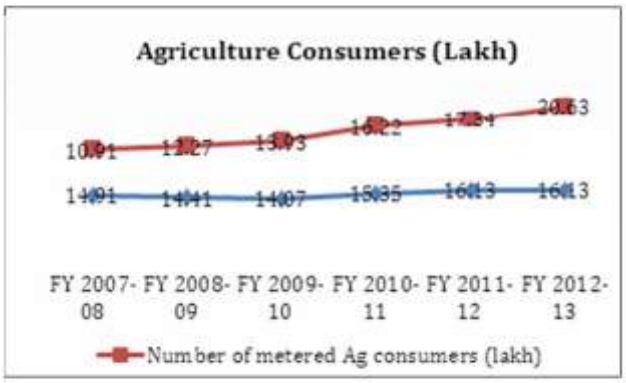
Following DTC are selected for Study according to geographical sepeartion from single line diagram:

- JK DTC (4286536)
- Water Work DTC (4286579)
- Sapkal DTC (2861042)
- Tormal DTC (4286462)

IV. METERED AND UNMETERED CONSUMERS

Total agricultural consumption is the sum of metered and estimated unmetered consumption and distribution losses are then estimated by deducting agricultural use and the metered consumption of nonagricultural consumers. To develop a more precise estimate of agricultural power use, it is important to know correct figure of metered and unmetered consumers. Agricultural consumers benefit from electricity subsidies provided by the States but these consumers remain unmetered in many cases. Separating the feeder to irrigation pumps from other uses with assured electricity supply during the stipulated hours can contain excessive electricity consumption. In the case of low-income households that enjoy subsidized electricity which remain unmetered, prepaid meters can regulate their power consumptions.

At present, the electricity consumption of an unmetered pump is just an estimate based on the calculations made by Maharashtra Electricity Regulatory Commission (MERC). The Commission has been asking MSEDCL since 1998 to meter all agricultural pumps, but the company has not followed this directive. However, around 93% connections provided since then are metered ones and therefore the metered figure has reached 50%.In this agricultural area the consumption is more than that estimate by MERC's formula. Hence, MSEDCL is losing a lot of revenue. The energy charge for farmers is Rs 2.10 per unit, of which, state government pays Rs. 1.70 per unit as subsidy and remaining is to be paid by the farmer. On the other hand, MSEDCL gets Rs. 600 per horse power (HP) for an unmetered connection per year as subsidy. MSEDCL has been charged with increasing agricultural consumption to reduce several times and MERC had exposed it in the year 2000, which led to increase in distribution losses from 17% as claimed by MSEB (MSEDCL's predecessor) to 40%. Since there is no way of finding out how much electricity an unmetered pump is consuming, electricity being stolen can be partly passed off as increase in unmetered agricultural connection. Moreover, higher the agricultural consumption, higher is the subsidy paid by state government. Only half the 34 lakh agricultural pumps are metered in Maharashtra state. The following figures summarize the trend in growth in metered and unmetered agricultural consumers and consumption over five years [4] .



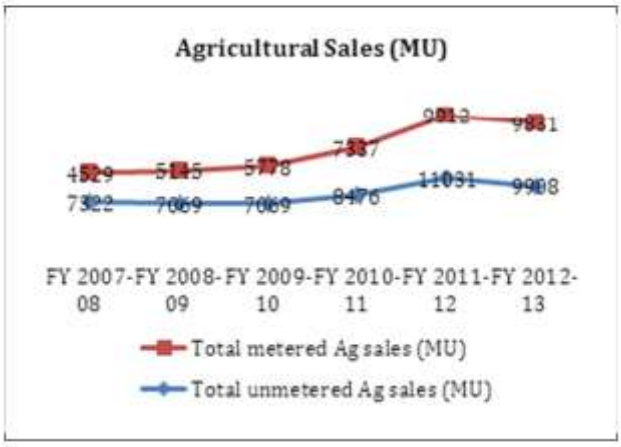


Fig. 1 Agricultural consumers and sales over the years for MSEDCL[4]

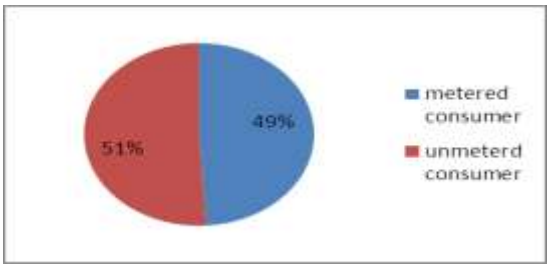


Fig. 2 Pie graph of metered and unmeterd consumers percentage.

On Amdapur AG feeder 51% consumers are unmetered.The greater goal of this paper is to end the ambiguity in the unmetered agricultural consumption figure. So it is important to find exact figure of unmetered consumers.

V. DATA ANALYSIS

From the Farmer survey forms data analysis is done and following results are obtained. . The correct estimation of unmetered consumption by the agricultural sector greatly depends upon the cropping pattern, ground water level, seasonal variation, hours of operation etc.

A. Meter State

Out of total metered consumers on Amdapur AG 73 % meters are in working state and 27 % are not in working state.So this is serious issue as meter readings not obtained.

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22 - 25

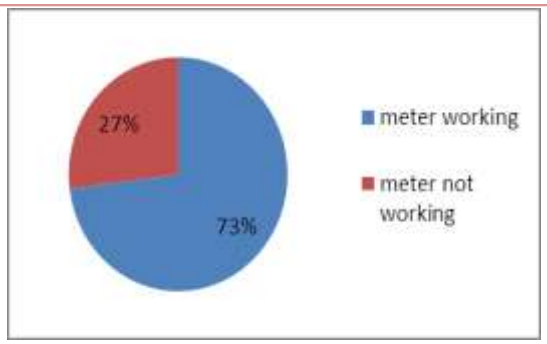

Fig. 3 Pie graph showing meter state.

B. Water Source

In Amdapur area 91% of consumers have well as a water source. Other sources of water are borewell,Dam,Shevadi. Shevadi is a small water canal.

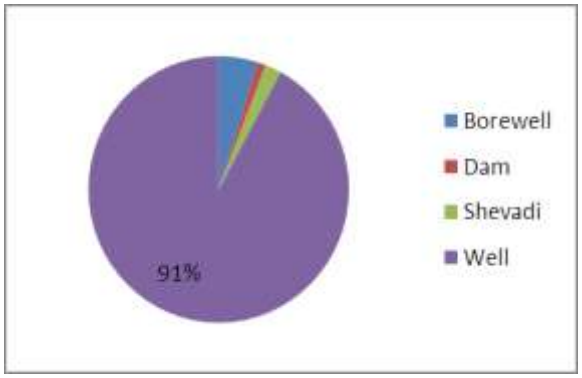

Fig. 4 Pie graph Showing percentage of water usage.

C. Depth of Water Source

50% of water source have depth of 25-50 feet ,about 25 % water source have depth of 50-75 feet and 20% have 10-25 feet. According to deph of Water source the electricity consumption of motor is varied.

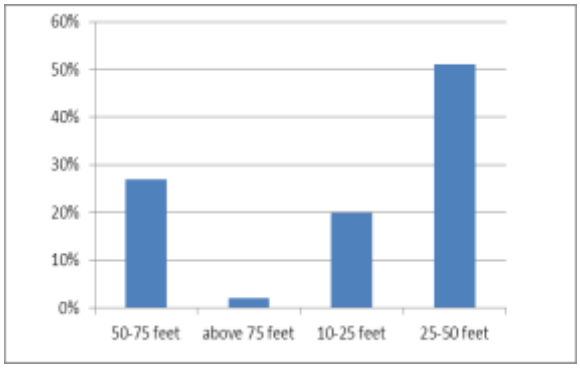

Fig. 5 Percentage of Depth of water source in feet

D. Irrigation

Maximum consumers uses the sprinkler type of irrigation.Other types of irrigation are Drip,Food and Furrow.Fig. 6 shows percentage of their uses.

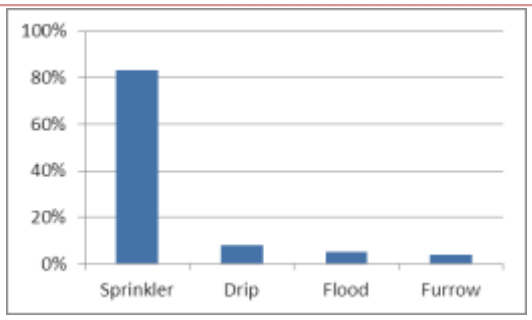

Fig. 6 Percenatge of irrigation type used.

E. Crop Data

Fig. 7 shows 45% of Soyabeen crop is taken in amdapur region. Soyabeen and Tur is cropped in combine,about 28% of this crop is taken. Wheat is also main crop of about 15 % consumer take this crop.other crops are Bhuimug,mug,onion and tur etc. This same crop are taken in the month from June to November. About 78% consumers are take second crop in their farm in month of November to March,wheat is the main crop taken in this months.

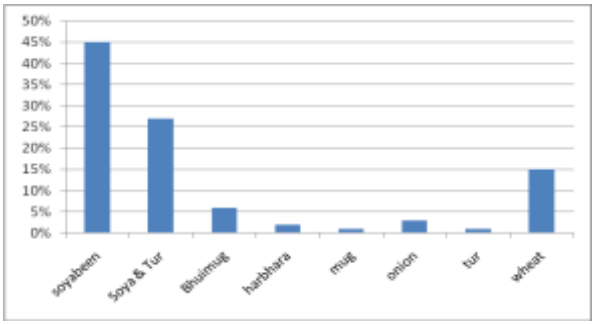

Fig. 7 Percentage of crop taken in the month from June to Novemeber.

F. Daily Pump Usage

About 45% consumers have used pump 2-4 hours daily.30% consumers used pump 0.5-2 hours daily.15% consumers used 4-6 hours daily. In rare cases above 6 hours pump are used. As survey is done in summer period there is more scarcity of water.

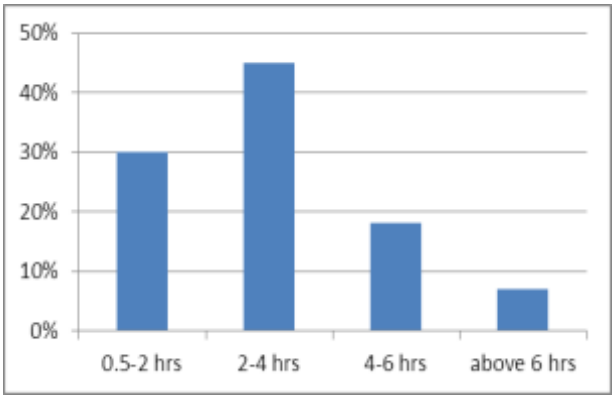

Fig. 8 Percentage of Daily Water punp usage in hours

G. Voltage Fluctuations

There are large voltage fluctuation is observed in the agricultural area.From the data,only 23% consumers get the

voltage in balanced range from 225-230 volts. 41% consumers obtained voltage greater than 235 volts and 20% consumers obtained the voltage less than 220 volts.This scenario is reverse in seasonal month.

H. HP rating of Motors

67% consumers used 3 HP motors,32% consumers used 5HP motor and only 2% consumers used 7 HP motors.Unmetered consumers have electricity tariff on the basis of their HP ratings of motor registered.Actual consumption is more than registerd.

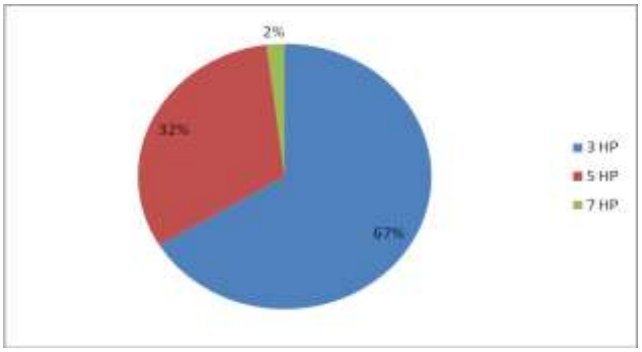

Fig. 9 Percentage according to HP rating of motors.

I. Power Factor

A distribution system's operating power is composed of two parts: Active (working) power and reactive (non-working magnetizing) power. The active power performs the useful work - the reactive power does not. Reactive power is useful to maintain voltage constant.The induction motor used in agricultural pump have a lower power factor.

Clamp on power meters are used to measure voltage,current and power factor of consumers machines.From the survey form data only 7% consumers have power factor of about 0.9 .26% consumers have 0.8 power factor reading and 19% consumers have power factor of about 0.7 . But still 28 % consumers have power factor less than 0.6 which is very poor.

VI. PROBLEM FACED BY CONSUMERS

The most common problem of consumer is voltage fluctuation and irregular power supply. Many consumers are connected to DTC above the rating of DTC it results in burning in DTC. Many consumers didn't get the bill on time. These are the common problems faced by consumers.

VII. CONCLUSION

Amdapur AG Feeder is studied in this paper and analysis is done. The unmetered consumer and metered consumer are in equal proportion here. Maximum consumers are not satisfied with the voltage fluctuation in supply. Capacitive bank is necessary as power factor at many consumers end is very low. Well is the main water source in this area with commonly 25-50 feet depth. Sprinkler is the common irrigation type used in amdapur region and consumers use 2-4 hours pump daily. By this method of analysis agricultural load consumption, the detailed analysis of the area can be obtained depending upon the results, low power factor and voltage fluctuation problems can be easily handled and methods are adopted to improve them.

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