CHAPTER III

SURVEY METHODOLOGY

Description of the Sample Design

The total number of electrified villages in the Poona Division as on August 1965 were first arranged taluka-wise, and within each taluka theywwere further ordered chronologically by the year in which they were electrified based on their dates of electrification. Since the objective of the study was to analyse the factors underlying the use of electricity for irrigation purposes, the electrified villages were classified into two categories, namely, those having developed irrigational use of electricity in the wake of electrification and those where such use had not developed. In the sub-Divisional offices (known as Operation and Maintenance Sub-Division) of the Board, the meter-cards of the individual consumers with their classification[1] are maintained village-wise as the bills are issued

1 The consumers of electrified villages were classified in the following five groups : (1) Domestic lighting (2) Commercial lighting (3) Street lighting (4) Industrial, and (5) Agricultural, i.e., irrigation purposes.

to the consumers from these offices. Two lists of villages were prepared based on the meter-cards of the villages. The one list was of the villages whose meter-cards as of August 1965 showed consumers of electricity for irrigational purposes, while the other list was of the villages whose meter-cards of the same month did not show such consumers. Thus a village was classified as having an irrigational load of electricity or otherwise, if a consumer of electricity for irrigation purposes was found or not among the meter cards of the village as of August 1965.

Table 3.1 shows the classification of electrified villages on the above-mentioned two characteristics which constituted the sample for selection of villages for the field inquiry. It can be observed from the Table 3.1 that out of 153 electrified villages, 81 villages had developed irrigational load of electricity while 72 had not developed such a load by the end of August 1965. It was decided to adopt 10 per cent sampling fraction for field inquiry which meant selection of 15 villages, of which 8 having irrigational load and 7 not having such a load. Further, these villages in each category were selected from table 3.1 with probability proportional to years of electrification and talukas in the Division. Table 3.2 shows number of sample villages selected from different cells of table 3.1 following the above-stated procedure of selection.

Table 3.1 : The sample-frame - classification of electrified villages according to their years of electrification and their location vis-avis taluka.

YEAR OF ELECTRIFICATION	TALUKA	NAVAL			HAVELI			KHED			PURANDHAR			MULSHI		
		Number of villages			Number of villages			Number of villages			Number of villages			Number of villages		
		Electrified	Having agricultural load	Non having agricultural load	Electrified	Having agricultural load	Non having agricultural load	Electrified	Having agricultural load	Non having agricultural load	Electrified	Having agricultural load	Non having agricultural load	Electrified	Having agricultural load	Non having agricultural load
1957-58		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
1958-59		2	1	1	1	1	-	-	-	-	-	-	-	-	-	-
1959-60		-	-	-	3	1	2	1	1	-	-	-	-	-	-	-
1960-61		3	1	2	4	3	1	3	3	-	3	3	-	-	-	-
1961-62		5	1	4	13	9	4	10	4	6	8	6	2	1	1	-
1962-63		-	-	-	4	4	-	11	5	6	8	4	4	6	2	4
1963-64		-	-	-	-	-	-	1	1	-	-	-	-	1	-	1
1964-65		-	-	-	6	3	3	1	1	-	2	1	1	1	-	1
1965-66*		-	-	-	1	-	1	-	-	-	2	-	2	1	-	1
Total		13	6	7	32	21	11	27	15	12	23	14	9	10	3	7

* Upto end August 1965.

Table 3.1 (contd.)

YEAR OF ELECTRIFICATION	TALUKA: AMBEGAON Number of villages			JUNNAR Number of villages			SIRUR Number of Villages			TOTAL Number of villages		
	Electrified	Having Agricultural load	Not having agricultural load	Electrified	Having Agricultural load	Not having agricultural load	Electrified	Having Agricultural load	Not having agricultural load	Electrified	Having Agricultural load	Not having agricultural load
1957-58	-	-	-	-	-	-	-	-	-	3	3	-
1958-59	-	-	-	-	-	-	-	-	-	3	2	1
1959-60	-	-	-	-	-	-	-	-	-	4	2	2
1960-61	-	-	-	-	-	-	-	-	-	13	10	3
1961-62	-	-	-	-	-	-	-	-	-	37	21	16
1962-63	3	3	-	5	5	-	-	-	-	31	23	14
1963-64	4	1	3	14	9	5	9	1	8	29	12	17
1964-65	10	2	8	1	1	-	1	-	1	22	8	14
1965-66*	-	-	-	-	-	-	1	-	1	5	-	5
Total	17	6	11	20	15	5	11	1	10	153	81	72

* Upto end August 1965.

Table 3.2 : Distribution of sample number of villages selected from different cells of the table 3.1.

Year	TALUKA																										
	Maval			Haveli			Khed			Purandhar			Mulshi			Ambegaon			Junnar			Sirur			Total		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1957-58 to 1959-60	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
1960-61	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-
1961-62	-	-	-	2	1	1	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	2
1962-63	-	-	-	-	-	-	1	1	-	1	-	1	1	-	1	-	-	-	1	1	-	-	-	-	4	2	2
1963-64	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	1	3	1	2
1964-65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	-	2	1	1
1965-66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1	1	-	3	2	1	3	2	1	2	1	1	1	-	1	2	1	1	2	1	1	1	-	1	15	8	7

A = Total no. of sample villages selected.
B = No.of sample villages selected from the category "villages having agricultural load"
C = No.of sample villages selected from the category "villages not having agricultural load".

Table 3.3 : Details of sample villages originally selected for field inquiry.

Sr. No.	Name of the village	Category of village with respect to development of agricultural (irrigational) load	Year of electrification of the village	Date of Electrification of the village	Taluka in which the village is located
1.	Vadgaon	Having agricultural load	1957-58	13-12-57	Maval
2.	Chikhali	-do-	1960-61	27-6-60	Haveli
3.	Phursungi	-do-	1961-62	11-12-61	Haveli
4.	Shivari	-do-	1961-62	26-1-62	Purandhar
5.	Dawadi	-do-	1962-63	30-6-62	Khed
6.	Narayangaon	-do-	1962-63	16-12-62	Junnar
7.	Retawadi	-do-	1963-64	26-1-64	Khed
8.	Narodi	-do-	1964-65	31-8-64	Ambegaon
9.	Mahalunge	Not having agricultural load	1961-62	30-1-62	Khed
10.	Chincholi	-do-	1961-62	31-3-62	Haveli
11.	Kothale	-do-	1962-63	31-7-62	Purandhar
12.	Paud	-do-	1962-63	30-11-62	Mulshi
13.	Parunde	-do-	1963-64	30-10-63	Junnar
14.	Ranjangaon	-do-	1963-64	29-2-64	Sirur
15.	Shinoli	-do-	1964-65	26-1-65	Ambegaon

Table 3.3 shows the details of 15 villages selected on the basis of random number tables from the villages in the respective cells of the table 3.1.

Alteration in the Selected Villages

However, during the course of the survey of the selected villages, one alteration had to be made in the villages originally selected for the field inquiry owing to unforeseen difficulties. In the course of the field survey of the village 'Shivari', when the canvassing of the schedules pertaining to the cultivators using oil engines was completed, and when the schedules pertaining to the cultivators using electric motors were almost filled in, it was realised that all the motor-users reported to be existing in the village Shivari, according to the meter-cards at the Sub-divisional Office, actually belonged to the neighbouring village Walunj.

The mis-reporting of the location of motor-users was perhaps due to the peculiar circumstance under which the electricity was granted to the village Shivari. As was revealed in the survey, the inhabitants of the village Shivari and Walunj had applied for granting electric connection for a temple within the precincts of the village Shivari, as annually a fair is held in the temple. The Board officials put a condition that electricity would be granted to the temple provided the

cultivators on the neighbouring farms agreed to take electricity for pumping sets. The geographical situation of the two villages (Shivari and Walunj) is such that a road (State Highway joining Poona and Phaltan) separates both the villages, and while the temple lies on the one side of the road within the boundaries of the village Shivari, the neighbouring farms are on the other side of the road in the village Walunj.

Subsequently the cultivators came forward to take up electric motors on their farms and hence electric lights were granted to the temple. As the temple was located in the village Shivari, the officials of the Board perhaps thought that the farmers going for electric motors also belonged to the village Shivari and, therefore, put their meter-cards in the bunch containing the meter-cards of village Shivari.[1]

The above-mentioned findings of the survey entailed alterations in the composition of Table 3.1 as under :

(a) Since the village Shivari had now to be categorised as village not having agricultural load, it marginally altered the distribution of villages electrified during 1961-62 between two categories (viz., having and not having agricultural load) from 21 and 16, respectively, as shown in the Table 3.1 to 20 and 17. This was the result of change

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1 The fact that this mis-reporting was carried over the years, is a corroboratory evidence to the finding of the "Report of An Evaluation Enquiry of the Rural Electrification Scheme" of the Maharashtra Government, 1966, that the officials of the Board do not visit the village once it is electfieid - see page 14 of the Report.

in composition of 2 categories of villages electrified in Purandhar taluka during the year 1961-62.

(b) The above-stated change in the status of village Shivari in relation to development of agricultural load was compensated by the change in the status of village Walunj from being shown originally as village not having agricultural load to now being shown as village having agricultural load. Thus, the distribution of electrified villages between two categories remained unaltered, both at the aggregative level as also for Purandhar taluka.

(c) However, as a result of the change in the date of electrification of village Walunj, the distribution of electrified villagesbetween different years of electrification as shown in the Table 3.1 has undergone alterations. In the records of the Divisional Office, the village Walunj was shown to be electrified on 12-2-1965. However, on the basis of first pumpset being connected in the village on 21-10-63, the date of electrification had to be corrected as 21-10-63 (i.e., electrified during 1963-64) as per the procedure of MSEB.[1] This would alter the composition of villages shown as electrified during the year 1963-64 and 1964-65 in Table 3.1 from 29 and 22, respectively to 30 and 21.

Thus, the findings of the survey did not materially affect the sampling plan based on probability proportional to years of electrification and talukas of the Division, since it neither significantly altered the composition of electrified

1 As stated in Chapter II the MSEB declares a village as electrified as soon as any consumer, irrespective of his use of electricity (whether agricultural, industrial, domestic lighting or street lighting, etc.), is connected in the village.

villages between different years of electrification nor their distribution between the two categories in relation to development of agricultural load. However, decision to substitute originally selected villages, i.e., Shivari and Kothale in respective categories of electrified villages (i.e., having and not having agricultural load of electricity) by Walunj and Shivari, respectively did affect the representation to years of electrification of villages on the principle of probability proportional to size. Table 3.4 depicts the deviation from the principle of probability proportional to size due to substitution of villages stated above. It may be noted that distribution of total number of electrified villages in the Division between years of electrification as shown in Table 3.4 has taken into consideration the change in the year of electrification of village Walunj and the changes in the status of village Shivari and Walunj in relation to development of agricultural load as a result of finding of the survey. It may be noted that substitution has not resulted in any deviation in regard to representation to talukas based on the probability proportional to size, since the substituted villages also belong to Purandhar taluka as were the villages selected originally.

Table 3.4 : Deviation from the principle of probability proportional to size in the sample of selected villages due to substitution of villages.

Year of electrification	Revised distribution of total electrified villages			No.of villages that get selected following the original sampling procedure(i.e. probability proportional to size)			No.of villages actually got selected due to substitution of villages		
	Total No.of electrified villages	No.of villages having irrigation-al load	No.of villages not having irrigation-al load	Total no.of electrified villages	No.of villages having irrigation-al load	No.of villages nothaving irriga-tional load	Total No.of electrified villages	No.of villages having irrigation-al load	No.of villages nto having irriga-tional load
1957-58 to 1959-60	10	7	3	1	1	-	1	1	-
1960-61	13	10	3	1	1	-	1	1	-
1961-62	37	20	17	4	2	2	4	1	3
1962-63	37	23	14	4	2	2	3	2	1
1963-64	30	13	17	3	1	2	4	2	2
1964-65	21	8	13	2	1	1	2	1	1
April 1965 to August 1965	5	-	5	-	-	-	-	-	-
Total	153	81	72	15	8	7	15	8	7

It can be observed from Table 3.4 that the substitution of villages did not significantly affect the total sampling plan. The year 1963-64 got more representation, while the year 1962-63 got less representation than what is demanded by the weights proportional to the number of electrified villages in the respective years. The representation to each category of villages is not affected at the overall level, although the representation to each category between the years of electrification is not in proportion to the total number of electrified villages in each category in the year. While the category of villages having irrigational load of electricity got more representation in the comparatively recent period of electrification (year 1963-64), the category of villages not having irrigational load of electricity got more representation in the comparatively earlier period of electrification(year 1961-62).

It may be noted in this connection that the table pertaining to sample-frame (table 3.1 above) presents a point-of-time picture of electrified villages with respect to the development of irrigational load of electricity, since the electrified villages are classified, as having irrigational load or not, on the basis of meter-cards of the villages as of August 1965. Hence, farther the dates of electrification of villages selected for not having irrigational use from this month, the better

it is, because a larger time-span would have been allowed in the cases of such villages for the development of irrigational use. The village Shivari, which was substituted for the village Kothale to represent the category of villages not having irrigational load of electricity, was electrified almost a year earlier than Kothale.

It may be noted, at the outset, that the decision to substitute the originally selected villages was taken in the field, during the course of the survey. Further, when the erroneous classification of the village Shivari vis-a-vis the development of agricultural load had come to light, the survey of cultivators using oil engines in the village was completed and survey of cultivators using electric motors in Walunj was under way. It was, therefore, decided on the spot to substitute village Walunj for Shivari, originally selected in the category of villages having irrigational load of electricity, thus complying with the need to select one village from this category from Purandhar taluka. On the other hand, having realised the true status of village Shivari and, with survey of farmers using oil engine in the village being completed, it was decided to substitute this village for the village Kothale - a village from Purandhar taluka selected originally under the category, "not having agricultural use of electricity". Moreover, it was thought that 2 neighbouring villages in 2 different categories might

help in analysing the conditions conducive to development of irrigational use of electricity.

Sampling at Second Stage

While sampling at first stage involved selection of villages, sampling at second stage entailed selection of modes of irrigation of 3 different types, as stated earlier, from these selected villages. Although the study concerns itself with analysing the factors underlying the use of electricity by the cultivators for irrigation purposes, the primary unit considered for sampling at second stage is modes of irrigation and not the cultivators using different modes for the following reasons:

- As stated earlier, it was difficult to classify cultivators in mutually exclusive groups based on their employment of one particular mode of irrigation.
- For the fulfilment of objectives of study, it was necessary to analyse the costs of irrigation by each of these 3 modes of irrigation, since choice of any particular mode is expected to be related to its costs of irrigation vis-a-vis those of other modes.

It may, therefore, be noted that with primary unit of sampling at second stage being mode of irrigation, the same cultivator could get included twice under the sampling procedure for employing 2 different types of modes of irrigation, say an electric motor and oil engine, etc. Further, it may be observed that while in the category of villages having

agricultural use of electricity, all the 3 modes of irrigation were selected, in the other category of villages, only 2 modes of irrigation (viz., oil engine and bullock-operated lift) were selected; use of electricity for irrigation purposes being precluded in the other category of villages by definition.

Characteristics of Different Modes of Irrigation

As mentioned above, primary unit of sampling at second stage of sampling was mode of irrigation, since for the fulfilment of objectives of study it was important to compute the cost of irrigation by different modes. Before sampling procedure for different modes of irrigation is spelt out, it would be relevant to describe their salient features.

Electric Motor and Pumpset: An electrically operated pumpset is an immobile instrument of irrigation since the motive power for the operation of pump is derived from the overhead lines and, therefore, its movement from the place of installation is constrained by the network of overhead lines. Secondly, even if it is possible to shift the pump from one place of operation (one well) to another (another well) due to the existence of overhead lines at both the places, it is generally not resorted to because a movement of pump from one place of operation to another entails movement of many other accessories such as starter, switch-board, etc. whose dismantling and installation

is a skilled job, which an average cultivator does not possess of. Thirdly, under the Indian Electricity Act of 1956, for every such movement which means an installation of pumpset afresh, a certificate is required to be produced from a licensed electrical inspector showing the soundness of installation before the supply of electricity can be augmented. This in itself being a cumbersome job, frequent movement of electric pumpset is not generally undertaken. In respect of electric motors included in the sample, movement of not even a single motor from its initial place of installation was reported by the cultivators. The cost of irrigation by an electric pump-set, therefore, refers to cost of irrigating one plot of land coming under the command of one source of irrigation on which the pumpset was permanently installed.

Oil Engine : In relation to electrically operated pumpset, oil engine is a mobile unit, which can be moved from one source of irrigation to another, if so desired by its owner-cultivator. This is because the source of power to oil engine (i.e., diesel or petrol) is stored internally within the engine in a tank and not drawn externally as in the case of an electric motor from overhead lines. To facilitate its movement, oil engine is installed on a trolley which can be moved freely. Further, other accessories, particularly the pipes used in respect of mobile engines are also of a flexible types (i.e., hose pipes

as against galvanised iron-cast pipes) to facilitate their movement and easy dismantiling and installation.

Thus, while in respect of an electric motor, the costs of irrigation necessarily refer to costs of irrigating one plot coming under the command of one source of irrigation, in case of an oil engine, particularly mobile units, it refers to costs of irrigating all the plots coming under the command of different sources of irrigation on which it was operated.

Bullock-operated Lift : This mode of lift, like an oil engine, is also a mobile unit since the source of motive power for the lift are pair of bullocks which are as mobile as human beings. Further, the accessories of lift equipment like main and subsidiary strings, leather bags, etc. are also easily amenable to transportation from one source of irrigation to another. On the other hand, the structure on which the lift operates (i.e., wooden structure in the form of an arc) does not cost much and can be erected at all places of operation without incurring much expenditure. Hence, as inthe case of a mobile oil engine, in respect of bullock-operated lifts also, the cost of irrigation refers to costs of irrigating all the plots coming under the command of different wells on which the lifts were operated.

Sample of Electric Motors

From the meter-cards of the consumers of the villages

selected under the category, 'having irrigational use of electricity' (hereinafter referred to as category 'A'), a list of electric motors used for irrigational purposes was made village-wise. Each meter-card along with the name of the consumer also furnished details regarding the horsepower of the motor operated and the date on which the motor was connected to the distribution system in the village. For each selected village, electric motors were, therefore, classified by the size of the motor expressed in terms of horsepower, and further within each size, they were ordered chronologically by their dates of connection.

As stated earlier, the classification of electrified villages into two categories being based on the meter-cards of the village pertaining to only one month, it did not provide any idea about the time-dimension involved in the development of irrigational use of electricity from their respective dates of electrification.[1] To facilitate the analysis of time-span involved in the development of irrigational use, electric motors connected in the selected villages were grouped by the lag in years in their connection from the respective dates of electrification of villages in which they were located. The time-lag being defined as the difference in the date of

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1 It can be observed from the last 3 columns of table 3.1 that the proportion of villages having irrigational use of electricity to total number of villages electrified in the year diminishes as we come down the column, which indicates that in the electrified villages the irrigational use of electricity developed with some time-lag.

electrification of the village and the date of connection of the pumpset in terms of years.

In Table 3.5 we present village-wise distribution of total electric motors connected in the villages selected in the category 'A' by the lag in years in their dates of connection and in horsepower such as 3, 5 and others.

Table 3.5 constituted frame for the selection of electric motors in villages selected under the category 'A'. It can be observed from the table 3.5 that the selected villages accounted for 195 number of pumpsets, i.e., roughly 18 per cent of the total number of pumpsets connected in Poona Rural Division.[1] It may further be observed from the table 3.5 that in the selected villages, 3 horsepower and 5 horsepower were the two dominant sizes of pumpsets often employed by the cultivators to irrigate their holdings. Together, these two sizes of pumpsets accounted for nearly 97 per cent of total number of pumpsets of all sizes connected in these villages.

As the survey was to be conducted single-handed, to keep the work-load in manageable proportion, it was decided to cover 50 per cent of total number of pumpsets connected in each selected village subject to the maximum of 10 pumpsets per village. Furthermore, it was decided to represent number of

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1 Total number of pumpsets connected in this division were 1094 as on August 1965 (Refer table 2.3 in Chapter II).

Table 3.5 : Distribution of Electric motors in sample villages by lag in years from the dates of electrification of respective villages and size in terms of horse power.

Name of the village	Date of Electrification of village	Total No. of pump-sets connected in the village	Distribution of motors of different sizes by the lag in years in their connection																			
			0-1			1-2			2-3			3-4			4-5			5 & above		
			3 HP	5 HP	Oth-ers	3 HP	5 HP	Oth-ers	3 HP	5 HP	Oth-ers	3 HP	5 HP	Oth-ers	3 HP	5 HP	Oth ers	3 HP	5 HP	Oth ers
Vadagaon	13-12-57	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Chikhali	27-6-60	39	-	-	-	-	-	-	1	81	1	3	8	-	12	6	-	-	-	-
Phursungi	11-12-61	35	-	8	2	2	6	-	1	3	-	9	4	-	-	-	-	-	-	-
Dawadi	30-6-62	29	-	-	-	-	-	-	3	26	-	-	-	-	-	-	-	-	-	-
Narayangaon	16-12-62	53	-	5	-	19	7	-	12	8	2	-	-	-	-	-	-	-	-	-
Retawadi	26-1-64	5	2	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Walunj	21-10-63	18	8	3	1	4	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Narodi	31-8-64	14	13	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		195	24	19	3	25	16	-	17	45	3	12	12	-	12	6	-	1	-	-

	Total		
	3 HP	5 HP	Oth ers
Vadagaon	2	-	-
Chikhali	16	22	1
Phursungi	12	21	2
Dawadi	3	26	-
Narayangaon	31	20	2
Retawadi	2	3	-
Walunj	12	5	1
Narodi	13	1	-
Total	91	98	6

pumpsets connected in different sub-groups of time-lag in their connection in the sample so as to enable us to analyse the factors underlying the development of irrigational use of electricity over time. It was also decided to represent electric motors of different sizes (different Horsepower) in the sample so as to see the irrigational requirements met by the motors of different sizes as well as to compare the cost per hour of irrigation for the motors of different sizes.

It may be mentioned here that some element of purposiveness was introduced in the selection of motors considered for the purpose of study. This purposiveness was introduced for enabling us to estimate costs of irrigation by electric motor as accurately as possible, which was so necessary for fulfilling the objectives of study.

To obtain an accurate estimate of costs of irrigation by this mode, it was necessary to have correct estimate of costs on the following two components : (i) The costs of electric motors and other accessories termed as fixed costs. The expenditure incurred on these items as reported by the cultivators could be checked with the dealers from whom they had purchased pumpsets and other accessories. It should be noted that the dealers of electric motors of different makes were located in the Poona city and in almost all cases the cultivators (respondents) had purchased their equipment from one of them

and hence it was easy to check on the costs reported by the cultivators from the receipt-books of these dealers. (ii) Operational costs, i.e., the cost of electricity consumed for irrigation purposes by the users of electric motors. The owner-cultivators of electric motors were asked to state the crops raised on the irrigated plot and the number of irrigations given to each crop and the duration of each irrigation to the crops in terms of hours of motor operated during the year 1st June 1965 to end May 1966.[1] Thus, an independent estimate of total hours of irrigation by electric motor in the year could be obtained from above-stated information reported by the user of sample electric motor. Unlike the other modes of lift (such as oil engine and the bullock-operated lift), it was possible in the case of electric motor to have another estimate of the total hours of irrigation in the year from the monthly meter-readings available in the meter-cards[2] of the sample motors available at the sub-divisional offices of the Board. Hence only such schedules were accepted for analysis whose estimates arrived at

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1 Though the Agricultural Year generally refers to the period 1st July to end-June, for the purpose of this study we have chosen the year as 1st June to end-May, for the following reason. During the pilot survey, it was observed that the farmers having irrigational facilities had sown kharif crops like Bajra, Paddy and Kharif Jowar in the second week of June. On the other hand, summer crops like chillies, green vegetables were harvested during the 3rd/4th week of May.

2 The units in the meter-reading are expressed in Kilowatt hours (KWh= a kilo watt of energy consumed for one hour). However, it is possible to convert horsepower of motor into kilowatt (1 h.p.= 0.746 K.W.) and, therefore, with the knowledge of the horsepower of the motor operated, it was possible from the meter reading to arrive at an estimate of number of hours of operation.

by these two sources more or less tallied with each other. In the cases of rejected schedules, it was mostly observed that the estimate arrived from the hours of irrigation reported by the cultivators was at variance (more than 15 per cent) with the estimate arrived at from the meter reading. It was either due to improper functioning of the meter or because of tampering with the meter by the cultivator using it. It may be noted that two cultivators (one each from village Phursungi and Narayangaon) admitted that they had tampered with the meter and hence their schedules were accepted for the purpose of study. On the other hand, in case of some of the other rejected schedules it was observed that the estimate of hours of irrigation as reported by the cultivator was much below (more than 20 per cent) the estimate arrived at from the meter reading. It was due to the selling of water to neighbouring cultivator which the user of electric motor did not want to disclose.[1] Perhaps these cultivators thought that the sale of water was an 'unholy' act which may not be appreciated or it was resorted to in respect of jointly owned well without the knowledge of other partners having ownership right in the well. Unfortunately, in the case of these electric motors (whose schedules were rejected) it was not possible to verify from the neighbouring cultivators whether the motors were actually operated to irrigate their holdings.

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1 It should be observed here that in the case of electric motor, being an immobile mode of lift, renting out the machinery amounts to selling of water, while in case of oil engine, which can be moved from well to well, renting out does not amount to selling of water as the cultivator who hires it can always take the engine to his own well.

Such schedules were, therefore, also rejected for the purpose of analysis. In all, 12 schedules were rejected.

Table 3.6 presents distribution of sample number of motors accepted for the purpose of study. The distribution of sample number of motors is presented for each selected village by the time-lag in the connection of motor from its date of electrification. Furthermore, within each sub-group showing time-lag in the connection of motors, they are classified by their sizes expressed in terms of horsepower.

Comparison of table 3.6 with table 3.5 would reveal that roughly 38 per cent of the total number of motors connected in the sample villages got selected in the sample of electric motors. Also, it can be observed that both the sizes of motor, i.e., 3 H.P. and 5 H.P. got ıair amount of representation in the sample so as to enable us to compute costs of irrigation for each size of motor separately. Lastly, it can be seen that at the aggrevative level, motors in each sub-group of time-lag also got enough representation in the sample barring the sub-group of time-lag of 5 years and above wherein, in fact, only one motor was connected in selected villages. Electric motors in other sub-groups of time-lag got representation of more than 30 per cent each in the sample.

Table 3.6 : Village-wise Distributionof sample number of electric motors by the time lag in their connection from the respective dates of electrification of village and their sizes in terms of horse-power.

Name of the village	Date of electrification of village	Total sample no.of pump-sets connected in the village	Distribution of motors of different sizes by the lag in years in their connection																				
			0-1			1-2			2-3			3-4			4-5			5 & above			Total		
			3 HP	5 HP	Oth-ers	3 HP	5 HP	Oth-ers	3 HP	5 HPers	Oth-	3 HP	5 HPers	Oth-	3 HP	5 HP	Oth ers	3 HP	5 HP	Oth ers	3 HP	5 HP	Oth ers
Vadagaon	13-12-57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chikhali	27-06-60	17	-	-	-	-	-	-	-	4	1	2	4	-	4	2	-	-	-	-	6	10	1
Phursungi	11-12-61	10	-	3	-	1	2	-	-	1	-	2	1	-	-	-	-	-	-	-	3	7	-
Dawadi	30-06-62	15	-	-	-	-	-	-	1	14	-	-	-	-	-	-	-	-	-	-	1	14	-
Narayan-gaon	16-12-62	16	-	2	-	6	3	-	2	2	1	-	-	-	-	-	-	-	-	-	8	7	1
Retawadi	26-01-64	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Walunj	21-10-63	7	3	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-
Narodi	31-08-64	7	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-
Total		75	10	9	-	10	5	-	3	21	2	4	5	-	4	2	-	-	-	-	31	42	2

Although it was decided to cover maximum of 10 electric motors in each of the selected villages, because of the good rapport established with the cultivators through the village level officials of the Block Development office, it was possible to cover more than 10 motors in the villages Chikhali, Dawadi and Narayangaon. In the village Vadgaon, none of the electric motors could be considered for computation of costs of irrigation because both the motors did not function during the period of reference, i.e., June 1965 to May 1966, as they were disconnected.

Selection of Other Modes of Irrigation

As the selection of other modes of irrigation was related to the conditions stipulated by the MSEB for supply of power for irrigational purposes, it would be relevant to describe them before spelling out the procedure adopted for selection of other modes.

Conditions Stipulated by MSEB for Supply of Power

Under the then existing conditions for supply of energy to irrigation purposes, it became economically impossible for an individual cultivator to go in for electricity. The then existing service line conditions[1] stated that (a) rural

1 For details of Service Line conditions, see "Conditions and Miscellaneous Charges for Supply of Electrical Energy" - a pamphlet for consumers by Maharashtra State Electricity Board, April 1962. These conditions are applicable even to-day, i.e., as of 1979-80.

transformer sub-station would be set up for loads of not less than 15 H.P. either of one consumer or of more than one consumer, and (b) in case of a bonafide agricultural pumping loads, the Board provided overhead service line free of cost upto 300 metres (approximately 1000 feet) from nearest distributing point, i.e., rural transformer sub-stations, or from service line for any other consumer. Any length in excess of free length was payable by the consumer at the rate of Rs.6.56 per metre (approximately Rs.2 per foot). Both these conditions necessitated for the cultivators to form a group of wells because (i) an individual cultivator rarely needed a motor of 15 H.P. (in our population of 195 motors in the sample villages only one motor was of 15 H.P. denomination), (ii) an individual farmer's excess over 300 metres from its nearest point of supply could be compensated in a group by less than 300 metre distance of other well from its nearest point of supply so as to have an average for the group as a whole to 300 metres per well - a distance which was provided free by the Board.

Since for the fulfilment of objectives of the study, it was imperative to analyse the difficulties encountered by the cultivators employing other modes of irrigation in switching over to electricity, it was necessary to ensure that the distance of their present place of operation from the existing service line/rural transformer sub-station was not prohibitive

(i.e., more than 1000 feet) for switch-over. In other words, 'prospective users' of electricity are defined as those cultivators deploying oil engines or bullock-lifts within 1000 feet of existing lines or transformer sub-station.

However, the 'prospective users' of electricity were defined in different manner for 2 sets of selected villages, i.e., having and not having irrigational use of electricity.

With the existence of service lines for electric motors in the category of electrified villages having irrigational use of electricity, the wells situated within 1000 feet off these lines having oil engines/bullock-operated lifts, were defined as 'potential places' for irrigational use of electricity. On the other hand, an isolated well with oil engine/ bullock-lift could not be treated as a 'potential place' for irrigational use of electricity in the absence of such service lines in the villages not having irrigational use of electricity, in view of the above-stated conditions stipulated by MSEB. In respect of these villages, therefore, a compact group of irrigation wells (with oil engines or bullock lifts) such that the distance of each well from the other on an average was less than 1000 feet, was treated as 'potential places' for irrigational use of electricity. Furthermore, in the selected villages under this category, group of wells clustering around the well where oil engine was operated was considered, since it is

expected that urge for an oil engine user to shift to electricity is relatively stronger, both being mechanised devices of irrigation.

Procedure for selection of Other Modes of Irrigation

The total number of units of mechanised modes of irrigation like electric motor and oil engines existing in a village could be ascertained a priori.[1] It was, therefore, possible to gear the procedure of selection to units of these modes of irrigation, determining the sampling fraction. However, the same could not be applied to bullock-operated lifts. There are no records at the village level on number of lifts of this type in the village, presumably because mere possession of bullock does not imply operation of lift by the cultivator; bullocks being put to number of uses (both agricultural and non-agricultural) by the cultivators. Thus, whereas in respect of electric motors and oil engines, units of these modes were selected, in case of bullock-operated lifts, cultivators known to be operating the lifts were selected. Needless to state that while selecting oil engines and bullock-operated lifts, it was ensured that the places of their operation[2] could be deemed as

1 The number of electric motors in a village could be known from the meter cards of the village at the sub-divisional office of the MSEB. Likewise, the number of oil engines in village could be found out from village Form No.15, which records stock of agricultural implements, particularly the mechanised ones.

2 In respect of mobile units of these modes of irrigation, it was ensured that one of the wells on which the mode was operated was such that it was within 1000 feet of existing line or a part of compact group of wells.

'potential places' for switching over to electricity, as mentioned earlier.

Though the primary unit of a sampling at second stage was mode of irrigation for fulfilment of objectives of the study, the cultivators operating these modes of irrigation had to be interviewed. Thus, the owner-operators of these modes of irrigation constituted the respondents. It would be, therefore, relevant to state number of respondents (cultivators) covered by the sample of different modes of irrigation in the selected villages. Table 3.7 depicts number of cultivators covered by the corresponding number of modes of irrigation selected for the study.

It may be pointed out at the outset that number of cultivators covered by the sample under each mode of irrigation (particularly electric motor and oil engine) is sometimes less than the number of units in the sample since the same cultivator was covered twice with his 2 or more units having been included in the sample. Thus, it may be observed from Table 3.7 that in the sample of electric motors in the villages Chikhali and Narayangaon, 2 cultivators each were covered more than once. Likewise, in the sample of oil engines, one cultivator each was covered twice in the village Retawadi, Shivari and Mahalunge, while in the village Ranjangaon, 2 cultivators were covered twice.

Table 3.7 : Number of cultivators covered by the samples of modes of irrigation.

Sr. No.	Name of the selected village	Electric Motor		Oil Engine		Bullock Lift	Total no.of cultivators covered in the village
		Sample no.of Units	No.of cultivators covered	Sample no.of Units	No.of cultivators covered	No.of cultivators covered	
1	2	3	4	5	6	7	8
1.	Vadgaon	-	-	-	-	5	5
2.	Chikhali	17	15	6	6	5	26
3.	Phursungi	10	10	7	7	4	20
4.	Dawadi	15	15	1	1	5	20
5.	Narayangaon	16	12	6	6	5	23
6.	Retawadi	3	3	4	3	5	11
7.	Walunj	7	7	7	7	3	16
8.	Narodi	7	7	-	-	4	11
9.	Chincholi	-	-	-	-	-	-
10.	Shivari	-	-	9	8	4	12
11.	Mahalunge	-	-	7	6	5	11
12.	Paud	-	-	-	-	-	-
13.	Parunde	-	-	-	-	5	5
14.	Ranjangaon	-	-	13	11	4	15
15.	Shinoli	-	-	5	5	5	10
	Total	75	69	65	60	59	185

Similarly, the same cultivator was covered twice but under the sample of two different modes in the same village. For instance, in the villages Phursungi and Walunj, one cultivator each was covered twice but under the samples of electric motor and oil engine, while in the village Dawadi, the same cultivator was covered under the samples of electric motor and bullock-operated lift.

Method of Collection of Data

In each selected village for each cultivator included in the samples of different modes of irrigation, the information pertaining to operation of the selected mode of lift was obtained at the site of the operation of mode. This was done with a view to obtaining as much accurate information as possible on area under different crops irrigated by the mode and the duration of the mode operated for irrigating the crops which was crucial for having estimate of total hours of irrigation by the mode in the year so as to arrive at the cost of irrigation in relation to the level of operation of the mode. Moreover, it was also important to visit the sites to identify the 'potential places' for use of electricity.[1] For this purpose, assistance

[1] It may be noted that for determining 'compact group' of wells which could be deemed as 'potential places' for use of electricity in villages not having irrigational use of electricity, maps of the selected villages were obtained from the office of 'Settlement Commissioner', Maharashtra State at Poona. These maps showed the delineations of agricultural fields in different survey numbers. The location of wells obtained from Village Form No.16 were superimposed on these maps to determine 'compact group' of wells which could be considered as 'potential places' for use of electricity.

was sought of the 'Gram-Sevak', a village level official of the Block Development Office.

It may be noted in the context that while in the case of electric motor it was possible to visit all the sites where the modes were being operated since it is an immobile unit, in the case of oil engine and the bullock-operated lift, it was not possible always to visit all the sites where the modes were operated as some of these modes were operated at more than one places (wells). In respect of mobile units, the information for all the plots irrigated by the mode was obtained at one of the places of operation of the mode, since it would have been too much to ask the respondent to visit all the places of operation of the mode. However, the information regarding area commanded by the well, area irrigated, etc., reported by the cultivator for unvisited places of operation of the mode was verified from the Form No.16 of village records, which contains details of irrigated holdings in the village.

In the course of field survey, apart from the data on costs of irrigation by sample mode of lift, information was gathered from each of the cultivators covered by the samples of modes of irrigation on :

(a) composition of his total irrigated holding in terms of number of irrigated plots coming under the command of different sources of irrigation.

(b) size of each such irrigated plot,
(c) type of mode employed to irrigate each such plot, and
(d) ownership right in the sources of irrigation of different plots.

This information was collected with a view to finding the relationship between adoption of a particular type of mode of irrigation and size of plot commanded by the source of irrigation and ownership right in the source of irrigation. It may however, be pointed out that while the above information was collected from each of the cultivators covered by the samples of modes of irrigation, costs of irrigation are worked out only for his sample unit of modes of irrigation.

Based on the above-stated data collected during the field survey, distribution of owner-cultivators of sample modes of irrigation by different types of modes employed to irrigate their scatter of irrigated holdings is presented in Table 3.8.

Coverage of Wells in the Selected Villages

As mentioned earlier, information contained in Form No.16 of village records was availed of to determine 'compact group of wells' which could be deemed as 'potential places' for use of electricity. Also, this form was referred to for verifying the information on size of irrigated plots, survey number of plots, etc., reported by the owner-cultivators of mobile sample modes of irrigation, particularly oil engines and

Table 3.8 : Distribution of owner-cultivators of sample modes of irrigation by types of modes employed for irrigating their scatter of irrigated holdings.

(In Numbers)

Sample mode of irrigation	Total cultivators covered by the sample of mode of irrigation.	Distribution of cultivators covered by types of mode of irrigation employed				
		Cultivators having only the sample mode of irrigation	Cultivators having one additional type of mode other than sample mode			Cultivators having 2 additional types of modes other than the sample mode.
			E.M.	O.E.	B.L.	
Electric Motor	69	42	-	4	23	-
Oil Engine	60	46	5	-	7	2
Bullock-lift	59	54	3	1	-	1
Total	188*	142	8	5	30	3

Notes: E.M. = Electric motor; O.E. = Oil Engine; B.L. = Bullock Lift.

* Total number of cultivators covered by samples of all the 3 modes of irrigation is 185, as shown in Table 3.7 above. The discrepancy in the total shown above in comparison to total shown in Table 3.7 appears because 3 cultivators common to sample of 2 modes of irrigation inthe villages Phursungi, Dawadi and Walunj appear twice in the above distribution of cultivators presented for mode-wise samples.

bullock-operated lifts, which were not visited in person. Form No.16 of village records contain sizes of irrigated plots in different survey numbers coming under the command of agricultural wells in the villages. As such, it was possible to obtain total number of the then existing agricultural wells in the selected villages as also the number of wells covered by samples of modes of irrigation from the respective forms (number 16) of selected villages. Table 3.9 depicts coverage of wells by the samples of modes of irrigation in the selected villages.

It can be observed from Table 3.9 that in two of the villages selected under the category, 'not having agricultural use of electricity', namely Paud and Chincholi, there was no irrigation potential, and hence no mode of lift was selected in these villages. In the villages Paud, there was no agricultural well although some 18 wells were there (stated in the village from No.16) in the village used solely for the purpose of drinking water. On one of such wells an oil engine was being operated by the Village Panchayat. In the village Chincholi, all the 3 irrigation wells had gone dry. Hence, for all practical purposes, there was no agricultural well during the period of reference, i.e., June 1965 to May 1966, in the village. It may further be observed from Table 3.9 that the sample modes of all types covered more than 20 per cent of

Table 3.9 : Total number of wells in the selected villages and wells covered by the samples of modes of irrigation.

Sr. No.	Name of the selected village	Total No.of agricultural wells in the village.	Total no.of electric motors in the village.	No.of sample motors.	No.of wells covered by samplemotors.	Total No.of oil engines in the village.	No.of sample engines.	No.of wells covered by sample engines.	No.of farmers selected for bullock lifts.	No.of wells covered by sample bullock lifts.	Total No.of wells covered by sample modes of all types. (Col.5 + 8 + 10)	Percentage of total wells covered by sample lifts of all types(Col.11 as % of Col.2)
	1	2	3	4	5	6	7	8	9	10	11	12
1.	Vadgaon	18	2	-	-	-	-	-	5	6	6	33.33
2.	Chikhali	102	39	17	15	6	6	6	5	8	29	28.43
3.	Phursungi	106	35	10	10	9	7	12	4	5	27	25.47
4.	Dawadi	130	29	15	15	1	1	1	5	9	25	19.23
5.	Narayangaon	295	53	16	16	10	6	8	5	9	33	11.19
6.	Retawadi	106	5	3	3	4	4	6	5	15	24	22.64
7.	Walunj	41	18	7	6	9	7	12	3	7	25	60.98
8.	Narodi	59	14	7	7	1	-	-	4	8	15	25.42
9.	Chincholi	3	-	-	-	-	-	-	-	-	-	-
10.	Shivari	75	-	-	-	11	9	27	4	8	33	44.00
11.	Mahalunge	35	-	-	-	8	7	13	5	5	17	48.57
12.	Paud	0	-	-	-	1	-	-	-	-	-	-
13.	Parunde	30	-	-	-	1	-	-	5	9	9	30.00
14.	Ranjangaon	99	-	-	-	15	13	17	4	8	25	25.25
15.	Shinoli	44	-	-	-	5	5	7	5	5	12	27.27
	Total	1143	195	75	72	81	65	109	59	102	280	24.50

Note: 2 wells in village Shivari and 1 well in village Mahalunge overlapped between samples of oil engines and bullock-lifts.

total wells in each of the selected villages except in the villages Narayangaon and Dawadi. The mobile characteristic of oil engine and the bullock-operated lift is also reflected in the table as evident from the fact that number of wells covered by these sample modes is greater than the number of sample modes.

Field Survey

The schedules canvassed for owner-cultivators of 3 different types of samples of modes of irrigation in the selected villages are given in Annexures 3A to 3C. These schedules were pre-tested in village Manjari - Village outside the groups of selected villages. The survey was conducted during the 5 months' period - October 1966 to February 1967. The schedules were personally canvassed.

ANNEXURE - 3A

SCHEDULE FOR CULTIVATORS USING SAMPLE ELECTRIC MOTORS

(Specimen)

I. Identification Block

a) Name of the cultivator :

i) Serial No.:

b) Village : c) Taluka :

ii) Date of interview:

d) Date of electrification of the village :

e) Size of electric motor (H.P.) :

f) Date of Connection of Motor :

g) Scheme under which motor was connected :

h) Identification code of cultivator : (Based on types of modes owned by him).

II. Socio-Economic Status

a) Age of the pumpset owner :

b) Education :

c) Size of the family :

d) Number of Adult members in the family :

of which -

i) working on farm :

ii) Outside farm :

iii) Nature of occupation for members in (ii) :

e) Total income from subsidiary occupation : (per annum)

f) Size of cultivated holding (In Acres) :

Own	Leased in	Leased out	Total	Of which irrigated holding	Number of irrigated plots
1	2	3	4	5	6

III. Details of Irrigated Holding.

Sr. No.	Survey No.	Source of Irrigation	Lift equipment (type)	Area commanded by source of irrigation	Net area irrigated	Ownership right in		No. of joint-partners		Rotation in operation of		Relationship with partners in	
						Source of irrigation	Lift equipment	Source of irrigation	Lift equipment	Source of Irrigation	Lift equipment	Source of irrigation	Lift equipment
	(1)	(2)	(3)	(4)	(5)	(6a)	(6b)	(7a)	(7b)	(8a)	(8b)	(9a)	(9b)
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													

Remarks :

IV. Details of Irrigated Plot of Sample Electric Motor.

Survey No.	Source of irriga-tion	Net area irrigated	Crops grown during 1965-66					
			Kharif Season		Rabi Season		Summer	
			Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
		1.						
		2.						
		3.						
		4.						
		5.						
		6.						
		7.						
		8.						

V. Installationof Electric Motor

1. Is the sample motor first to be installed among the different motors owned by you? Yes/No

2. If Yes, when did you decide to switch over to electricity? Before electrification/after electrification of village.

3. Who introduced you to the benefits of electricity?

___ Motor Company Agent
___ MSEB Official
___ BDO Official
___ Sarpanch
___ Joint Partner
___ Family members
___ Newspaper
___ Fellow-cultivator (Pl.give the name)
___ Any other (pl. specify).

4. In what way the benefits of electricity were explained to you?

5. Did MSEB conduct any meeting in the village for inducing farmers to switch over to electricity?

6. How much time did you take to decide for switching over and apply for electricity?

7. Were you aware of the terms and conditions of electric supply? How did you come to know?

8. Who helped in formulating a group of wells (scheme) for electrification?

9. Approximately how many months before connection, security deposit was paid?

10. Who paid the security deposit?

___ self; ___ Joint partner; ___ any other (Please specify).

11. What was the previous mode of operation before installation of electric motor?

12. What happened to that mode?
Sold of/operating on other well/Redundent/Any other (specify).

13. Did difficulty in selling the previous mode delayed your taking up electricity? Yes/No.

If yes, how, for how many months?

14. What arrangements did you make to buy electric motor and other equipment?

___ self savings; ___ joint partner; ___ bank finance;

___ Any other (Please specify).

15. How much time did you take to raise finance?
Did it delay connection?

16. Remarks (particularly in respect of jointly-owned motor).

VI. (A) Investment Costs of Motor.

Item	Make	size/ type	Life	price/ value	Remarks
1. Electric motor & Pumpset.					
2. Pipes					
a) Suction					
b) Delivery					
c) Bends					
3. Other Accessories					
a) Footvalve					
b) Starter					
c) Meter					
d) Switch Board					
e) Capacitor					
f) Belt					
4. Foundation					
5. Pump-house					
6. Terminal Pole					
7. Extra line cost					
8. Wiring charges					
9. Fitting charges					
10. Service connection charges.					
11. Security deposit					
12. Any other					
a)					
b)					
c)					
Total					

VI.(B) From where did you buy the equipment? (Please name the dealer).

(C) Do you have the cash memos? If so, please furnish.

(D) Why did you select a motor of this make?

(E) Source of Finance :

Source	Particular agency	Amount	Rate of interest	Term of loan	Repayment instalment	Remarks
Own						
Borrowed						
Other						
1.						
2.						
3.						

VII. (A) Operation of Motor (1965-66)

Name of season/ crop	Area under crop	No.of waterings & interval between 2 waterings	Duration of each watering in hours of electric motor operation													Total No. of hours of operation
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Kharif																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Rabi																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Summer																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Grand Total																		

VII. (contd.)

(B) Did you irrigate the farms of neighbouring cultivator?
If Yes -

How many hours the motor was operated for such purpose during 1965-66?

(C) Did you charge him? At what Rate?

(D) Meter Readings (1965-66)

Month		Meter readings	Remarks	Amount of bill	Remarks
April	1965				
May	1965				
June	1965				
July	1965				
August	1965				
September	1965				
October	1965				
November	1965				
December	1965				
January	1966				
February	1966				
March	1966				
April	1966				
May	1966				
June	1966				

i) Do you observe the readings of your meter? At what interval?

ii) Do you think that meter records the consumption of electricity properly? Yes/No/do not know.

If yes, why?
If not, why?

(E) In respect of jointly owned electric motors -

i) What are the arrangements for operation of motor among the partners?
___ each co-partner; ___ Senior partner operating for every one; ___ Any other.

ii) Are the hours of operation fixed?

If Yes,

please specify.

iii) How do you share the energy bill?

___ In proportion to ownership right.

___ As per meter reading during the turn.

iv) Do you think that the energy charges paid are in proportion to your use of motor?

If so, why?

v) Has motor been disconnected for non-payment of bill in the past? Yes/No

vi) If yes, when?

vii) What action was taken against the partner not paying the bill?

VIII. Maintenance Charges.

(A) Greesing, Minor Repairs and Overhauling (1965-66).

Item	Frequency	Annual quantity	Amount spent	Time taken	Remarks
1. Greasing.					
2. Minor repairs					
Fuse					
Pump repair					
Belt					
Any other					
3. Overhauling.					
Total					

(VIII contd.)

(B) Major Repairs and Break-down (from date of Installation)

Item	Frequency	Amount spent Average	Amount spent Total	Time taken	Remarks
1. Rewinding of coil.					
2. Starter repair.					
3. Switch Board replacement					
4. Pump shaft					
5. Motor Repairs					
a)					
b)					
c)					
6. Any other					
a)					
b)					
c)					
Total					

(C) Have you employed any electrician to look after the maintenance of motor?

i) If employed, how much do you pay to him?

(D) In respect of jointly-owned electric motor -

i) How do you share maintenance charges?

ii) Has any of the co-partners refused to pay the charges in the past?

iii) What action was taken against the partner?

iv) Do you think that you had to pay charges for the fault of others? If so, please specify.

v) Do you think that you have to pay charges more than in proportion of your use?

If Yes, why and how much.

(IX) General

(A) Will you advocate use of electricity to others? Yes/No.

If Yes, why?

If not, why?

(B) Are you contemplating to switch over to electricity on any of your other wells?

If yes, when?

If not, why not?

(C) In what way, electricity was helped you to achieve better results in relation to your previous mode of operation?

General Remarks :

ANNEXURE - 3B

SCHEDULE FOR CULTIVATORS USING SAMPLE OIL ENGINES

(Specimen)

I. Identification Block :

a) Name of the cultivator :

b) Village : c) Taluka :

i) Serial No.:

ii) Date of interview :

d) Date of electrification:

e) Year and month of purchase of engine :

f) Size of oil engine (H.P.):

g) Identification code of cultivator :
(Based on types of modes owned by him.)

II. Socio-Economic Status :

a) Age of oil engine owner :

b) Education :

c) Size of family :

d) Number of adult members in the family :
Of which -

i) working on farm :

ii) Outside farm :

iii) Nature of occupation for members in (ii) :

e) Total income from subsidiary occupation : (per annum)

f) Size of Cultivated holding (In Acres)

Own	Leased in	Leased out	Total	Of which irrigated holding	Number of irrigated plots
(1)	(2)	(3)	(4)	(5)	(6)

III. Details of Irrigated Holding

Sr. No.	Survey No.	Source of Irrigation	Lift Equipment (type)	Area commanded by source of Irrigation	Net area irrigated	Ownership right in		No.of joint partners		Rotation in operation of		Relationship with partners		Remarks
						Source of Irrigation	Lift Equipment	Source of Irrigation	Lift equipment	Source of Irrigation	Lift equipment	Source of Irrigation	Lift equipment	
	1	2	3	4	5	6a	6b	7a	7b	8a	8b	9a	9b	10
1.														
2.														
3.														
4.														
5.														
6.														
7.														
8.														

IV. Details of Irrigated plots by sample engine

Sr. No.	Survey No.	Source of Irrigation	Area commanded by source of Irrigation	Net area irrigated	Crops grown during 1965-66 (Plot 1)						Crops grown during 1965-66 (Plot 2)					
					Kharif		Rabi		Summer		Kharif		Rabi		Summer	
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

					Crops grown during 1965-66 (Plot 3)						crops grown during 1965-66 (Plot 4)					
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

IV. (contd.)

Sr. No.	Survey No.	Source of Irrigation	Area commanded by source of Irrigation	Net area irrigated	Crops grown during 1965-66 (Plot 5)						Crops grown during 1965-66 (Plot 6)					
					Kharif		Rabi		Summer		Kharif		Rabi		Summer	
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

V. Installation of Oil Engine :

1. When was the Oil engine purchased?

2. At the time of purchase of Oil engine, was it new or second-hand?

   If second-hand,

   a) Why did you buy second-hand engine?

   b) At the time of purchase, did you have any idea about the number of years for which the engine was used by its previous owner?

3. If the year of purchase of oil engine is later than date of electrification of village.

   Why did you not go for electricity and bought an oil engine?

4. How did you raise finance for the engine ?

   ___ Self saving; ___ Bank finance

   ___ Joint partner; ___ Any other.

   (a) In case of finance by joint partner,

   Did you share the engine at the time of purchase or at a later date?

   (b) Remarks.

VI. (A) Investment Cost: Oil Engine.

Item	Make	Year of purchase	Size/ type	Life	Price/ value	Remarks
1. Oil engine						
2. Pump						
3. Pipes (original)						
a) Suction						
b) Delivery						
4. Pipes (replaced)						
a) Suction						
b) Delivery						
5. Other Accessories						
a) Belt						
b) Foot valve						
c) Bends						
d) Trolley						
e) Any other.						
6. Foundation						
7. Pump house						
8. Installation charges						
9. Any other						
a)						
b)						
c)						
Total						

(B) In case of fresh installation,

i) from where did you buy the equipment?

ii) Do you have the cash memos? If so, please furnish.

(C) Why did you select the engine of this make?

(D) Source of Finance.

Source	Agency	Amount	Rate of interest	Term of loan	Repay-ment instal-ment	Out-stand-ing loan (on date)	Remarks
Own							
Borrowed							
Other							
1.							
2.							
3.							

VIII. (A) Operation of Oil Engine (1965-66) : (i) Plot - 1*

Name of season/ crop	Area under crop	No.of water-ings Inter-val bet ween 2 water-ings	Duration of each watering in hours of oil engine operation													Total hours of operation
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Kharif																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Rabi																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Summer																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
Total																		
Grand Total																		

*This proforma was repeated for each plot irrigated by engine.

(B) Do you irrigate the farms on any of the wells of your neighbouring cultivator?

i) How many hours the engine was operated for such purpose during 1965-66?

(C) Did you charge him for irrigating his crops?

i) At what rate?

(D) Do you hire out engine itself?

i) How many hours/days it was hired out during 1965-66?

ii) What was the rate per hour/day for hiring out the engine?

iii) What were the conditions of hiring out?

VIII. Operation Cost of Engine - 1965-66 :

(a) Did you buy fuel/lubricating oil as and when the need arose or stocked it?

(b) Was it always available?

(c) What was the distance travelled for buying it?

(d) What was the rate paid per litre/5 litres/gallon of fuel?

e) Was the rate stable throughout?

f) What was the rate of consumption of fue l?

i) Per hour ii) for every 8 hours:

g) What was the rate paid per litre/gallon/of lubricating oil?

h) How often did you replace lubricating oil?

i) What was the quantity of replacement? each time:___ Annual:___

j) Expenditure on fuel and lubricating oil.

Total hours of irrigation (1965-66)	Total consumption of fuel	Expenditure on fuel	Total consumption of lubricating oil	Expenditure on lubricating oil

IX (A) Maintenance Cost of Engine - 1965-66 :

Item	Frequency	Annual quantity	Amount spent	Time taken	Remarks
1. Greasing					
2. Minor Repairs.					
Oil tube					
Cleaning of valves					
Minor pump repairs					
Any other :					
a)					
b)					
c)					
3. Overhauling.					
Total					

(B) Major Repairs and Break-down (from date of installation)

Item	Frequency	Amount spent		Time taken	Remarks
		Average	Total		
1. Liner					
2. Piston					
3. Head repair					
4. Crank shaft					
5. Valve packet					
6. Nozzle					
7. Rings					
8. Bearings					
9. Pumpshaft					
10. Any other					
a)					
b)					
c)					
Total					

i) Is the mechanic locally available?

ii) Have you employed a permanent mechanic?

iii) How much do you pay him?

(C) In respect of jointly-owned engine -

i) How do you share the cost of fuel and lubricating oil of the engine?

ii) How do you share the maintenance charges of the engine?

iii) Does every partner pay the charges regularly?

iv) In your opinion, is it worth to share the ownership right of the engine with others?

X. Shifting to Electricity :

(A) Are you envisaging to switch over to electricity?

___ Yes/___ No

i) If Yes -

a) Have you already applied for electricity?

b) On which of your irrigated plot?

c) When do you propose to apply?

d) What do you propose to do with your oil engine?

ii) If, not -

a) Why are you not in favour of switching over to electricity?

(B) Are you aware of relative costs of operation of electric motor and oil engine?

i) What are the economies in cost per hour?

ii) Are you aware of minimum consumption bill in respect of electric motor?

___ Yes/No ___

If Yes,

iii) At what level of operation, minimum consumption bill is exceeded?

General Remarks :

ANNEXURE - 3C

SCHEDULE FOR CULTIVATORS USING SAMPLE BULLOCK LIFTS

(Specimen)

I. Identification Block :

a) Name of the cultivator :

i) Serial No.

b) Village : c) Taluka

ii) Date of interview :

d) Date of electrification of village :

e) Number of bullocks operated for lift :

f) Number of leather bags (mhots) employed for lift.

g) Identification code of cultivator (based on no.of bullocks and mhots employed for the lift).

h) Identification code of cultivator (based on types of modes owned by him)

II. Socio-Economic Status :

a) Age of Bullock-lift owner :

b) Education :

c) Size of family :

d) Number of adult members in the family:

of which -

i) working on farm :

ii) working outside farm

iii) Nature of occupation for members in (ii).

e) Total income from subsidiary occupation : (per annum)

f) Size of cultivated holding (in Acres)

Own	Leased in	Leased out	Total	Of which irrigated holding	No.of irrigated plots
(1)	(2)	(3)	(4)	(5)	(6)

III. Details of Irrigated Holding

Sr. No.	Survey No.	Source of Irrigation	Lift Equipment (type)	Area Commanded by source of Irrigation	Net area irrigated	Ownership right in		No. of joint-partners in		Rotation in operation of		Relationship with partners	
						Source of Irrigation	Lift equipment	Source of irrigation	Lift equipment	Source of Irrigation	Lift equipment	Source of Irrigation	Lift equipment
	1	2	3	4	5	6a	6b	7a	7b	8a	8b	9a	9b
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													

Remarks

IV. Details of Irrigated Plots by Sample Bullock-Lift.

Sr. No.	Survey No.	Source of Irrigation	Area Commanded by source of Irrigation	Net area Irrigated	Crops grown during 1965-66 (Plot 1)						Crops grown during 1965-66 (Plot 2)					
					Kharif		Rabi		Summer		Kharif		Rabi		Summer	
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

					Crops grown during 1965-66 (Plot 3)						Crops grown during 1965-66 (Plot 4)					
					Kharif		Rabi		Summer		Kharif		Rabi		Summer	
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

IV. (contd.)

Sr. No.	Survey No.	Source of Irrigation	Area commanded by source of irrigation	Net area irrigated	Crops grown during 1965-66 (Plot 5)						Crops grown during 1965-66 (Plot 6)					
					Kharif		Rabi		Summer		Kharif		Rabi		Summer	
					Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop	Crop	Area under crop
1.																
2.																
3.																
4.																
5.																
6.																
7.																

V. Investment Cost of Bullock-Lift.

Item	Year/ frequency of purchase/installation	Life	Size/ type/ number	Price/ value	Remarks (source of purchase etc.)
1. Wooden Structure					
i)					
ii)					
iii)					
2. Wooden accessories					
i)					
ii)					
iii)					
3. Leather bag					
i)					
ii)					
iii)					
4. Strings					
i)					
ii)					
5. Any other					
i)					
ii)					
iii)					
Total					

VI. Variable costs

(A) Details of Bullock holding - 1965-66 :

No.of bullocks owned	Of which		No.of bullocks		No.of bullocks used for irrigation purposes	Remarks
	Purcha-sed	Home-breed	Hired in	Hired out		
1	2a	2b	3a	3b	5	5

i) Did you hire in bullocks for irrigation purposes?

If so, from whom? How many days?

VI. (contd.)

(B) Value of Bullocks

Sr.No.of Bullock (1)	Value of date (June 1965) (2)	Life Expectancy (3)	Remarks (4)

(C) Cost of feed for bullocks - 1965-66 :

Item	Quantity per bullock per day	No.of days/ months in the year for feed	Total quantity during the yr. Per bullock	Total bullocks	Value of quantity per day	Annual total/ value Per bullock	All bullocks
Jowar Straw							
Bajra Straw							
Paddy straw							
Maize							
Lucerne grass							
Husk							
Oil cake							
Any other							
a)							
b)							
c)							
Total							

(i) Expenditure on feed purchased - 1965-66)

Item of feed	Frequency of purchase	Quantity purchased each time	Price paid for quantity	Annual quantity purchased	Annual expenditure on feed

(D) Value of Farm yard manure - 1965-66 :

i. Quantity of F.Y.M. per day :

ii. Number of days taken to obtain cart load of manure :

iii. Number of cart loads per year :

iv. Value of one cart-load of F.Y.M. :

v. Annual value of F.Y.M. :

(E) Maintenance of Mhot (1965-66) :

Item	Frequency	Amount
1. Oiling		
2. Stiching		
3. Soldering		
4. Other		
Total		

(F) (i) Number of persons employed for operating the lift :

Of which -

Hired :

Family labour :

ii) Daily rate of casual labour (including payment in kind).

VII. Operation of Bullock Lift - 1965-66 : (i) Plot I*

Name of season/ crop	Area under crop	No.of waterings & interval between 2 waterings	Duration of each watering in hours of operation of bullock-lift (Pair of Bullocks) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total hours of operation
Kharif																		
1.																		
2.																		
3.																		
4.																		
5.																		
7.																		
8.																		
Total																		
Rabi																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
Total																		
Summer																		
1.																		
2.																		
3.																		
4.																		
5.																		
6.																		
7.																		
8.																		
Total																		
Grand Total																		

* This proforma was repeated for each plot irrigated by bullock lift.

VIII. Shifting to Mechanised Mode :

(a) Are you contemplating to shift over to mechanised mode?

___ Yes/___ No

(b) If yes, which of the mechanised mode?

___ Electric motor/Oil engine _____

(c) State reason for preference.

(d) Why have you not shifted earlier.

General Remarks.