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Water Policy Research

HIGHLIGHT

This highlight compares data on wells and tube wells, diesel and electric pumps from four sources, namely, Minor Irrigation Census (MIC), Agricultural Census (Ag), Input Survey (InS) and statistics from State Electricity Boards (SEBs) and/ or the State Statistical Bureaus for four time periods representing mid-1980s, 1990s, early 2000s and mid-2000s. We find that more often than not, there is a wide divergence in data - divergence that does not seem to be attributable to mere time lags and definitional differences. This is a cause for serious concern and calls for immediate action and coordination among different government data collection agencies. This is also symptomatic of the overall poor and deteriorating condition of irrigation and other databases in India.

Poor State of Irrigation Statistics in India

The Case of Wells and Tube Wells

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Poor State of Irrigation Statistics in India
The Case of Wells and Tube Wells[1]

Research highlight based on a paper with the same title[2]

Introduction

At a time when there are widespread concerns about unsustainable trends in groundwater and electricity sectors (Shah et al. 2003), asking a simple question, namely, how many agricultural pumps (diesel or electric) are there will yield an ambiguous answer depending on the data source one uses. Such ambiguity is problematic because the precursor to any policy decision is reliable data. This highlight furthers S.L. Shetty's argument of a 'deteriorating statistical base' (Shetty 2012) by providing evidence of the same with respect to data on agricultural wells, tube wells and pump sets.

The Ag and the MIC provide information about the number of wells and tube wells and the number of diesel and electric pump sets used in agriculture. The InS provides information about the number of agricultural electric and diesel pump sets. SEBs and in certain cases the States' Directorate of Economics and Statistics also provide figures for the number of energized pumps. A multiplicity of sources with considerable variation in figures for the same ostensible entity makes the selection of which source to use a problematic issue and this has wider policy implications.

In the paper four periods are considered by selecting common years for four sources - Ag, InS, MIC, SEBs or States' Directorate of Economics and Statistics. For years that aren't common, the years selected for a particular source is roughly around the same time period, varying by a year or so. The four time periods are 1985-86, 1993-94, 2000-01 and 2005-06. If the data differs by less than 10 percent, we consider it 'highly comparable'. When two sources differ by more than 10 but less than 20 percent, we call it 'moderately comparable'. Anything with a difference that is more than 20 percent is considered 'not comparable'. While this classification is arbitrary, a 10 to 20 percent difference is reasonable and not too stringent, given the huge numbers involved.

Number of wells and tube wells

According to Ag, number of wells and tube wells has gone up from 12.1 million in 1985-86 to 18.4 million in 2005-06, while as per MIC, number of wells and tube wells has increased from 11.4 million in 1986-87 to 19.7 million in 2006-07 (GoI 1992A; GoI 1993; GoI 2012A; GoI n.d.). Both these are roughly comparable as are the figures for 2000-01, which are very close to one another - 18.8 million (Ag) and 18.5 million (MIC) (GoI 2005; GoI 2008A). However, there is a wide divergence in figures for 1990s, with Ag giving us a figure of 17.3 million and MIC of 11.6 million - a divergence of more than 32 percent (Table 1; GoI 1996; GoI 2001).

Number of diesel pumps

Table 2 gives the number of agricultural diesel pump sets for different time periods starting from the mid 80s, as reported by the Ag, InS and MIC and Figure 1 shows the all-India totals of diesel pumps from these sources.

In the first period, the Ag (1985-86) and the MIC (1986-87) show considerable comparability for the all India total of diesel pumps at 3.2 million and 3.5 million respectively. However at the state level, data for only four states (Andhra Pradesh, Bihar, Haryana and Madhya Pradesh) are comparable across the two sources. The InS (1986-87) in contrast reports a total (5.9 million) which is almost twice the Ag and the MIC figures (GoI 1992B).

The second time period are the years around 1993-94. While the MIC is available for 1993-94, the InS is available for 1991-92 and the Ag for 1995-96. (GoI 2000). Due to the gap between the InS and Ag reporting years, the MIC alone is compared with the InS and the Ag respectively.

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[1]This IWMI-Tata Highlight is based on research carried out with support from the International Water Management Institute (IWMI), Colombo. It is not externally peer-reviewed and the views expressed are of the authors alone and not of IWMI or its funding partners.

[2]This paper is available on request from p.reghu@cgiar.org

Table 1 Number of wells and tube wells for select states in India (in lakhs[3])

State	Ag I (1985-86)	MIC I (1986-87)	Ag II (1995-96)	MIC II (1993-94)	Ag III (2000-01)	MIC III (2000-01)	Ag IV (2005-06)	MIC IV (2006-07)
	Mid 1980s		Mid 1990s		Early 2000s		Mid 2000s	
Andhra Pradesh	8.53	12.99	14.45	15.65	17.76	19.29	18.22	22.00
Assam	0.42	0.17	0.05	0.28	0.37	0.80	0.26	1.04
Bihar	7.32	7.55	8.23	9.87	NA	7.93	NA	6.51
Gujarat	6.24	8.67	7.82	NA	7.80	10.83	8.21	11.18
Haryana	3.96	3.99	5.46	5.27	4.27	4.20	7.76	4.68
Karnataka	3.85	4.53	8.53	5.52	8.59	8.60	8.21	9.78
Kerala	27.91	1.24	37.58	1.29	43.80	1.71	47.19	1.70
Madhya Pradesh	12.65	9.82	12.32	12.72	10.71	15.92	7.97	16.65
Maharashtra	9.35	12.41	15.16	NA	14.34	17.95	NA	20.54
Odisha	0.27	2.37	2.36	3.44	3.32	4.27	1.72	4.72
Punjab	9.31	8.93	15.26	9.58	14.12	10.80	15.18	11.78
Rajasthan	10.12	NA	12.04	11.19	7.73	13.41	10.58	14.99
Tamil Nadu	2.74	15.93	5.80	14.19	19.38	18.92	25.76	18.66
Uttar Pradesh	12.44	21.22	15.98	21.31	20.38	36.85	21.88	42.53
West Bengal	6.05	4.42	11.79	5.65	14.47	6.48	10.33	5.19
India Total	121.61	114.64	173.17	116.23	188.45	185.03	184.90	197.56

Note: The number of wells not in use as enumerated by the agricultural census when compared to the MIC is extremely high for Kerala. Since wells not in use are also included in the overall number, this may be the cause for the wide variation in figures.

The Ag puts the number of diesel pumps at 4.7 million and MIC at 4.17 million. Rajasthan is the only state showing comparability with a 6 percent difference between the two sources. The InS total of 6.8 million for all of India continues to be at considerable variance with the MIC value.

The third time period is around 2000-01. Data is available for the Ag and MIC for 2000-01. InS data is for the year 2001-02 (GoI 2008B). There again start to appear wide divergences in figures reported. The Ag reports a total of 4.2 million diesel pump sets for all of India, while the MIC reports a figure as high as 6.3 million, a difference of more than 2.1 million. Even between the MIC and the InS, the difference in the pan India total is more than 50 percent, with InS reporting 14.2 million diesel pumps.

The time period around 2006-07, provides us with InS data for 2006-07 and Ag data for 2005-06 (GoI 2012B). Again the InS figure for all of India is almost 3 times the

[3]One lakh = 0.1 million

Table 2 Number of agricultural diesel pumps (in lakhs)

States/ Diesel Pump Sets	Time period around 1986-87			Time period around 1993-94			Time period around 2000-01			Time period around 2005-06	
	AgC (1985-86)	InS (1986-87)	MIC (1986-87)	AgC (1995-96)	InS (1991-92)	MIC (1993-94)	AgC (2000-01)	InS (2001-02)	MIC (2000-01)	AgC (2005-06)	InS (2006-07)
Andhra Pradesh	1.76	1.55	2.15	1.09	3.1	1.49	0.41	5.31	1.18	0.44	4.90
Assam	NA	NA	0.13	0.10	0.03	0.27	0.18	2.14	0.78	0.08	0.89
Bihar	4.34	3.65	4.92	5.06	6.91	6.96	NA	NA	6.76	NA	NA
Gujarat	3.07	NA	1.88	2.66	5.52	NA	1.42	5.34	4.73	2.19	4.67
Haryana	1.12	1.87	1.32	2.13	2.01	1.55	0.39	4.93	1.48	1.71	4.77
Karnataka	0.14	0.77	0.43	0.61	1.19	NA	0.11	1.51	0.30	0.42	2.50
Kerala	0.42	0.37	NA	0.31	1.19	0.15	0.51	0.68	0.10	0.23	0.35
Madhya Pradesh	1.12	2.25	1.32	2.05	2.7	0.93	0.91	6.01	1.72	0.72	7.08
Maharashtra	0.46	2.82	1.64	0.41	0.93	NA	0.18	5.74	0.65	NA	NA
Odisha	0.02	0.27	0.06	0.35	0.62	0.22	0.44	1.89	0.55	0.37	2.25
Punjab	4.69	2.23	2.39	6.82	2.22	3.57	5.35	6.79	2.88	5.11	4.61
Rajasthan	2.82	4.96	NA	5.03	8.62	4.70	3.03	14.75	5.65	3.92	15.40
Tamil Nadu	0.38	3.86	2.71	1.01	3.77	NA	1.35	12.39	2.97	4.71	5.59
Uttar Pradesh	7.79	26.04	12.77	11.11	29.16	17.37	17.13	61.42	30.84	18.40	61.17
West Bengal	4.24	4.38	3.35	8.45	0.79	4.47	10.34	11.68	0.67	6.79	15.14
Total	32.41	59.68	35.11	47.14	68.92	41.70	42.16	142.61	63.39	45.37	131.80

Figure 1 Total number of agricultural diesel pump sets in India at different points in time

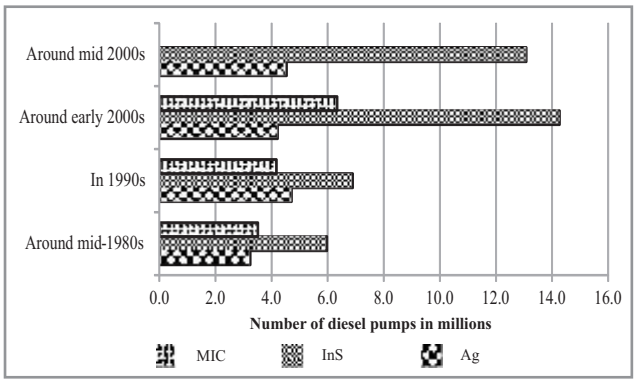
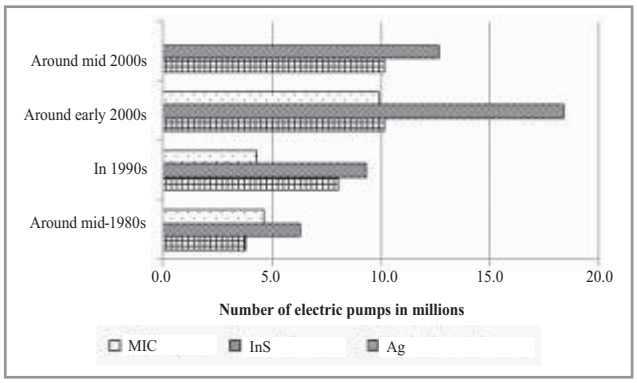


Figure 2 Total number of agricultural electric pump sets in India at different points in time



Ag figure, with InS reporting 13.1 million diesel pumps and Ag reporting 4.5 million pumps. Punjab and Tamil Nadu are the only states with comparable to moderately comparable data across the sources.

We suspect that the huge variation between the two Censuses and the InS may partly be attributed to definitional differences (with the InS perhaps counting diesel pumps that are used for activities other than pumping) and the methodology - census versus sample survey. However, these are just guesses and there is no reliable way of understanding the difference between these sources or ascertaining which the correct figure is.

Number of electric pumps

Table 3 gives the number of agricultural electric pump sets in a manner similar to the previous section, with the inclusion of an additional source - the SEB or the State Directorate of Economics and Statistics wherever available. Figure 2 shows the all India total for agricultural electric pumps as reported by the different sources.

In the mid 80s none of the three sources show comparable figures for the all India total. However, the MIC (1986-87) figure of 4.7 million and the Ag (1985-86) figure of 3.8 million are considerably closer in proximity as compared to the InS (1986-87) figure of 6.3 million. Haryana, Bihar and Madhya Pradesh show comparability in diesel as well as electric pump sets between the Ag and MIC figures. Haryana however is exceptional, for it shows comparable figures between these two sources with each other and also with respect to the SEB figures for electric pump sets.

The period around 1993-94, has the Ag data for 1995-96, the MIC for 1993-94, the InS for 1991-92 and the SEB figures for select states. The difference between the MIC figures and the Ag figures is now much higher. In fact the number of electric pump sets in wells and tube wells for all of India, as given by the Ag at 8.04 million is twice the number given by the MIC (4.34 million). The InS figure at 9.3 million is still higher. Rajasthan is the lone state which shows comparability between the MIC and the Ag for both diesel and electric pump sets.

In the early 2000s, for the first time, the all India total of electric pumps for the Ag (2000-01) at 10.17 million and the MIC at 9.94 million is remarkably close. However the InS figure of 18.45 million continues to be at a huge variance with the previous two sources. Punjab is unique in the comparability it displays between multiple sources.

The time period around 2006-07 presents three sources, the Ag for 2005-06, the InS for 2006-07, and the SEB figures for certain states. The difference between the Indian total for electric pump sets as given by the Ag (10.17 million), and as given by the InS (12.69 million), is a little more than 20 percent. Though still quite substantial, this difference indicates a slight convergence of figures especially when viewed against the backdrop of previous years, where differences between the two sources amounted to almost one half of the other. For these two sources Tamil Nadu exhibits comparable figures for diesel as well as electric pump sets.

Thus, the pan India total for electric pumps as given by the MIC and the Ag shows a certain degree of comparability in the 80s. After a period of wide differences in the 90s, the totals converge again around 2000-01. In contrast the InS throughout shows substantial differences when compared to the first two sources and again may be due to the methodology followed in drawing up the sample for InS.

Conclusion and policy implications

In this paper, we have compared numbers of wells, tube wells and electric and diesel pumps from four different sources and found that the figures from each of these sources vary and vary widely. While a ten to twenty percent difference in figures enumerated may be due to definitional differences and time lags, but differences that are as much as 40 percent or more, raise questions about the veracity of the data. Since all of these data are essentially government data provided by various agencies, wide divergences may be suggestive of lack of coordination. A related problem which could have a bearing on the wide varying estimates is the clarity of definition. For instance some SEBs use the term ‘number of Irrigation Pump sets (IPs)/ tube wells energized’ interchangeably, others include surface lift schemes too under IPs. Still others just enumerate ‘pump sets energized’, without explicit clarification on whether these are agricultural or non-agricultural pump sets.

Assuming that convergence is equivalent to greater accuracy (while keeping in mind that it need not necessarily be so), we divided the states into highly comparable (0-10 percent difference), moderately comparable (10-20 percent difference) and not comparable and found that ten states showed comparability (high or moderate) between sources for more than one time period. For a given time period, four states showed comparability (either between the same sources or other sources) for all the three entities i.e. wells and tube wells, diesel pump sets and electric pump sets. These were Bihar, Haryana and Punjab in the mid 80s and Rajasthan in the 90s. Since then not a single state has shown comparability for all three categories. While data diverged substantially, only the two states of Punjab and

Table 3 Number of agricultural electric pumps (in lakhs)

Electric Pump Sets	Time period around 1986-87				Time period around 1993-94				Time period around 2000-01				Time period around 2005-06		
State	Ag (1985-86)	Input (1986-87)	MIC (1986-87)	SEB	Ag (1995-96)	Input (1991-92)	MIC (1993-94)	SEB	Ag (2000-01)	Input (2001-02)	MIC (2000-01)	SEB	Ag (2005-06)	Input (2006-07)	SEB
Andhra Pradesh	4.75	3.79	7.38	NA	12.71	13.4	13.08	13.01	13.08	27.93	16.92	22.07	17.20	27.88	24.41
Assam	NA	NA	0.01	NA	NA	NA	0.01	NA	0.18	0.10	0.01	NA	0.17	0.26	NA
Bihar	0.72	3.06	0.78	NA	0.86	5.34	0.60	2.63	NA	NA	0.47	2.75	NA	NA	NA
Gujarat	2.08	3.05	1.89	3.38	4.32	5.98	NA	5.32	6.07	8.08	5.68	6.94	5.87	4.87	NA
Haryana	2.77	4	2.66	2.77	3.17	3.03	3.68	3.91	3.83	6.64	2.54	3.68	5.97	6.22	4.39
Karnataka	3.42	2.91	3.50	NA	7.08	7.9	NA	NA	7.96	10.14	8.07	13.18	7.35	11.08	17.14
Kerala	2.17	1.6	NA	NA	6.32	2.6	0.82	2.56	12.18	7.86	1.38	NA	15.53	6.33	NA
Madhya Pradesh	4.15	4.44	4.95	NA	8.00	7.89	10.63	9.67	8.29	19.14	13.69	12.37	6.41	16.77	NA
Maharashtra	5.69	11.42	8.22	NA	13.89	7.52	NA	17.61	13.58	34.85	15.94	NA	NA	NA	NA
Odisha	0.04	0.12	0.15	NA	0.39	0.33	0.28	NA	0.50	0.49	0.34	0.75	0.54	0.63	NA
Punjab	4.58	4.91	4.89	NA	8.40	4.96	5.90	NA	8.74	9.46	7.89	7.71	10.01	6.76	9.70
Rajasthan	2.33	4.06	NA	NA	4.04	9.17	4.28	NA	3.23	10.01	5.10	NA	5.12	12.04	NA
Tamil Nadu	1.69	12.18	7.93	NA	4.18	9.66	NA	13.95	17.10	36.67	14.13	17.22	20.57	20.89	18.02
Uttar Pradesh	2.51	7.3	3.92	NA	4.32	14.92	3.29	6.65	2.34	8.96	4.87	NA	2.73	8.50	NA
West Bengal	0.99	0.45	0.36	0.48	2.53	0.13	0.68	0.95	3.68	2.11	0.06	1.09	3.08	3.40	1.12
Total	38.20	63.49	46.85	NA	80.44	93.24	43.43	NA	101.68	184.48	99.44	NA	101.72	127.14	NA

Haryana showed less divergence than others. In the absence of further evidence, it is hard to say whether the consistent convergence (or divergence) of a particular source is indicative of greater veracity (or unreliability).

Change is required at three levels. First, there is a need for improvement in the methods and techniques of data collection. This is especially true of the InS which relies on a smaller sample. Second, an improvement in reporting and sampling framework is needed. Finally, immediate action and better coordination between different data collection agencies of the government is a must if data quality is to improve. In this, the Central Government can play a crucial role by recognizing and incentivizing states with least data discrepancies so that laggard states are also encouraged to improve their data collection systems.

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The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water-management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Highlights and IWMI-Tata Comments.

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