# Minor Irrigation Census Computerization: A Step towards ICT for Micro Level Planning in Water Resources Management and Planning to Achieve Rural Prosperity

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**Abstract** - ***India's achievements in development of Water Resources have been remarkable, since independence. The National Water Policy 2002 has addressed the issues related to develop, conserve, utilize and manage these important natural resources in this Millennium. There are approximately 20 million Minor Irrigation structures in the country, which are classified as: Dugwell, Shallow Tube well, Deep Tube well, Surface Flow Irrigation Scheme, and Surface Lift Irrigation Scheme.***

***The Ministry of Water Resources (MoWR) has already conducted three Censuses with the reference Year: 1986-87, 1993-94 and 2000-01, and currently Census with the reference Year 2006-07 is in progress. National Informatics Centre (NIC) is involved in computerizing the census data and subsequent data analysis as per the business logic given by MoWR.***

***This Paper draws a roadmap for using this database for formulating various Schemes to improve the socio-economic condition of small and marginal farmer, and also its immense need for grassroots level development and planning for Water Resources Management and Planning. This paper also shows as to how this database is useful to the national initiatives such as "DISNIC-Plan: IT for Micro Level Planning", a Central Sector Schemes of NIC and recommended by Planning Commission (http://www.disnic.gov.in) and "Agriculture Resources Information Systems (AgRIS)", a Central Sector Scheme of the Department of Agriculture & Cooperation in Pilot Districts (http://www.agris.nic.in). This becomes a major component of the proposed "National Water Portal" of the MOWR.***

***Index Terms***
***AgRIS - Agriculture Resources Information Systems***
***BI - Business Intelligence***
***CCA - Culturable Command Area***
***DISNIC - District Information System NIC***
***DSS - Decision support System***
***GW - Ground Water***
***GIS - Geographical Information System***
***IT - Information Technology***
***Mha - Million Hactare***
***MoWR - Ministry of Water Resources***
***MI - Minor Irrigation***
***NIC - National Informatics Centre***
***NABARD- National Bank for Agriculture & Rural Development***
***PC - Potential Created***
***PU - Potential Utilised***
***SW - Surface Water***
***WRID - Water Resources Informatics Division***

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## 1.0 INTRODUCTION

For effective implementation of irrigation policy and planning, sound database regarding Minor Irrigation Sector is a must. The inadequacy of data has been considered as a serious constraint at various forums of irrigation planning. The National Commission on Agriculture had recommended that "Census of irrigation sources should be undertaken alongwith the agricultural census once in 5 years, Special irrigation surveys on the number of wells and their utilisation may be undertaken by the States". Planning Commission also recommended for a detailed census of minor irrigation works in 1970. A meeting of the Technical Committee for agriculture census 1980-81 considered the inclusion of list of items relating to minor irrigation in the primary enumeration schedules, but it could not be agreed. The main reason for non-inclusion of items relating to minor irrigation was that the agriculture census data was to be compiled from the existing data of land records of various States. The data do not have the information relating to minor irrigation works as desired.

### 1.1 Definition of Minor Irrigation Schemes

The criteria for classification of minor irrigation schemes have been changing from time to time. Since April 1993 all ground water schemes and surface water schemes (both flow schemes and lift schemes) having culturable command area upto 2000 hectares individually are considered as minor irrigation schemes.

### 1.2 TYPES OF MINOR IRRIGATION WORKS

#### 1.2.1 Ground Water (GW) Schemes

1. Dugwell
2. Shallow Tubewell
3. Deep Tubewell

#### 1.2.2 Surface Water (SW) Schemes

1. Surface Flow Schemes
2. Surface Lift Schemes

### 1.3 NEED FOR COMPUTERISATION

#### 1.3.1 High volume of data :

The minor Irrigation schemes are very large in number and data generated at field level has to pass through various levels of functionaries. The delay is imperative. This delay could be attributed to either the complicated procedures

involved at each level or the deteriorating condition of the basic documents. The errors like to creep in during transitions at different levels. It is proposed to store the data from the field level itself in the computer.

### 1.3.2 Importance of data

After collecting the error free data from all the States, Minor Irrigation Wing of the Ministry of Water Resources (MoWR) publish a report related to census statistics. This publication is useful not only to the professionals, planners and researchers in irrigation and agriculture sectors but also to all others who are directly or indirectly connected with the development of irrigation and water resources management in India.

The objective of this project is to gather the correct and validated data of Minor Irrigation Census from all the concerned states. These data to be compiled at headquarter and will be used for decision support. These data with appropriate software will be distributed to all the concerned states with their data.

### 1.3.3 Information called for by different departments

Agriculture being the most important economic activity in our country, all planning and other related activity depend on the information collected from Irrigation schemes. Effective compilation, classification and timely availability of this information are essential. Computerization of Minor Irrigation Census will facilitate accurate compilation and timely dissemination of desired information.

### 1.3.4 How the computerisation system can improve upon the Manual system:

Keeping in the view of computerisation's vast scope for compilation of census data, the following are the advantages of the computerised system vis-à-vis traditional system:

1. Duplication of data can be eliminated.
2. Data integrity and timeliness is ensured.
3. Data can be kept safely in electronic media like Hard disks, CD-ROM, Pen drives, Cartridges etc, thereby making the census data more secure.

## 2.0 COMPUTERISATION OF CENSUS DATA

The National Informatics Centre (NIC), was requested to develop necessary software for computerising the Census data. Such software's in CDROM were provided to Minor Irrigation Census Commissioners for computerising the Census data. Wherever necessary, private consultants/agencies were hired by the Minor Irrigation Census Commissioners to do the data entry of the primary enumeration schedules, using data entry software provided by NIC. The work was taken up at the district headquarters to avoid transportation difficulty and misplacement of enumeration schedules. It also minimised the delays in computerisation. The validated CDROM having data, collected during the census on primary enumeration schedules were prepared and after duly ascertaining the correctness of data two copies were passed on to the Minor Irrigation Census Commissioner at the state level. A copy of the data media was sent to the centre by the State Minor Irrigation Census Commissioners. Based on the primary data at the State headquarters, a State Minor Irrigation Census Report was brought out for which a tabulation plan was supplied by the NIC, New Delhi. The census data received from the States at the Centre in floppies were utilised for compiling a National Level Minor Irrigation Census Report. The processing of the report was taken up with the help of National Informatics Centre (NIC).

### 2.1 Methodology

The Census data was collected through canvassing six different enumeration schedules. One of the schedules is the village schedule which was canvassed by the enumerators through enquiries from patwaries/village level workers/gram pradhans, and the revenue or land records maintained in the government records. The other five schedules were to be canvassed by enumerators through enquiries from the owners of the schemes. These five schedules relate to five different types of minor irrigation schemes. The various schedules alongwith instructions for filling up were given to state governments. The fieldwork of the census was either undertaken by the nodal department itself or entrusted to some other agency which the State/UT government considered fit in respect of infrastructures available with it. However, for the entire census operation, Minor Irrigation Census Commissioner, was the pivotal point. The primary work of collection of data was carried out by the enumerators. They were village level workers or village accountants or lekhpals or patwaries or a combination of these as the case may be. The work of supervision was entrusted to the next superior officer of the field agency by the State/UT. They were Block Level Officers or Sub-Divisional Officers who in order to ensure the correctness of data recorded by an enumerator conducted frequent site visits of the schemes.

In order to increase the reliability of data a sample check was conducted in addition to the enumeration and supervision of data collection as mentioned above. Systematic sampling technique was adopted for 5 percent sample check at the district level. It helped in detecting under enumeration/over enumeration and hence a correction factor, wherever necessary, was applied to the main census results. The following methodology was adopted for drawing the sample.

### 2.2 Salient Features of the Software

The software developed has the following salient features

1. The screens are user friendly
2. Wherever there is codification, only codes can be entered and corresponding name is displayed automatically. All care has been taken in case of incorrect codes wherein a help screen pops out to list the valid codes available to view and select accordingly.
3. Validation checks have been incorporated in the software at the appropriate fields

The software has been developed in a modular fashion and has the following main modules:

a) Data Entry module
b) Report generation module
c) Decision Support System
d) Query Module
e) Business Intelligent Module
f) GIS presentation

### 2.3 Application Architecture and Technologies

The overall objective of this project is to gather the correct data and process for different purpose. The database collected from all States/ UTs have been merged for making a National level database and a number of reports have been generated.
The application has been divided into three modules based on their requirement i.e. Data Entry Module, Abstract Creation and Decision Support System (DSS). The objective of Data Entry Module is to gather the validated base/ enumerated data. Abstract Creation Module will process these data (base/ enumerated data) for generating a database that will be used by Decision Support System. DSS Module will generate all types of reports, queries and provide useful information.

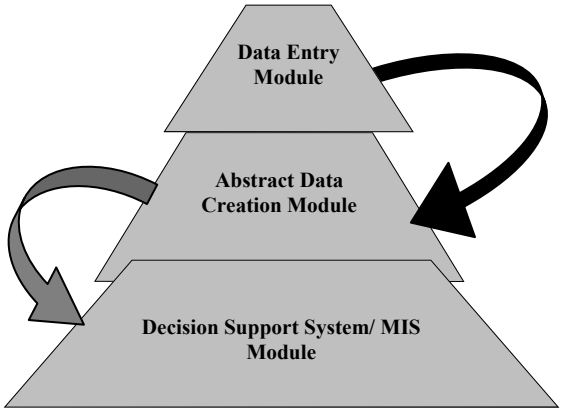



**Figure 1**

**Project Architecture**

(i) **Situation before the initiative**: Before this initiative, the data was compiled manually. Reliability of data was not guaranteed. Processing and compilation took lot of time. Publication of reports took around seven years.
(ii) **Strategy Adopted**: Data was collected by the State Government through Five different schedules of enquiry. Data entry was done by the State Government through private vendors at State/District level. Processing and tabulation was done in the Ministry of Water Resources at New Delhi.
(iii) **Result Achieved/ Value Delivered to beneficiary of the project**:

1. Strengthen the decision-making in the management of water Resources
3. Access of information based on pre-defined queriesImproved Management Information SystemOnline Analytical Processing System and Data Visualization
6. Data dissemination through web site
8. Models for discovery of pattern among data **Other distinctive features/ accomplishments of the project**:
10. Decision Support System with Query Module
11. Portal – disseminating information/reports up to village level
12. Business Intelligent functionality

## 3.0 TRAINING PROGRAMME FOR DATA COLLECTION

Training cum workshops were organised by the Minor Irrigation Census Commissioners at the State Headquarters in which the District Level Officers participated. A representative from the Centre was invariably an Observer in such workshops. The details of the methodology adopted for the census, its procedure, concepts and definitions were discussed thoroughly and necessary clarifications were given. The instructions for filling up the primary enumeration schedules were also discussed during the workshops. In turn, the District Level Officers organised training programmers' at district headquarters where the primary enumerators participated. They were explained thoroughly the instructions for filling up the primary enumeration schedules.
A National Level Workshop was conducted by NIC at New Delhi for all the State Government officers entrusted with the MI Census data collection and computerisation work. The live software demo was carried out and feedback were collected and addressed in the software. The CDROM containing the software along with Users' Manual was distributed among all the participants.

## 4.0 PROCEDURE FOR CONDUCTING CENSUS OPERATION:

The Primary enumerators while negotiating the schedules were to visit the owner of the minor irrigation scheme or its next neighbour and collect information on the basis of personal enquiry from him. The physical verification of the schemes was also to be done by the enumerators. The purpose of the census was to be explained to the farmers to win over their confidence in revealing the specific information in respect of minor irrigation works. Assurance that the data furnished by them would be kept confidential needed to be given to the farmers. Certain information relating to the schemes were to be collected by the enumerators by physical examination of the scheme.
After filling up the schedules, the enumerators were required to deposit all completed schedules with the Block Development Officer/Officer in-charge at the block level. The block level officer supplied all the schedules to the district level officer concerned who computerised the data contained in the prescribed schedules and passed on the floppy containing data as well as the schedules, to the Minor Irrigation Census Commissioner of the State/UT.

## 5.0 RELIABILITY OF DATA

The Census of Minor Irrigation Works has been completed by the States/UTs on various dates in a span of about five years. A number of difficulties were encountered by the States in its completion. Depending on the gap between the reference year and the date of census, the reliability of data varies. Smaller the gap, more reliable the data collected. Despite best efforts by the Minor Irrigation Census Commissioners in the States, certain limitations remain in this report to be looked into in future census operation. Broadly these limitations are elaborated in the following paragraphs.

### 5.1 Features

1. Strengthen the decision-making in the management of water resources
2. Access of information based on pre-defined queries
3. Improved Management Information System
4. Online Analytical Processing System and Data Visualization
5. Data dissemination through web site
6. Models for discovery of pattern among data

### 5.2 Impact

1. Efficient planning and decision making for development of Water Resources through consistent and consolidated information.
2. Empower end users to perform in-depth Analysis.
3. Prediction of irrigation potential/utilization and segmentation of areas through OLAP models.

### 5.3 Hardware & software used for Census computerization

#### 5.3.1 For Development Purpose

***For MIS Software***

***Hardware***

One Server –PIII Xeon, OS: 2000 Server
Two Client- PIV, OS: 98 SE, RAM: 128 MB

***Software***

Microsoft Visual Basic 6.0, Microsoft VB.NET, Seagate Crystal Repot, SQL Server 2000, MS-ACCESS 2000

***For Business Intelligence/ GIS Software***

***Hardware***

One Server –PIII Xeon, OS: 2000 Server, Brand: HCL, RAM:1.0 GB

***Software***

COGNOS and ARCINFO, SQL Server 2000

#### 5.3.2 For Deployment Purpose

***For MIS Software***

***Hardware***

Client having 128MB RAM and loaded with OS 98 SE or higher.

***Software***

No specific software is needed.

***For Business Intelligence/ GIS Software***

***Hardware***

NIC have specific Server installed at NICHQ for BI & GIS respectively, no specific hardware was purchased for this project

***Software***

Any Internet browser is required at client side

### 5.4 Minor Irrigation Census portal

*http://mowr.gov.in/micensus/mi3census/index.htm*

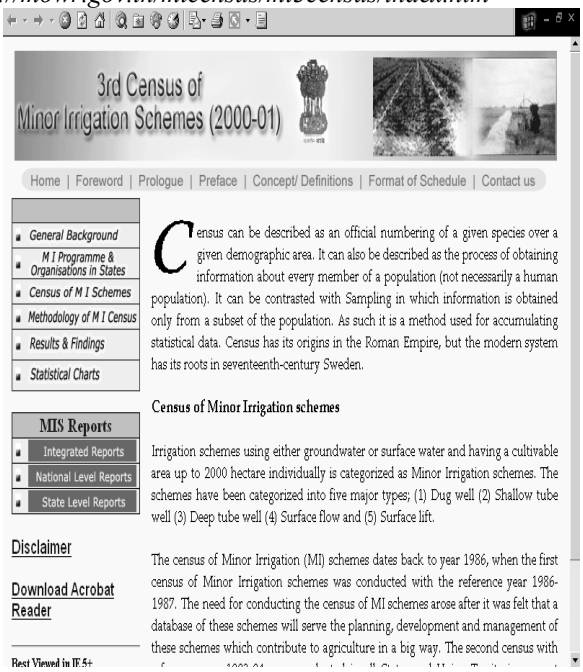



**Figure 3**

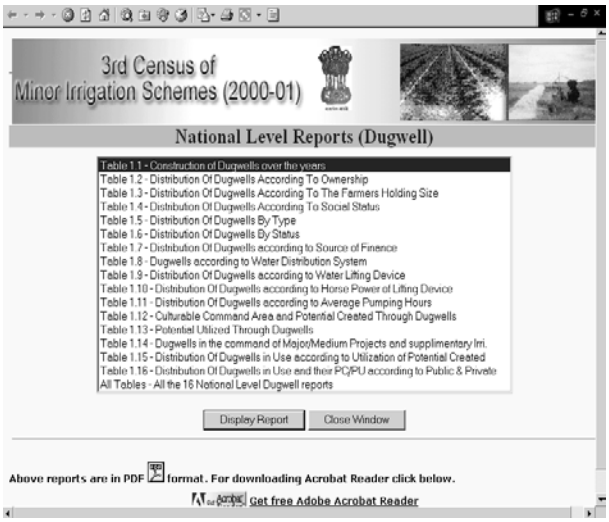
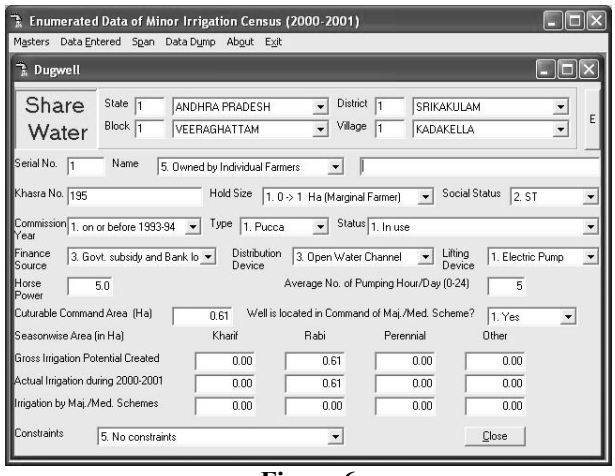



**Figure 4**

### 5.5 Screen Shots of Data entry software

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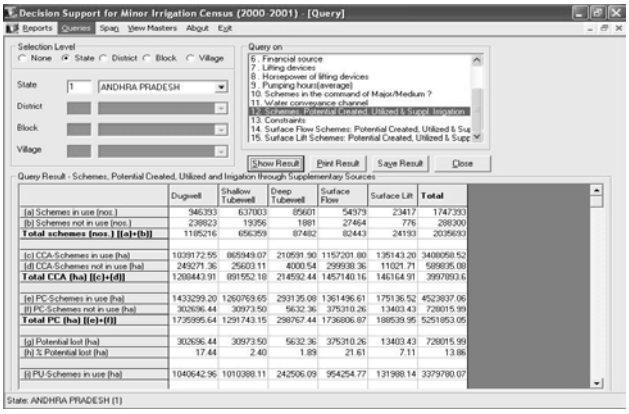


**Figure 7**

## 6. FUTURE SCOPE

The database will be of immense need for grassroots level development and planning for Water Resources Management. In addition to this, this database will also be useful to the other national level initiatives such as DISNIC-Plan: IT for Micro Level Planning, a Central Sector Schemes of NIC and recommended by Planning Commission (discnic.gov.in) and Agriculture Resources Information Systems (AgRIS), a Central Sector Scheme of the Department of Agriculture & Cooperation in Pilot Districts (agris.nic.in)

## 7. SOCIAL IMPACT

Minor Irrigation Schemes are environment friendly and provide gainful employment opportunities to the rural population, resulting in optimum utilization of resources. This also contributes to rural economic growth and plays an important role in increasing agricultural production to meet the needs of the growing population. In the States these schemes are being implemented by many departments / organisations like Agriculture, Rural Development, Irrigation, and Social Welfare. At the Central level also, a number of departments have been implementing programmes on minor irrigation. The government has been instrumental in providing credit to farmers for the development of minor irrigation through Commercial Banks, Regional Rural Banks, Co-operatives and National Bank for Agriculture & Rural Development (NABARD)

In order to develop and maintains firm database on minor irrigation, MI Census is conducted through the Minor Irrigation Division of the Ministry of Water Resources under the Centrally Sponsored Scheme "Rationalisation of Minor Irrigation Statistics (RMIS)". Minor Irrigation projects have smaller gestation period, require smaller investment and the benefit reach the farmers immediately. Ground water schemes provide irrigation through out the year and are more dependable which help in sustaining agricultural production over the years. Most of the Minor Irrigation projects are being executed and maintained by farmers.

## 8. CONCLUSION

The database thus created has been of immense use for all fields of people i.e. research scholars, students, planners, state governments etc.

**Few facts of the data as MoWR have completed the analysis of data through the NIC tools :**

1. Total nos. of schemes : 1,97,52,199
2. Ground Water Schemes : 18503268 (94 %)
3. Surface Water Schemes : 1248931 (6 %)
4. At all India level 97% MI Schemes are in Private Sector and 3% are in Public Sector
5. At all India level, MI Schemes owned by Small & Marginal Farmer is 63%
6. It is also found that nos. of schemes are under utilised because of various reasons out of which inadequate power supply contributes to 10 % of total schemes.
7. Potential created through MI is around 74.3 Mha
8. Potential utilized through MI is around 52.0 Mha .

## REFERENCES

[1]. Guidelines for conducting the Minor Irrigation Census by Minor Irrigation Statistics Wing, Ministry of Water Resources (http://mowr.gov.in/micensus/mi3census/index.htm).

[2]. 3rd Minor Irrigation Census technical report (http://mowr.gov.in/micensus/mi3census/index.htm).

[3]. 2nd Minor Irrigation Census technical report (http://mowr.gov.in/micensus/mi2census/default.htm).

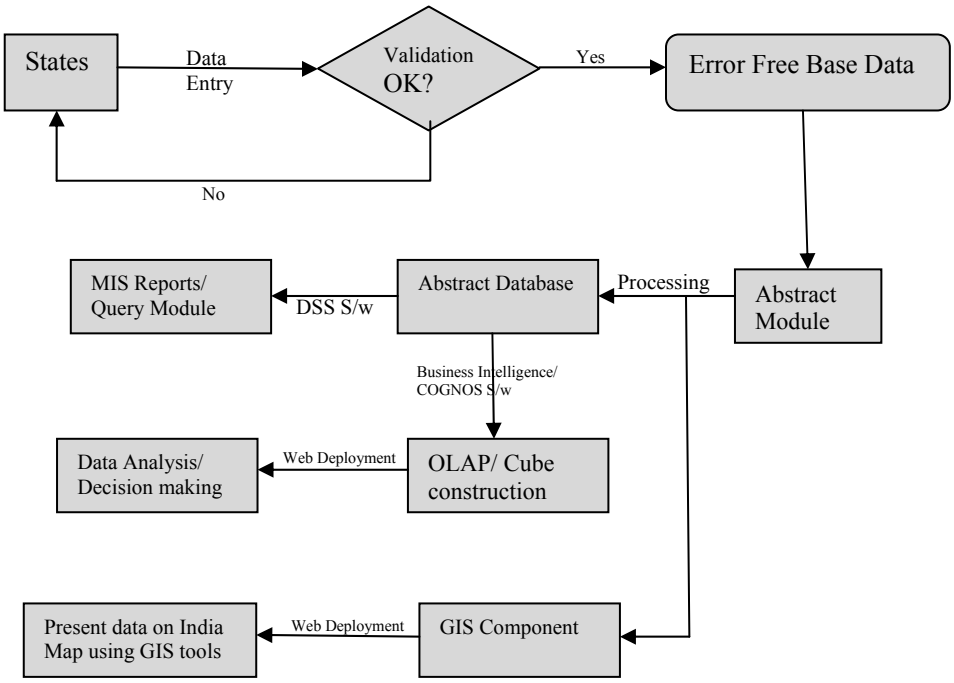
States
Data Entry
Validation OK?
Yes
Error Free Base Data
No
MIS Reports/ Query Module
DSS S/w
Abstract Database
Processing
Abstract Module
Business Intelligence/ COGNOS S/w
Data Analysis/ Decision making
Web Deployment
OLAP/ Cube construction
Present data on India Map using GIS tools
Web Deployment
GIS Component

**Figure 2**