Computerization of Land Records in India : Achievements and Experiences

Edited by
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COMPUTERIZATION OF LAND RECORDS IN INDIA: ACHIEVEMENTS AND EXPERIENCES

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First Published 2008

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Associate Editor Hari Charan Behera

Printed at Reprographic Unit, LBSNAA, Mussoorie

Published by Centre for Rural Studies, LBSNAA, Mussoorie

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Preface

Post colonial paradigm in India visualized a shift in land resources management. Due significance has been accorded to statistics related to crop, irrigation and land use for them to form a basis for land development in the country. Consequently it was necessary to uphold with a large number of registers for maintenance of records. Traditionally, land records are maintained in two formats viz., text format and graphic format. These two compliment each other as they are designed to depict each other's picture in different formats. The nomenclature for text based records also differs from state to state. The number of registers varies from state to state, which touches to even twenty in some states. But some common land records as maintained by the revenue departments are:

1. Village map: A pictorial form showing the village and field boundaries
2. Field book, which is an index to the map, in which changes in the field boundaries, their area, particulars of tenure-holders, methods of irrigation, cropped area, other uses of land etc. are recorded.
3. Records of Right, which records the names and classes of tenure of all occupants of land.

The above form of maintenance of land records is manual and needs enough human labour. This follows some forms of litigation with human errors, huge delays, and often manipulation. In addition, there is no uniformity in the maintenance of land records in this traditional land record system. The central and state governments have been seized with the recurring problem of inadequately maintained land record system as it had made administration of land reforms difficult and had served to neutralize their benefits.

In view of the inherent flaws associated with the manual land record system into consideration and to bring efficiency, transparency, easy accessibility, Ministry of Rural Development (MoRD), Government of India, initiated centrally sponsored scheme in 1988-89 for computerization of records. In order to manage the programme effectively three agencies play effective role. These are: National Informatics Centre for providing training on application software to the revenue officials and technical support for the implementation of the scheme. Ministry of Rural Development is providing funds to the state Governments for site preparation, data entry work and purchase of furniture and other miscellaneous expenditure, and financial support for tehsil / taluk level set ups, training, etc. Where as, States are responsible for data collection, verification and validation, distribution of ROR to the landowners at nominal rates, on demand, and automating the entire workflow in land administration process and monitoring.

With the collaboration of centre and state, the computerization of land records programme has been in progress. The computerization of land records has been equipped with the supply of non-spatial and spatial data.

The land records supply information about the record of rights, the principal record, crop details, mutation record, and tenancy information. In some states like Madhya Pradesh, Tamil Nadu, Karnataka, and others additional records are maintained.

Computer printed copies of Record of Rights (RORs) are being distributed to the farmers with a less price than the manual records.

The inclusion of non-spatial data has been maintained by most of the states and followed more or less in the line of main objectives. However, the achievement is not at par with the expectation still after 17 years history of CoLR. Some states such as Karnataka and Gujarat have come up with certain successful achievements, some with moderate achievements such as Orissa, Rajasthan, Tamil Nadu, etc., and some are still lagging behind in the achievement of the objectives.

The incorporation of spatial data is further complicated with the sense that the digitization of cadastral maps has not been successfully launched in the CoLR program. In 1998-99 funds were alloted for digitization of maps and 32 pilot projects were sanctioned in 21 states. Still nearly after a decade of this project we are lagging in various stages of completion. Linking spatial data with non-spatial one completely is yet to be achieved.

The linking of these data will be providing useful information to the policy makers, planners and beneficiaries. It can be achieved by using any suitable software. It involved basically two steps:

(i) Porting of non-spatial data from existing database to the database of GIS software.
(ii) Linking of existing non-spatial database with the maps

The problems encountered during this process are:

1. The present day GIS packages are still working on the file based databases. This makes the porting of the non-spatial data into a GIS a difficult task.
2. For accurate analysis in a GIS the map should be well identified with any coordinate system. The village maps are not geo-referenced.
3. Multilingual support in GIS with CDAC Fonts/Activex Controls is also to be sorted out

Based on the above mentioned bottlenecks in the digitization of cadastral maps it is suggested that a resurvey with the help of GPS should be taken up. This will enables us to produce maps with proper coordinate system. The aerial photography supported with GPS may be taken up for fresh development of cadastral maps.

Integration of computerized land records data with registration department

A related issue is about changes in ownership due to sale, partition, exchange, gift, etc. which at present cannot be automatically entered even if registration is done through computerized system because there is no link between the land records department and registration department. Therefore, there is a need to integrate this data with registration department and other departments dealing with land issues which could facilitate simultaneous updating of land records due to sale of property, partitions, exchange, gifts, etc. this may also help faster updating of land records, which may be useful to land holders.

The book is an outcome of the collection of manuscripts submitted by the resource persons and participants in the national workshop organized by Centre for Rural Studies, LBS National Academy of Administration in 2005. The collection of resources is based on knowledge and experiences of the policymakers, administrators, and technocrats. The critical comments and suggestions provided by the contributors are outlined in several chapters to enrich the ideas of readers.

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Acknowledgement

The book owes its origin from the National workshop on "Computerisation of Land Records in India: Achievements and Experiences" conducted by Centre for Rural studies, LBSNAA on 13-14 December, 2005 under the auspices of the Department of Land Resources, Ministry of Rural Development. We express our sincere thanks and appreciation to the Ministry of Rural Development for the unstinted support and patronage given to the Centre for Rural Studies.

We gratefully acknowledge the resolute support rendered to us by Shri Rudhra Gangadharan, IAS, Director and Chairman, Centre for Rural Studies, Lal Bahadur Shastri National Academy of Administration, Mussoorie and Shri Padamvir Singh, IAS, Joint Director and Vice Chairman, Centre for Rural Studies, LBSNAA who are the moving spirits behind this endeavor.

We specially thank Dr. Hari Charan Behera who merits immense appreciation for his sincere efforts in bringing out this book.

Nonetheless, the efforts by our Team in CRS consisting of Dr. Saroj Arora, Dr. V.V. Singh, Shri Ramesh Kothari, Shri Samar Kashyap, Shri Deepak Kumar, Shri S.S. Kharola, Shri Adesh Kumar, Shri Dalip Singh Bisht and Shri Suresh Kumar deserve commendable appreciation and admiration.

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Editorial Introduction

Since the inception of Computerization of Land Records (CoLR) in India in 1988-89, it has been a much discussed episode among technocrats, policymakers, administrators and other service providers involved in the program to explore issues and possibilities for stepping towards the success. The thrust of the computerization of land records is to provide utmost facilities towards prompt and error free services to the beneficiaries and provide securities mainly to landholders and tenants. The program of Computerization of Land Records brings two aspects into the forefront. These are: spatial and non-spatial data. The inclusion of spatial and non-spatial data with accuracy and easy delivering, updation, retrieval and maintenance are the primary mode towards success. It needs to be easy accessing and cost-effective while getting Record of Rights (RORs) or seeking for mutation of land records. In order to do this, the supplying agencies or the service providers should be well equipped with the adequate technical support, training, financial support and others. The question arises is that are we equipped with all the technical measures? Also, are we in a position to deliver the required information to the stakeholders or beneficiaries on time? Different states have gained different experiences and achievements of CoLR since the last two decades. In technical and non technical aspects, some have progressed and some still lie in the back corner. Therefore, there is a need to understand the whole gamut of experiences through generalized perspectives illustrating various case studies from different states. The focus of this book is on the spatial data updation that mainly focuses the digitization of cadastral map, and the non-spatial data for the immediate delivery to the stakeholders. This volume on "Computerization of Land Records: Achievements and Experiences" is an outcome of a National Workshop organized by the Centre for Rural Studies of the Lal Bahadur Shastri National Academy of Administration, Mussoorie held on 13-14, December 2005. This book has two sections (i) Computerization of Land Records: A Generalized Perspective, and (ii) Computerization of Land Records: Experiences through Cases

First section has five chapters:

The first chapter on "Computerization of Land Records (CoLR) – An Innovative Approach to Management" by A.S. Dutt, Azad Singh and M. Chakraborty is an attempt to understand the basic features of computerization of land records. The major focus in the paper is the discussion on the trends in technological dimensions of the programme. Spatial distribution of land and the management of land records are emphasized by the authors. Storage, updation and retrieval and delivery of information with the growth and generation of new technologies are highlighted in the paper.

The second chapter on "A Nationwide Land Records and Information System" is jointly authored by S .K. Jain, M.M. Gore and Gulab Singh. It presents a database schema for the Nationwide Information System (NIS) in context of country India. An NIS keeps and manages information about a whole country. Such NIS helps government in making macro level policies for the country. Timely exchange of information among different departments of a government is

essential for effective implementation of the policies at grassroots level. An NIS can be useful for speed and balanced development of an entire country. Current database and internet technologies are adequate to develop such system. Governments of respective countries, particularly from underdeveloped and developing countries, should take initiatives in the direction of developing NIS for the benefits of their people. In addition to presentation of a database schema, the paper also discuss on query classification and available technological support for implementing NIS.

The third chapter on "Practical Approach to Land Information System in India" is also jointly authored by Alok Sharma and Lokesh Shrivastav. This highlights the issue of Computerization of Land Records in general and cadastral mapping in particular. It points out the possible factors that are hardening the process of digitization, with reference to vectoring a cadastre. The possibilities have been explored to digitize the cadastre and inclusion of spatial data and reduce the difficulties. The authors have realized the use of multi-thronged approach as the possible solution and defined the maintenance of digital cadastre and the associated ROR. They emphasized the need for strengthening of the quality of the persons through training at the village and tehsil levels for well maintenance. An emphasis for innovative techniques to ensure smooth workflow process and reviewing data for potential errors and changes towards getting accuracy was also emphasized.

In the chapter on "One Country-One LIS" the authors T. Raja Rao and P. Raj Shekhar raised the issue of diversification in methodology of creation, maintenance and updation of survey records. Therefore, they emphasized the need of single LIS for the entire country. The authors also describe the issues of computerization of survey records through their practical experiences. These are:

(i) Lack of awareness and also lack of appropriate technologies for computerization of cadastral records.

(iii) Technology Challenges: Accuracy: Various software solutions were tried by different states but the challenge is that it should be tailored to Indian context because the art and engineering behind Cadastral survey is a 100 year old system handed over across generations of surveyors. Therefore, the software solutions should follow the traditional approach. The second challenge is the level of accuracy with the digitized maps.

(iv) It is difficult to realize the accuracy and support in a short span. The needs for field testing would take 8-10 years. So in this context, the new software has no guarantee of support and sustenance.

The authors suggested that the needs are now to emphasize the Indigenization and Integration of Land Information System nation wide. An attempt is made to discuss the success story of VISIONLAB in the paper.

The Fifth Chapter on Comprehensive Modernization of Land Records (CMLR): Technology Architecture is also jointly authored by D. R. Shukla, Vinay Thakur, Ganesh Khadanga and D.S. Venkatesh. This chapter focuses on the following issues:

(i) CoLR and registration are being carried on a stand alone basis with difference in users' perception and local objectives.

(ii) Limited or no interaction leads to backlog of mutation cases, non-updation of Khasra /Khatoni/ Girdawari, and cadastral maps. As a result this doesn't show the actual ground partitions, multiple registration of the same property, non-availability of data to registration department and decreased coordination among the departments.

CMLR proposes to integrate land records maintenance with the Registration and Survey and Settlement Departments. The central database will have the data related to the following initiatives

(i) The latest ownership attributes data in the form of Record of Right (ROR).
(ii) List of Registered deeds and indexes.
(iii) Latest cadastral maps of a village (village/Field Measurement Books).

Section two of this book includes Computerization of Land Records: Experience through Case Studies. It highlights the inter-state variations in the use of tools and techniques, database for spatial and non-spatial data and progress made in delivery of services. This also highlights various issues pertaining to computerization of land records.

Sixth Chapter is the case of Bhoomi, the computerized land record system in Karnataka. The following are the key points discussed towards success of the program.

1. Bhoomi is an online system to carryout the mutation on live data with built in workflow automation in a local language.
2. It provides full proof authentication.
3. It has brought transparency in maintenance and updation of land records.
4. There has been effort for the capacity building training programmes and awareness creations towards bhoomi.
5. Better security has been ensured with the application of number of external devices.
6. Efficiency in generating non-spatial data.
7. A web based maintaining system has been developed to ease out the above concerns by senior officials.

Chapter-7 is the discussion on e-Dhara: Land Records Management System in Gujarat. V. Ramachandran and Sharad Rawal, the authors of this chapter have reflected the significant aspects of e-Dhara, the land records management system, project in Gujarat. With the progress of e-Dhara the government is trying to ban the manual system. 97% of the landholders have been given the free copy of the computerized RORs and the issuance of certificates to create awareness. The new system brought significant changes in the way land records maintained and administered. Online mutation is utilized in the districts and implemented in all 225 talukas as on 01-04-2005. The process to get computerized ROR has become easier in which the Khatedar does not require submitting the application. The details about the mutation process are explained by the authors. The software used in e-Dhara is called "Bhulekh Soft". Despite the success, there are glitches in the hardware and in technical aspects, which are being targeted.

Chapter -8 is on "Status of Computerization of Land Records in Tamil Nadu" by K.A. Mathew. The Tamil Nadu Info-system for Land Administration and Management (TAMIL-

NILAM) project was introduced with the objective of the computerization of land records data for the benefit of public. Out of the 206 taluks in the state, 201 taluks have come online and are fully operational in transaction mode. Manual extracts have been banned. There are various services like information on land matters and obtain extracts, birth and death certificates, information on pension schemes, guidelines with regard to value of land and general information on various welfare schemes. There is effort made to transform from the client-server model and MS-SQL based relational data bases to a central data processing centre and with advanced supportive mechanisms. The author has also brought forth the need of digitization of Field Measurement Sketch (FMS), which is essential for other departments concerned with the highways, railways, irrigation, agriculture, forest and others.

Chapter -9 on "Computerization of Land Records in Madhya Pradesh" is by B.M. Sharma and Rajeev Agrawal. It highlights that all 48 districts in Madhya Pradesh are covered under CoLR program. The land records include various aspects such as plot numbers, ownership rights, topographical recognition and crops with sown area etc. The inclusion of non-spatial data and spatial data are the significant measures taken by Govt. of M.P.

In addition, the digitization of cadastral maps and networking of computer program to facilitate the on-line mutation etc are some of the expected activities to be undertaken. Presently, the department of land records is using the best available latest operating systems and machines capacity building in the form of training is well achieved in comparison to other government organizations. Now version 2.0 of the Bhu Abhilekh software is successfully working in all the states while development of version 3.0 is in progress.

Further, the authors have suggested for the merger of the two departments such as tehsil and sub registrar office for easy flow of information.

Chapter -10 is an evaluation study of computerization of Land Records in India. Here the authors have used that data collected by the Centre for Rural Studies in four states such as Rajasthan, Tamil Nadu, Karnataka and West Bengal for the impact analysis. Through this empirical study, the authors have tried to present an overview of the computerization program and its impact. This paper also explores the possible areas where the programme can be more effective and efficient.

Eleventh Chapter on "ICT Based Integration of Land Records (HALRIS) and Land Registration (HARIS) in Haryana" was contributed by Ghanshyam Bansal and Gurpreet Saini. CoLR scheme was introduced in Haryana in the year 1990-91 and extended to the other districts by the year 1997-98. During the year 2000, the Haryana Revenue Department decided to computerize the registration systems such as Property Registration System and Land Record System. But later it was felt to integrate HALRIS with HARIS. Ultimately solution of online updating of land records was available through HALRIS##HARIS Model. The impact of the model is positive in the form of service delivery mechanism and this advance mechanism is less prone to error. The achievement and sustainability factors have also been clearly examined by the authors. Simultaneously, many drawbacks in the citizen service charter of land records were also highlighted.

Chapter-12 deals with CoLR in Himachal Pradesh. The CoLR was initiated in 1989 in Himachal Pradesh. There is gradual shift in software application in the state. Now, Visual Basic 6.0 at

front-end and MSSQL Server 2000 at back-end was put into use. The software is called Him Bhoomi. Computerization model in the state is the exact replica of the present manual record system thereby enabling its replication. A complete MIS encompasses minor irrigation census, agriculture census details, and linkages with census certification enlarge the scope of data and information.

Further, effort is to extend the scope of computerization by implementing Him RIS (Himachal Registration Information System) in all the tehsils. In addition to introduce encryption/decryption of data, there is effort to introduce barcodes in the Nakal robust methods to check the errors, linkages with GIS system etc. Presently, no attempt is made to digitize the cadastral maps as the government is of the view to finish the most non-spatial aspect of computerization first.

Chapter-13 raises issues of cadastral mapping. It narrates the existing errors and limitations of cadastral mapping while in pilot basis. In this chapter, the author has delineated his field experiences and given the recommendations. Under Computerization of Land Records program 154 tehsils out of 171 tehsils have been completed in Orissa. ROR data base is being updated to enable on-line correction of the ROR. Digitization of cadastral maps has been taken up as a pilot basis to enable on-line correction of the cadastral maps. The author realizes the errors in the mapping through field visit. The author points out the needs of Global Positioning System in comparison to Photo-Grammetry or Satellite Imagery to minimize the error in the digitization of cadastral maps. Therefore, the preparation of cover free cadastral maps with digitized spatial data and linkages with ROR data base will enable the land owners to have correct and updated land record relating to their individual land parcels.

The chapter-14 is the assessment study on Computerization of Land Records in Rajasthan jointly authored by T. K. Manoj Kumar and A. P. Singh. It is based on understanding of field based situation pertaining to Computerization of Land Records in Rajasthan. It focuses on the effectiveness of delivery of services by undertaking several parameters such as awareness and motivation, usage of services, information flow, time spent in delivery of the services, accuracy of records, etc. This chapter attempts to highlights farmers' opinion and views of revenue officials on computerization of land record. The authors made some points on recommendations towards further improvement and smooth functioning of computerization of land record Programmes.

Chapter-15, the final chapter narrates the optimism about the CoLR program with focused on approach. The authors are optimistic in the approach and feasibility of both financial and technical systems through CoLR. Their view is that the programme would realize the dream of e-governance. Future plan is to introduce mutation process to play touch screen kiosk at all Tehsil centers for providing adequate services to the beneficiaries. Necessary initiatives are taken to introduce the modules for including crop details, land settlement and village map.

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Chapter-1

Computerization of Land Record (CLR) – An Innovative Approach to Management

A.S. Dutt
Azad Singh
M. Chakraborty

Introduction

The Centrally Sponsored Scheme on Computerization of Land Record (CoLR) was started in 1988-89 with 100% financial assistance as a pilot project in eight Districts of the States such as Rangareddy in Andhra Pradesh, Sonitpur in Assam, Singhbhum in Bihar, Gandhinagar in Gujarat, Morena in Madhya Pradesh, Wardha in Maharashtra, Mayurbhanj in Orissa and Dungarpur in Rajasthan. The objective was to remove the problems pertaining to manual systems of maintaining and updating of Land Records and to meet the requirements of various groups of users. This project was initiated by Ministry of Rural Development, Government of India. Consequently, some latest tools of Information Technology such as Geographical Information System (GIS), Cadastral mapping, Photometry, Electronic Total Station (ETS), Global Positioning System (GPS) Digitalization, Biometrics and others have revolutionized the process of Computerization of Land Record. It is expected that CLR will not only be beneficial for the common man but also prove a backbone for the development of agriculture based India.

Objectives:

The main objectives of Computerization of Land Records are as follows:

1. Computerization of ownership and plot-wise details for issue of timely and accurate copy of the Record of Rights (ROR) to the Land Owners.
2. To store the records with latest digital technology for long time.
3. To provide fast and efficient retrieval of information both graphical and textual.
4. To provide database for agricultural census.

Need of Computerization of Land Record:

India is an agriculture based country. The main source of income of majority of population is derived from the agricultural occupation. Land as an asset plays significant role both in rural and urban economic scenario. Further, land as an asset supposed to have frequent transactions between buyers and sellers, donors and receivers, etc. In recent years with rapid of growth of industrialization and frequent cases of land acquisition in a developing country like India land management is a sensitive task for the administrators and revenue officials. For a farmer or a landholder, it is very crucial to have an authentic and a tamper proof patta to challenge the litigation and threat of acquisition. There are also many cases as evident, where land record ensures easy delivery of loans or credits to

farmers and provide secure means to meet the ends. Therefore, the land record management is equally important. Land records are vital documents for both farmers and the government, used to have ownership and required for numerous administrative functions as well.

Land record keeping is being maintained since ancient time. In early days when the number of landholdings was less, the management of records of land was not as difficult as it is today. Slowly, the land becomes prime source of income and more important among the people. With the smooth development, the people were more interested in buying and selling the land. That's why the job of land record maintenance becomes more important.

Traditionally, land records are based upon

1. Village Map showing the field and village boundary
2. Khasra showing details of the land as crops, area, tenure holders, methods of irrigation etc
3. Records of Right (ROR / Khatauni) showing the ownership details

Land records books like Khasra Girdavari, Khatauni, Jamabandi etc. maintained by Patwari, the revenue official at village level, need updation from time to time. These books are being used extensively along with land acquisition and litigation generating voluminous paper to serve the farmers. The storage of these documents is prone to natural disaster like fire, flood, earthquake, loss or damages due to white ants etc. Therefore, land records and related documents need to be electronically documented.

Evolution of computerisation in land records' management

With the launch of computerisation of land records in eight pilot districts in 1988-89 and its further extension to other districts in various states of the country needed an urgent review of the process for further modification and thorough actions. The scheme was reviewed in 1993-94 and it was observed that States were finding it difficult on sustainability of project due to non-availability of skilled man power, hardware maintenance, etc. So, it was decided to use the infrastructure, manpower and network of National Informatics Centre (NIC). NIC upgraded its district centres with latest hardware and software and states were requested to allocate one room near NIC District Centre to start data entry operation.

The project is being implemented in collaborative manner by Ministry of Rural Development (MoRD) & NIC. MoRD provides funds to states for data collection, data entry, site preparation etc. and NIC provides technical support, software development, training etc. For this purpose a data entry module was developed in DOS / dBase or Unix / Foxbase by NIC. To update, verification and validation of data, NIC equipped its district centres with appropriate hardware and software. As the technology has changed, NIC has also upgraded its hardware, networking and software to new GUI based environment.

This computerized system brought about a significant change in the way land records maintained and administered in the states. The system not only simplified the process of record keeping but also provides many collateral benefits.

Technologies used in Computerization of Land Record (CoLR)

Some technologies such as RDBMS (Relational Database Management System), FoxPro, Visual Basic, Oracle, SQL Server are being used for computerization. Some of the important tools which are frequently used in Computerization of Land Record are as follows:

- Geographical Information System (GIS)
- Cadastral Mapping
- Electronic Total Station (ETS)
- Global Positioning System (GPS)
- Biometrics
- Remote Sensing
- Simulator

Geographical Information System (GIS)

GIS has been defined in different ways, based upon their functions, basic components and users. GIS may be termed as a computer system that stores and links spatial and non-spatial data or geographically referenced data with graphic map features to allow a wide range of information processing and operation, as well as map production, analysis and modeling. GIS may be viewed as integration of spatial and non-spatial data for decision support system. There are two formats used by GIS systems to store and retrieve geographical data i.e. Raster and Vector. GIS tools can play a major role in different types of land accounting, monitoring, procurement, utilization and infrastructure development.

GIS is used to link electronic documents and digitized maps of the area to generate the true Geographical Information System and Electronic Document Management System.

Advantages of GIS:

1. All important documents are instantly available.
2. Quick retrieval of data is possible using queries.
3. GIS improves data analysis visually which improves decision making.
4. Provides thematic and statistical analysis.
5. Easy day to day monitoring.

At present the following States are using GIS Technology in Land Records on experimental basis as pilot project.

State	Platform
1. West Bengal	ESRI Product
2. Karnataka	Bhoomi - ORACLE 10G and Autocad
3. Chhattisgarh	GIS Tools
4. Tamil Nadu (04 Districts)	CollabLand software of NIC HQ

Cadastral Mapping

A cadastral map is a map showing boundaries and ownership of land. The cadastral maps show the details as Survey District Names, Block Numbers (within each Survey District), Certificate of Title numbers, positions of existing older structures, government described runhold section and/or plot numbers and their respective areas, adjoining and adjacent street names, selected boundary dimensions and references to prior founding maps.

Cadastre is a technical term for a set of records showing the extent, value and ownership (or other basis for use or occupancy) of land. Strictly speaking, a cadastre is a record of areas and values of land and of landholders that originally was compiled for purposes of taxation. In many countries there is, however, no longer any land tax and in practice the cadastre serves two other equally important purposes. It provides a ready means of precise description and identification of particular pieces of land and it acts as a continuous record of rights in land.

The cadastral map has four main purposes:

1. Provides a cartographic record of official and sometimes private land surveys and subdivisions.
2. Facilitates the administration and transfer of land ownership.
3. Records of land ownership.
4. Assists in the valuation and taxation of land.

At present the following States are using Cadastral Map Technology in Land Record on experimental basis as pilot project:

State	Platform
1. Andhra Pradesh	GIS & Remote Sensing Tools
2. Assam	GIS & Remote Sensing Tools
3. Gujarat	GIS & Remote Sensing Tools
4. Karnataka	Bhoomi - ORACLE 10G and Autocad
5. Orissa	GIS & Remote Sensing Tools
6. Tamil Nadu (04 Districts)	CollabLand software of NIC HQ and PostgreSQL

Cadastral Technology is in the process of implementation in rest of the states.

Electronic Total Station (ETS) & Global Positioning System (GPS)

The introduction of ETS technology augurs a revolutionary change in the agriculture history of the state. A land holder could now obtain a floppy of his land holdings from the provincial record room and reserve it for posterity and ready reference without even having to go to lower administration.

The Global Positioning System (GPS) is a burgeoning technology, which provides unequalled accuracy and flexibility of positioning for navigation, surveying and GIS data capture. The GPS NAVSTAR (Navigation Satellite timing and Ranging Global

Positioning System) is a satellite-based navigation, timing and positioning system. The GPS provides continuous three-dimensional positioning 24 hrs a day throughout the world. The technology seems to be beneficial to the GPS user community in terms of obtaining accurate data up to about 100 meters for navigation, meter-level for mapping, and down to millimeter level for geodetic positioning. The GPS technology has tremendous amount of applications in GIS data collection, surveying, and mapping.

Advantages of ETS & GPS Technology

(1) Accurate geo-reference points of the village traverse was possible. Using this in future, it would be possible that all villages are geo referenced to mosaic the village maps to generate taluk maps and larger scale maps accurately.
(2) Total station survey gave extremely accurate results.
(3) The out-put generated is in the digital format and open to further processing by computer.
(4) Normally table work consumes for more time than the survey process work itself by using the traditional method. Using new instruments it is possible to reduce the office process time to practically nil, as the out-put is digital and can be loaded directly into the computer. Calculation of area and other parameters are also automatically available.
(5) Mosaicing of blocks and incorporating and GIS related details is possible. As a result of this the process of cadastral survey could now be extended to include additional details normally available in cadastral maps. User departments can give further information which can be incorporated in GIS format. Thus generation of all digital cadastral survey maps using total station opens opportunities of making a full-fledged GIS possible for the areas surveyed.
(6) The available man power can take up large areas simultaneously.

At present the following States are using GPS & ETS Technology in Land Record on experimental basis as pilot project:

State
1. Andhra Pradesh
2. Gujarat
3. Maharashtra
4. Tamil Nadu
5. West Bengal

Remote Sensing

In this Technology data is collected about the earth without taking a physical sample of the earth's surface. The energy reflected from the earth is collected by the sensors. The collected information can be used as a digital image or as a photograph. Generally these sensors are mounted on a satellite, or on a plane or other airborne structure. Basically there are two types of sensors: passive sensors and active sensors. Passive sensors are used to gather radiation reflected from the earth's surface. The radiation must come from the external source like sun. But the drawback of the passive sensors is that it can be used only during daylight, whereas active sensors are different from passive sensors. Active sensors do not require the any external source of energy. The energy required comes from the sensor itself.

Remote sensing and GIS technologies were initially developed for different purposes. However, both of these resources can be used for Land Record Management. With the latest technologies in computer hardware and software now it is possible to merge the data from these sources. Generally, by using GIS software packages, remote sensing data can be imported or viewed, within the software application. This feature allows superimpose remote sensing data layers with spatial data layers. Remotely sensed imagery can be used with GIS data sets for a variety of applications, including providing a continuous view of the areas.

At present the following States are using this Technology in Land Record on experimental basis as pilot project:

State

1. Andhra Pradesh
2. Gujarat
3. Maharashtra
4. Tamil Nadu
5. West Bengal

Some of the north-eastern states are in the process of implementing this technology for land record management.

Image Processing

Image Processing is a technique to manipulate the digitized data from an image using various mathematical operations. Generally this is done using a computer, to create an enhanced image which is useful for analysis purpose and also soothing to a human eye. There are three basic functions of an image processing:

1) Image Pre-Processing
2) Image Enhancement
3) Image Classification

Image Pre-Processing

Preprocessing commonly consist of a series of sequential operations, including atmospheric correction, radiometric correction, image registration, geometric correction, and masking.

Image Enhancement

Image enhancement is the process to improve the digital quality of the image e.g. to make an image lighter or darker, or to increase or decrease contrast. The following are the enhancement techniques:

1) Contrast Enhancement
2) Histogram Equalization
3) Spatial Filtering

Image Classification

Image Classification is the process of assigning classes to the pixels in a remotely sensed data. For example in an agricultural scene, each pixel could be assigned the class wheat, rye, barley or fallow. This is very important for GIS work, since the classified image is much easier to incorporate than the original unclassified image. There are two subdivisions used; Supervised Classification and Unsupervised Classification. NIC has developed in-house Image Processing software **IPSNIC.**

Technology at user end:

The latest technology of computer was very successful at user end. It provides the opportunity to the land owners to access their land records easily.

Simputer

Simputer is a low cost, simple hand-held computer developed by a team of scientists from the Indian Institute of Science and the Bangalore -based Encore Software and can be used for field data collection directly from fields. Simputer can be used at the village level to collect agricultural data like kind of crops grown, the status of the crop and possible output etc. This is being done in Karnataka State where village level revenue functionaries have been given simputers for data collections. Chhattisgarh state has also used simputer to collect the data at village level for some projects.

KIOSK & Smart Card

The Public delivery needs to be further strengthened to provide certified copies of ROR to the landowners at doorstep through village level kiosks. These kiosks can be setup by private entrepreneurs. The land owners can also given smart cards in order to provide them the access of their land records data on 'when and where' basis. These technologies are widely used by almost all the states.

Biometrics

Biometrics is the technology to measure and analyze the biological data. This technology includes analysis of human body characteristics, such as fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for authentication purposes. It is used in land record management to ensure that manipulation of records can not be done without fingerprints of the officials concerned to make any changes. This technology is initially used in BHOOMI Project of Karnataka State.

Future Vision

Future vision of the Computerization of Land Records (CLR) is to create a transparent, efficient and effective Land Record delivery system. In the present system, records specific to the Land Owner are not open for scrutiny which results in manipulation and favoritism. The present scenario of the Land Record Management System is specific to state. A centralized management system will aid in analyzing and monitoring the Land Records for the country as a whole in the near future. It will lead to the standardization in the maintenance of records and implementation of Land Record Acts issued by

Government of India in uniform manner. It can be enforced by introducing the latest ICT Technologies. The Government of India has already announced the National e-Governance Plan (NeGP), in which Land Record is one of the Mission Mode Project.

Conclusion

It was really fascinating to witness the management of Land Records through effective and meaningful deployment of Information Technology infrastructure. The availability of Land plays a vital role in the development of an area. As the technology is rapidly changing there is a need to incorporate the latest ICT tools for prompt and effective mechanism to manage the Land Record System. GIS, GPS, Remote Sensing, Simputer etc. technologies have great potential to simplified Land Record Management System which can serve as a multipurpose administrative tools.

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Chapter-2

A Nationwide Land Records and Information System

S K Jain,
M.M. Gore
Gulab Singh

Introduction

Proper sharing of information among various departments of a government is necessary for speedy and balanced development of a country. Timely exchanged information, vertically in the hierarchy of a government system, helps in making macro level policies for a country and in controlling the execution of the policies at micro levels. The development of a Nationwide Information System (NIS) for keeping and managing information about the whole country will be very useful in making policies at various levels in a government system. Such NIS will not only help to government in modifying policies well in time, but also will ensure balanced development of towns, districts, states, and the whole country. An NIS is supposed to retrieve information for queries like:

1. How many primary schools are in a particular district?
2. Which district has maximum income per capita in a particular state?
3. How many owners have given their lands to tenants for agriculture in a specific district?
4. Display rainfall level in a particular district.
5. Display population of a particular district, etc.

The list of queries can be very long. Data, available in the database of the NIS, can be used in various analyses for many purposes. The work described in this paper is an extension and revision of our previous works (Jain, Singh & Gore, 2003a, b). In (Jain et al., 2003a), we designed and implemented a "Land Records System" for Hamirpur, a district of province Himachal Pradesh in India. We also extended the design of LRS (Land Records System) to convert it into nationwide land records system and proposed an idea of NIS. The development of NIS for a diverse country like India is necessary for its balanced development. In this paper, we propose a database schema for the development of NIS taking an example of country India. The proposed NIS also contains information of land records of the entire country. The article also has a discussion on query classification and available technological support for implementing the NIS.

Database Schema Design

The first step of designing a database schema using the ER model (Chen, 1976) is to identify entity types and relationship types present in the application domain. To address a land plot for NIS, we use the same hierarchical addressing as we used in (Jain et al., 2003a). Figure 1 represents conventional hierarchical addressing used to refer a land plot in different regions of the country. Figure 2 exhibits the same conventional addressing hierarchy as shown in Figure 1, except the general terms Division-1 and Division-2 have been used in place locally used terms. Division-2 can be further divided into smaller hierarchical units with the

consultation of district and state level concerned officials. Figure 3 exhibits the database schema for nationwide LRS as proposed by us in (Jain et al., 2003a).

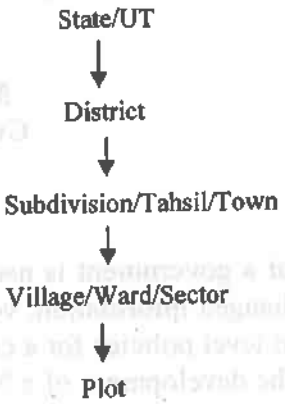

Figure 1: Geographic hierarchy using conventional terminology

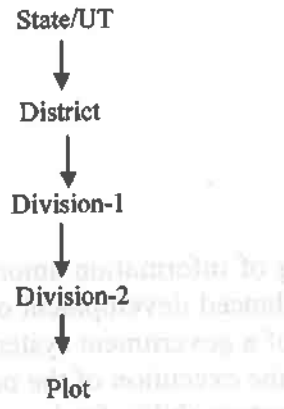

Figure 2: Geographic hierarchy using proposed terminology

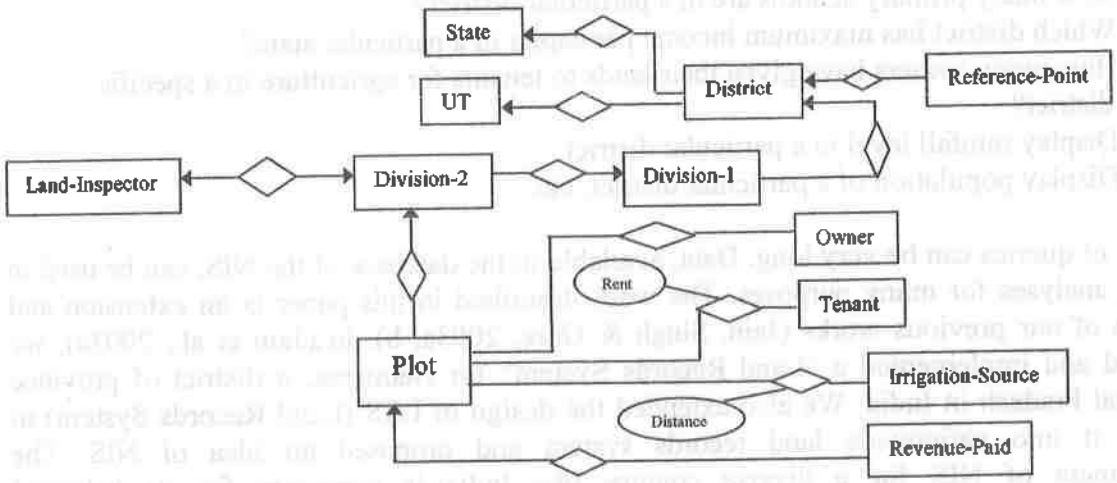

Figure 3: ER schema for Nationwide Land Records System

The database schema, shown in Figure 3, for the nationwide LRS consists of 12 entity types. The attribute level description of the entity types is as under:

Land Inspector EmpCode, E-name, E-FatherName, E-GrandFatherName, E-Address
Owner O-Code, O-Name, O-FatherName, O-GrandFatherName, O-Address, AccountNo
Tenant T-Code , T-Name, T-FatherName, T-GrandFatherName, T-Address, SubAccountNo
Irrigation-Source IS-Code , Type, I-Location
Plot Plot-Code, LandType, Area, Shape, Map, P-Location
Revenue-Paid Receipt-No, Amount, Date, PayeePerson, Remarks
State State-Code, S-Name
UT UT-Code, UT-Name

District D-Code, D-Name
Division-1 D1-Code, D1-Name
Division-2 D2-Code, D2-Name
Reference-Point Ref-Code, R-Name, R-Type, R-Description

We extend this ER schema for the database of the nationwide LRS to include information about basic amenities provided to people in villages, towns, and districts. The basic amenities may include education, health, entertainment, drinking water, bank, electricity, road, post office, telephone, highway connectivity, etc. The other useful information to be included in NIS may be population, sex ratio, literacy, income per capita, rain fall, crop etc. This extended system will help district administration to have a close watch on balanced development of the whole district and to convey latest data to state or/and central governments for further processing. The state and central governments will use these data for macro level planning and to allocate appropriate funds for various development activities. The exact structure of information for NIS can be decided only after consulting requirements with district, state, and central governments' concerned officials. We extend entity types of nationwide LRS to meet requirements of NIS as follows:

Plot Plot-Code , LandType, Area, Shape, Map, P-Location, Crop, DrinkingWater, ElectricityConnection, OtherData1, OtherData2,..., OtherDataN

Division-1 D1-Code , D1-Name, D1-Area, D1-Population, D1-SexRatio, D1-IncomePerCapita, D1-Hospital, D1-NumberOfTheatre, D1-NumberOfSchool, D1-CropProduction, D1-RainFall, OtherData1, OtherData2, ..., OtherDataN

Division-2 D2-Code , D2-Name, D2-Area, D2-Population, D2-SexRatio, D2-IncomePerCapita, D2-HighwayConnectivity, D2-PrimaryHospital, D2-Theatre, D2-School, D2-College, D2-BusStand, D2-Bank, D2-Postoffice, D2-Telephone, D2-CropProduction, D2-RainFall, OtherData1, OtherData2,..., OtherDataN

District D-Code , D-Name, OtherData1, OtherData2,..., OtherDataN

State State-Code , S-Name, OtherData1, OtherData2,..., OtherDataN

UT UT-Code , UT-Name, OtherData1, OtherData2,..., OtherDataN

Other relevant entities for the NIS may be as:

Bus Stand, Primary School, Primary Hospital, District Hospital, Regional Hospital, College, Bank, Post Office, Theatre etc.

Based on our understanding about the needs of the citizens and functioning of the government system of the country, we identify 28 entity types to satisfy requirements of the NIS. These entity types are as under:

Division-1, Division-2, District, UT, State, Reference Point, Land Inspector, Owner, Tenant, Irrigation Source, Revenue Paid, Plot, Bus Stand, Primary School, Primary Hospital, College, Bank, Post Office, Theatre, Petrol Pump, Police Station, Fire Brigade, District Hospital, Regional Hospital, Railway Station, River, Canal, and National Highway.

Figure 4 exhibits ER schema for NIS. This schema consists of 28 entity types and 75 relationship types. Out of 75 relationship types, 13 are of many-to-many, 60 are of one-to-many, and 2 are of one-to-one type. The schema shown in Figure 4 is too large, and we have represented it by scanned and reduced image. Schema in Figure 4 is difficult to comprehend and communicate; therefore, we shall represent it using a schema compression technique developed by us. The complete explanation of the

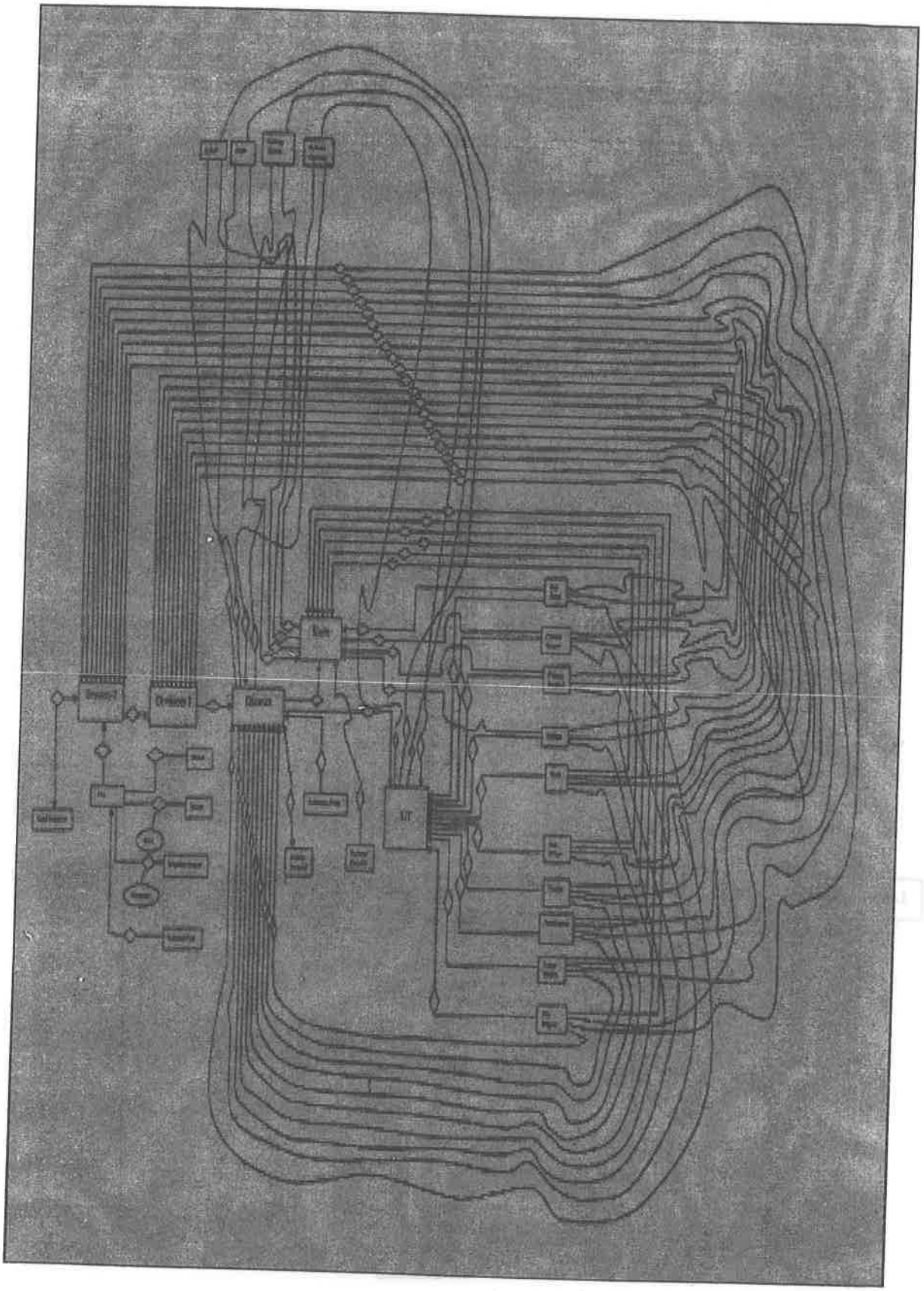

Figure 4: Proposed ER schema for Nationwide Information System (scanned and reduced image)

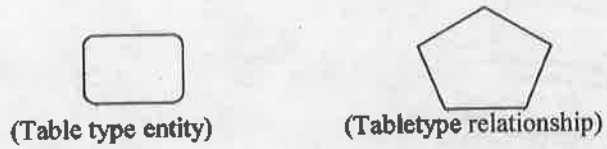

Figure 5: Notation for Tabletype entity and Tabletype relationship

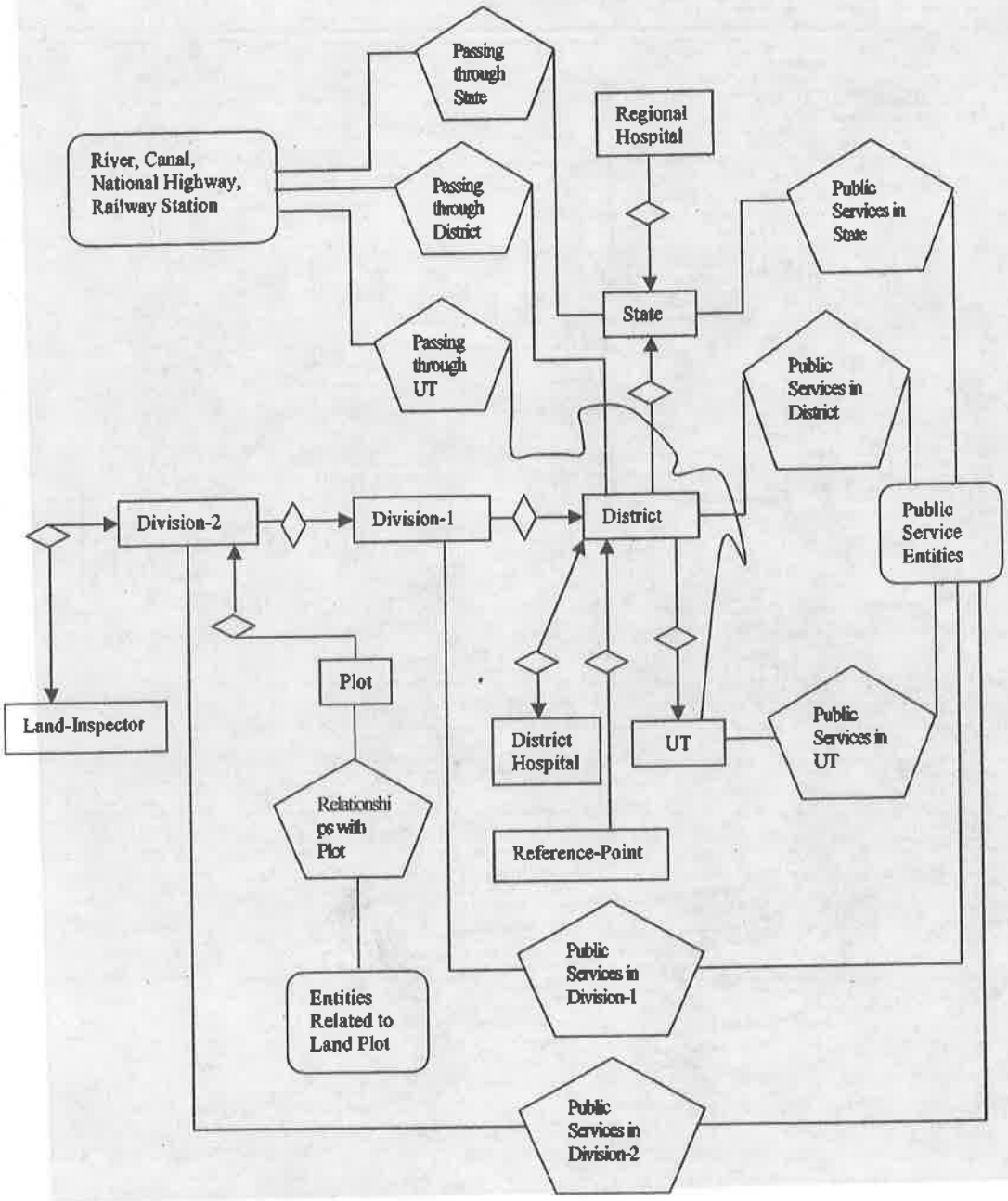

Figure 6: Compressed form of schema shown in Figure 4

Public Service Entities	Public Services in Division-1 Relationship Names and types from Division-1to entity types mentioned in first column	Attributes of Relationship types
Bus Stand	r-3 1-to-n	--
Primary School	r-4 1-to-n	--
Primary Hospital	r-5 1-to-n	--
College	r-6 1-to-n	--
Bank	r-7 1-to-n	--
Post Office	r-8 1-to-n	--
Theatre	r-9 1-to-n	--
Petrol Pump	r-10 1-to-n	--
Police Station	r-11 1-to-n	--
Fire Brigade	r-12 1-to-n	--

Table 1: Combined table for tabletype entity "Public Service Entities" and tabletype relationship "Public Services in Division-1

Public Service Entities	Public Services in Division-2 Relationship Names and types from Division-2 to entity types mentioned in first column	Attributes of Relationship types
Bus Stand	r-14 1-to-n	--
Primary School	r-15 1-to-n	--
Primary Hospital	r-16 1-to-n	--
College	r-17 1-to-n	--
Bank	r-18 1-to-n	--
Post Office	r-19 1-to-n	--
Theatre	r-20 1-to-n	--
Petrol Pump	r-21 1-to-n	--
Police Station	r-22 1-to-n	--
Fire Brigade	r-23 1-to-n	--

Table 2:Combined table for tabletype entity "Public Service Entities" and tabletype relationship "Public Services in Division-2"

Public Service Entities	Public Services in UT Relationship Names and types from UT to entity types mentioned in first column	Attributes of Relationship types
Bus Stand	r-47 1-to-n	--
Primary School	r-48 1-to-n	--
Primary Hospital	r-49 1-to-n	--
College	r-50 1-to-n	--
Bank	r-51 1-to-n	--
Post Office	r-52 1-to-n	--
Theatre	r-53 1-to-n	--
Petrol Pump	r-54 1-to-n	--
Police Station	r-55 1-to-n	--
Fire Brigade	r-56 1-to-n	--

Table 3: Combined table for tabletype entity "Public Service Entities" and tabletype relationship "Public Services in UT"

Public Service Entities	Public Services in District Relationship Names and types from District to entity types mentioned in first column	Attributes of Relationship types
Bus Stand	r-37 1-to-n	--
Primary School	r-38 1-to-n	--
Primary Hospital	r-39 1-to-n	--
College	r-40 1-to-n	--
Bank	r-41 1-to-n	--
Post Office	r-42 1-to-n	--
Theatre	r-43 1-to-n	--
Petrol Pump	r-44 1-to-n	--
Police Station	r-45 1-to-n	--
Fire Brigade	r-46 1-to-n	--

Table 4: Combined table for tabletype entity "Public Service Entities" and tabletype relationship "Public Services in District"

Public Service Entities	Public Services in State Relationship Names and types from State to entity types mentioned in first column	Attributes of Relationship Types
Bus Stand	r-66 1-to-n	--
Primary School	r-67 1-to-n	--
Primary Hospital	r-68 1-to-n	--
College	r-69 1-to-n	--
Bank	r-70 1-to-n	--
Post Office	r-71 1-to-n	--
Theatre	r-72 1-to-n	--
Petrol Pump	r-73 1-to-n	--
Police Station	r-74 1-to-n	--
Fire Brigade	r-75 1-to-n	--

Table5: Combined table for tabletype entity "Public Service Entities" and tabletype relationship "Public Services in State"

River, Canal, National Highway, Railway Station	Passing through UT Relationship Names and types from UT to entity types mentioned in first column	Attributes of Relationship Types
River	r-57 m-to-n	--
Canal	r-58 m-to-n	--
National Highway	r-59 m-to-n	--
Railway Station	r-60 1-to-n	--

Table 6:Combined table for tabletype entity "River, Canal, National Highway, Railway Station" and tabletype relationship "Passing through UT"

River, Canal, National Highway, Railway Station	Passing through District		Attributes of Relationships Types
	Relationship Names and types from District to entity types mentioned in first column		
River Canal National Highway Railway Station	r-33 r-34 r-35 r-36	m-to-n m-to-n m-to-n 1-to-n	-- -- -- --

Table 7: Combined table for tabletype entity "River, Canal, National Highway, Railway Station" and tabletype relationship "Passing through District"

River, Canal, National Highway, Railway Station	Passing through State		Attributes of Relationship Types
	Relationship Names and types from State to entity types mentioned in first column		
River Canal National Highway Railway Station	r-62 r-63 r-64 r-65	m-to-n m-to-n m-to-n 1-to-n	-- -- -- --

Table 8: Combined table for tabletype entity "River, Canal, National Highway, Railway Station" and tabletype relationship "Passing through State"

Entities Related to Plot	Relationships with Plot		Attributes of Relationship Types
	Relationship Names and types from Plot to entity types mentioned in first column		
Owner Tenant Irrigation-Source Revenue-Paid	r-25 r-26 r-27 r-28	m-to-n m-to-n m-to-n 1-to-n	-- Rent Distance --

Table 9: Combined Table for tabletype entity "Entities Related to Plot" and tabletype relationship "Relationships with Plot"

compression methodology is described in (Jain, Singh & Gore, 2003c); however, to compress schema shown in Figure 4, we describe methodology in brief as under:

"If two or more entity types are related to a specific entity type, convert them into a cluster; and represent details of the cluster using a table. We call this cluster of entity types as tabletype entity. Similarly, a number of relationship types are replaced by a tabletype relationship. Tabletype entities and tabletype relationships are shorthand notations for the clusters of the entity types and the relationship types; they have been used to simplify the size complexity of large sized ER schemas. A tabletype entity is interpreted along with a tabletype relationship; therefore, tables used for both (a tabletype entity and a tabletype relationship) can be combined as a single table. The notation used for tabletype entities and tabletype relationships is shown in Figure 5."

Figure 6 exhibits compressed form of schema shown in Figure 4. Schema shown in Figure 6 consists of three tabletype entities and 9 tabletype relationships. Tables 1, 2, 3, 4, 5, 6, 7, 8, and 9 describe details of the tabletype entities and the tabletype relationships shown in Figure 6. The understanding of details of the tables is self-explanatory.

Query Classification

The possible classification of queries for the NIS may be as follows:

- division specific queries
- district specific queries
- queries useful for municipality (local government)

- queries for local administration
- queries useful for state government
- queries useful for central government
- queries form planning and development point of view
- basic amenities related queries
- plot specific queries
- owner specific queries
- tenant specific queries

Few examples of queries for the NIS may be as follows:

1. How many primary schools are in a particular division/district?
2. How many primary hospitals are in a particular state?
3. Who is owner of a particular plot?
4. Which district has maximum income per capita in a particular state?
5. Find all plots in favor of a particular owner in a particular district.
6. How much a particular person owns land in the whole country?
7. How many plots have drinking water facility in a particular division/district?
8. How many plots have electricity connections in a particular division of a district?
9. Display divisions that do not have bank facility.
10. Display divisions that do not have a single post office.
11. How much state government earns from land revenue?
12. How many owners have given their lands to tenants for agriculture?
13. Display map of a particular plot.
14. Display all reference points in a particular district.
15. How much municipality earns from taxes?

The list of queries can be extended further. One interesting and most important query may be "Find all land plots owned by a particular person in the whole country". The answer of this query will expose the people who have disproportionate land in favor of their names. To implement this query, the owner should be identifiable at national level as a vehicle/voter is identified by its unique identification number.

Technological Support for Implementation

Next step for implementing the NIS is to translate ER schema into its equivalent relational schema. The translation process of an ER model into the relational model is straightforward (Teorey, Yang & Fry, 1986), (Markowitz & Shoshani, 1992). Entity tables in a relational schema will represent all entity types of the ER schema, one-to-one and one-to-many relationships will be implemented using foreign key constraint, and many-to-many relationships will require additional relationship tables (Teorey, 1999), (Elmasri & Navathe, 2000), (Silbergschatz, Korth & Sudarshan, 2002). The translated relational schema can be implemented using a commercial RDBMS or an open source RDBMS (Relational Database Management System). Oracle, SQL Server, DB2 etc. are popular choices of the commercial RDBMS; however, open source RDBMS MySQL (URL 6) and PostgreSQL (URL 7) are more attractive choices in terms of cost and performance. A nice explanation of open source software required for developing an information system is given in (Doernhoefer 2006). In paper (Doernhoefer 2006), different choices of OS, RDBMS, web server, and server level script in the open source world are given. All commercial RDBMSs also support data type

required to represent a land plot as an image. Detailed steps of implementing a database using Microsoft's RDBMS Access are described in (Jain, Chaudhary & Gore, 2000); however, Access is not recommended to use for large databases. Most of the queries for the NIS will be SELECT type and can be implemented in SQL. The accessibility of database through internet can be provided by generating web pages dynamically as given in (Nguyen & Srinivasan, 1996). Instead of writing CGI program to generate HTML code, various forms of annotated HTML embedded scripting commands, included within an HTML document, can be used. The details of popular approaches PHP, Active Server Pages, Java Server Pages, and Java Servlets can be found at sites URL 1, URL 3, URL 4, and URL 5. In (Fraternali, 1999), a survey of tools required for data intensive web applications development is given. In (Labrinidis & Roussopoulos, 2000), a study shows that mod_perl, an Apache Server module can improve performance of CGI script at least 10 times by making persistent database connection. Fast CGI (URL 2) is also a solution to improve the performance of CGI.

Conclusions and Further scope of Work

A Nationwide Information System (NIS) keeps and manages information about whole country centrally. An NIS can play a major role in speedy and balanced development of a country. The NIS will provide information useful for district administration, state government, and central government. The NIS will not only help in macro level planning, but also in controlling implementation of the policies at grassroots levels. In this paper, we have addressed the first step of developing NIS for India, that is, design of the database schema. Using ER model, we have prepared a database schema for NIS that contains 28 entity types and 75 relationship types. Query classification and implementation issues of NIS are also discussed in the paper. The development of an NIS is a large project and requires substantial manpower and resources in its design and implementation; however, current state of art technology is adequate to develop such NIS. The consistent structure of information for NIS can be made with the consultation of district, state, and central governments' concerned officials. The accessibility of NIS through internet will introduce transparency in government functioning. The NIS can also be extended for on-line sale and purchase of land/property through internet. In further scope of our work, we expect that concerned departments of government will come forward to take initiatives in the direction of developing NIS for the country.

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Chpater-3

A Practical Approach to Land Information System (LIS) in India

Alok Sharma
Lokesh Shrivastav

The importance of a Land Information System (LIS) is already well established. That a more transparent, efficient and people friendly system for the upkeep of land records is a need recognized by all.

Old System

The biggest concern in the traditional system is that its procedures are person dependent. People have to look up to the Patwari or Revenue Inspector for any legal land related transaction/requirement. A Patwari or Revenue Inspector is the axle of the wheel of Land transactions. It is he who verifies and effects a mutation in the revenue records. He is the one who would provide "Naqal" (copy) from the record of rights (ROR). The upkeep of cloth bound maps and brittle yellow pages of the RORs is a Herculean task often associated with risks of manual errors while making a fresh copy. He is responsible for the upkeep of the same.

Since the system is person driven and dependent, there are delays in the upkeep of the records and maps. There are disputes followed by litigations due to wrong entries done at the behest of one party and there are unending delays in the disposal of cases.

Often he has responsibilities for more than one village. He travels from one village to another to carry out his duties. With increasing workload and demands on him, the system simply buckles down as he is not able to cope with the duties he is expected to perform.

We some times conveniently blame a Patwari for his inefficiencies, his non-availability, his age old techniques, his behaviour, and call him corrupt who would not do anything till he is sufficiently rewarded for his services. While, some of these allegations may have substance, the fact remains that he needs help. A Land Information System (LIS) is just that help that can assist the Patwari to perform his duties efficiently. Implementation of LIS can provide him the much-needed aid with which he would be able to perform his tasks with better speed, accuracy and with decreased burden.

Apart from assisting the Patwari in his work, an LIS would also bring in transparency into the system. By linking the information of the ROR with the maps one gets real time visualization of the ground that helps in taking more informed decisions.

Policy makers were always looking for ways and means to transform the age-old system. Serious efforts to find an effective solution to the Land Reforms were started by Indian states in late nineties. Karnataka, Andhra Pradesh, Madhya Pradesh and Haryana to name a few took initiative in finding best solutions for reforming the Land Recording system with IT and emerging technologies like GIS coming to aid. LIS as a solution started being conceptualised as an acceptable and more importantly do-able solution in later part of the decade.

Where are we now

The states with computerization of RORs have taken up initiatives towards strengthening Land Reforms. Some states like Karnataka, Madhya Pradesh, Gujarat and Goa have completed the computerisation of R&R exercise for the entire state. However, some states are still in the process of developing this digital database. Karnataka developed "Bhoomi" an application that enables farmers to take a print of the record of the holding from the Kiosks established for the purpose. Digitisation of the cadastre maps has been attempted by many states but none has gone for this exercise for the complete state. Few states like Karnataka preferred to have only a scanned map for the maintenance of the Cadastre map, as this is the cheapest and quickest option for a digital cadastre, majority of them are in favour of a vector based digital cadastre.

All these efforts can be termed as a journey towards the goal of establishing a system that is trustworthy, dependable, transparent and effective. However, these steps all by themselves are not sufficient in meeting the overall objective of developing an LIS, which can provide the above desired qualities.

What is stopping us

An LIS at the macro level has two components:

1. Aspatial Component: These are TEXTUAL in nature like the ROR, Mutation Register, etc.
2. Spatial Component: These are GRAPHICAL in nature like the Cadastre Maps, Field sketchbooks, etc.

The aspatial components do not pose much problem in the realization of this goal barring one aspect of standardization of the fields across the states. Different states have different attributes in their respective record of rights and there is no standardization in the inter-state record keeping. Besides, each state keeps the records in their respective languages. The choice of database being used also differs from state to state. The initial work that was started by states made use of then prevalent databases like FoxPro (Madhya Pradesh started with FoxPro and changed it to Microsoft SQL later). However, within a given state there is uniformity of record structure and language. With this it becomes possible to bring all the registers in digital form.

The most difficult task is to develop the spatial component. This task has been found most wanting due to the complexities involved and the perceived prohibitive cost of creating a digital cadastre. Doubts are also raised for the accuracy of a vectorized cadastre vis-à-vis the record of rights. So far, no state has had an encouraging experience of developing a vector cadastre that can be replicated or taken as a base for others to follow.

The potential of Geographical Information System (GIS) or Land Information System (LIS) can be realized only when both Spatial and Aspatial components are linked together. All the initiatives such as revenue accrued, subsidiary given, compensations awarded for land acquisition for infrastructure developments, management of barren lands, allotment of land to the most needy, quick and accurate information dissemination to farmers, quick disposal of pending litigations, optimization of land resources, monitoring of irrigation resources, settlement and consolidation, etc have been started by states. However, those who are stopped short of reaping rich rewards could be realized if an LIS could be put in place.

Where do we go from here

We will have to proceed to achieve the objective of developing the LIS at least at a State level. We must study the methodologies that have been practiced by countries who have successfully created such information system, remodel them to make them suitable to Indian context. Developing methodology should be improved further by doing the Pilot projects and implement them in a phased manner taking few districts at a time with continuous learning and an improvement cycle in place.

In order to proceed we will have to take stock of technological advancements that are happening around us. Any decision that we have to take while deciding the basic frame of the LIS has to be futuristic in its approach. We must set up expert groups to deliberate upon and advise on implementation aspects like standardization of reference systems and projections for mapping, database models, cost benefit studies for various alternative approaches for data compilation, training and implementation strategies, progress monitoring schedules etc.

As stated earlier, initially, the computerization started using the then prevalent database. With technology changing at a fast pace, much more efficient RDBMS are now available offering powerful features.

Deciding about the right Relational Database Management System (RDBMS) for adoption one must consider its robustness, the security protocols that it offers (land records being a legal and sensitive information), and its ability to handle numerous transactions. One may also like to analyse features offered by some of the databases that enable even the spatial components to be stored within the database. This may have a significant impact on the way the digital cadastre could be stored and maintained. Of course, if a state decides to go for a database that has capabilities of storing the geometry of the fields, it will also have to devise the methods for verification of mutations by the

Revenue Inspectors/ Patwaris and how these changes will be made in the database. The crux of the matter is to have a futuristic model in place as the backend of the LIS.

All major RDBMS support multilingual UI. Instead of having the data in their respective language alone, states must adopt a bi-lingual approach. Apart from its own language the records should be available in a more acceptable common language so that there is standardization across the states, which can provide flexibility to the system at a future date.

Since the exercise of converting the aspatial data has already been started long back the states need to deliberate on the RDBMS that they should be using.

Spatial Data/Digital Cadastre

In European countries major initiatives have been taken by many nations to develop LIS. Some of them have even completed the exercise and have in place a robust system that caters to the need of the farmers as well as the government. Countries like the UK has the LIS implemented in England, Wales and Northern Ireland. Currently, the National Land Registry of Ireland is also getting the LIS created.

Solutions and indigenous capabilities exist within the country to develop solutions that are recognized by developed nations, are implementable, do-able, and visible*.

In case of India, the initiatives of creating digital cadastre have hit roadblock due to the following factors:

1. The Village Maps are old and obsolete and do not represent the current ground situation.
2. Fresh ground surveys using modern technology will involve huge cost.
3. There are no maps available on a defined scale, only Field Sketches are available and these are not to scale.
4. Our revenue inspectors are not equipped to handle the technology and are already overloaded with work.

Besides the above facts, we have to find answers to practical difficulties that will arise while developing the LIS. A few envisaged are listed below:

5. What is the reference system that we should adopt?
6. How do we handle the differences in the digitised areas vs. what is available in the record of rights?
7. Can some accuracy standards be defined?
8. How do we handle maintenance of the spatial component of the data?

All these questions and answers to majority of these have not been enthusiastic and encouraging. The questions though, are valid and arise out of the existing state of land records, the infrastructures available and the present system of maintenance of land

records. Due to these bottlenecks, the progress on creating digital cadastre has not been pursued vigorously by the states. However, success lies in either finding a workable solution to these problems or to work around these problems so as to achieve the overall objectives. It is with this mindset that the following thoughts are compiled.

Where do we start

Since the problems are manifold and varied in magnitude both qualitatively and quantitatively, no straightforward solution will be able to provide a satisfactory solution to all of the above questions. Therefore, one will have to think of an out of the box solution to a major extent the questions posed above. A multi-pronged strategy has to be evolved that will be able to tackle these questions in a phased manner eliminating the bottlenecks gradually. Few thoughts that are worth pondering over are compiled below:

Start with what is available

Let us start with what we have. We do not have to wait till the time one has the complete cadastre digitised. We can start with scanned maps coupled with only a Point layer with Survey number added as an attribute for each holding. Small routines can be developed in any chosen GIS software that will centre the scanned image based on the survey number given in the point layer at an appropriate scale so that the image does not get pixilated. It will be possible to print a predefined window on a fixed paper size with the plot in and create plot from the scanned map at a defined scale. The farmer can be provided this print along with the ROR information. Starting with this exercise we will have some advantages:

1. Complete information dissemination to the farmer from map as well as ROR.
2. No dependency on Patwari/Revenue man if the data is loaded in Kiosks established for the purpose of information dissemination like Bhoomi in Karnataka.
3. Patwaris to start getting oriented for the final objectives by getting used to computers and GIS in its basic form.
4. No dependency on tracing paper/Ammonia Print Machine for generating village maps.
5. No upkeep of hard copy or cloth bound maps.
6. Three tier pricing structure for farmer depending on his need for only the copy of ROR or the map or both. Increased revenue to exchequer if a farmer wants both.

Optimum survey and Digital Cadastre creation

Carrying out fresh surveys using modern equipment is going to be indeed cost prohibitive. At the same time it is also realized that the current maps are obsolete and do not represent the correct ground situation as on date. Resources within the department are limited and cannot cope with the fresh surveys.

Strategy to create the digital cadastre, which is up-to-date, therefore has to be different. Minimum survey to at least establish a highly accurate GIS control will have to be taken up as the objective is to bring the Cadastre to GIS. A system of DGPS control on Village tri junctions needs to be established with pillars constructed at the tri-junctions. These coordinates will help establish planimetric control to the digital mapping.

Also, the Differential Global Positioning System (DGPS) coordinates will be used to "Georeference" the scanned maps. Georeferencing is the process that is used to bring a scanned map to the real world coordinates. These so called "Georeferenced" maps are most essential and the foremost basic step in creation of the LIS solution.

Lack of resources for survey within the revenue department and cost prohibitive fresh surveys using modern survey instruments like Electronic Total Station (ETS) and DGPS may find an alternative in a combination of aerial Photogrammetry and the georeferenced revenue maps.

Madhya Pradesh did it to a great extent. An alternative to fresh field survey is to have a medium to large-scale aerial photography (1:3000 to 1:10000) flown. Survey of India (SOI) can contribute to a great extent in detailed planning and execution of aerial surveys. The Village tri-junction pillars should be in place and the GPS control established before this is done. The aerial photographs can then be orthorectified either within SOI or by involving private sector for a given district. The orthorectified photos can be mosaicked to create photomap of the villages. The scanned Cadastre maps should also be georeferenced.

Once we have these two inputs available, it will be easier to differentiate between bunds appearing on the aerial photo map and forming boundaries for the holding from the other which have been created by farmers for irrigation purposes etc. At the end of the day a digital cadastre gets created that "resembles" the current paper map and is closer to the current ground situation as the boundaries have been picked up from the latest aerial photos.

The question of accuracy still remains unanswered. What will be the variation between the areas available in ROR and calculated from the digital map created? A rule of thumb needs to be put in place rather then discarding the complete exercise as inaccurate. Wales and Northern Ireland gave a 10% tolerance as acceptable if the area of the polygon created is within 10 % of the area as per the gazetteer. We can decide what this tolerance should be in Indian context.

The suggestion for defining the tolerance is only to aid the authorities to determine which fields have a need for ground verification. For any legal requirement, the area as mentioned in the ROR will continue to remain as true and authentic entity.

Once the above exercise is completed, only those holdings where the area deviations are more than the tolerance specified should be noted for field verification. Apart from these,

other mutations that are pending for verification should also be marked for field verification.

A field survey exercise should then be taken to verify these aberrations in mapping and also for updating the mutations pending. Since, this exercise will be only for a part of the complete village coupled with the fact that the mutations in any case were due for validation and resurvey the cost of the field will not be prohibitive.

One may argue that the aerial photography will also be incurring expense, however, it will still be cheap as compared to the fresh field survey with modern instruments. One will also have to factor the time that will be invested in field survey versus going the aerial photo way. Coupled with the timesaving that will be realized in the later approach the overall solution will still be best suited for Indian scenario.

Maintenance

A digital Cadastre seems feasible with combination of various technologies and their optimum use as suggested above. However, equally or probably more importantly is the task of keeping it up-to-date. Land ownership changes as mutations happen every day and the person who is responsible to reflect them on the map is too much overloaded with responsibilities of many villages for various tasks. As a result an ideal scenario of a mutation being reflected in the data in 30 days, sometimes gets delayed for longer time period.

Therefore, more important is to devise strategies and methodologies right in the beginning for the maintenance of the database both spatial and aspatial.

One of the most daunting tasks in a data capture processes of 'equivalent' scale is the distribution of workload. It is for this reason that the unit of work allocation for data maintenance of digital cadastre and the associated ROR needs to be well defined. While the field verification of mutations needs to be done at even smaller level i.e. at individual village level, a team of revenue officers at Tehsil level should take up the updating of the digital data. More importantly is the task of management of tasks amongst various team members for the various processes involved i.e. how at any given point of time the multiple data capture staff can efficiently and independently work on the project, without compromising the data quality or integrity.

There is a clear need for strengthening of the quantity and quality of persons at the village and tehsil level if this has to be successful by keeping the data up-to-date. The Patwaris start their work in their youth and continue it till their retirement. They are trained in the age-old technology of chain and compass measurements. The fieldwork is taxing, and requires stamina.

With age as a factor the patwaris need to be accommodated in the later part of data maintenance and data upkeeping rather than the field verifications of mutations. The fieldwork needs to be assigned to the younger lot. This younger lot not only will be more

energetic and keen to do the field work but they will also be more adaptable to newer technologies in the field of surveying. They may even be pre-oriented to computers and can be trained in the latest tools for mutation like the digital mark up system being practiced in the developed countries.

Moreover, if an LIS is to be put in place, a prerequisite will be to make the senior patwaris technology oriented by exposing them to computers/GIS. They need not to become Geeks to do this work, but would definitely require an orientation to the emerging technologies. This will not only result in success of the LIS by ensuring that the databases and digital cadastre are updated, it will also generate opportunity for more employment for people in revenue services. Needless to mention that the advantages of LIS will far outweigh the extra load on state exchequer.

Thus, to summarize: to ensure the smooth workflow process innovative techniques are required. The basic objective is primarily to create the Client-Server based multi-user system, which will ensure setting up of a status tracking mechanism, dividing the sub-tasks into smaller work allocation units within the Tehsil. Thus the project management will become a much more efficient task as compared to conventional procedures for this one time process of cadastre database creation.

Technicalities of keeping an LIS up-to-date

Maintaining any form of data, especially digital there are certain principles and important questions to be kept in mind:

a) What to keep
b) How long to keep it
c) How to keep it, and
d) How often to keep it

However, this still is a loose definition and there is a need for developing additional guidelines to regulate and define records management and retention policies for digital data (not only for GIS!) by the government. Moreover, a record in a GIS/LIS is difficult to define. It can include: data in the database, scanned maps themselves, aerial photographs, metadata, etc.

Reviewing Data for Potential Errors and Changes

A system will also be required for quality control (QC) of the data added/'mutated'/updated. It will need to be determined what will be checked and what degree of accuracy is required. The issues which need immediate attention, are described below

Incompleteness

Begin by checking all the layers/attributes of the data in question in the database are there. Also, one needs to make sure no layers are repeated. Define a process for checking some of the individual features of each layer. Determine if there is any missing data and make sure data is not repeated in more than one layer.

Errors

There are two types of errors one should be concerned with: positional and attribute. Positional errors are defined as absolute or relative (and in our case, only relative). "Relative accuracy is a measure of the maximum deviation of the interval between two objects on a map and the corresponding interval between the actual objects in the field. Relative accuracy does not relate to a correct geographic position and therefore, the exact position of the object is less relevant.

Absolute accuracy is a measure of the maximum deviation between the location where a feature is shown on the map and its true location on the surface of the earth. Attribute errors are problems with the feature itself, not where it is located.

Applying the Edits and Tracking Changes

Editing the proposed cadastre database can become a tedious task. However, it is important to the data integrity that the edits are done accurately and consistently. All changes should be tracked in a way that will allow to determine when the records were updated, by whom, and what level of confidence the data was rated.

When necessary, a history log will have to be maintained and would be displayed for each record and all changes to the data will be noted. Archiving data is a good way to keep outdated information from cluttering the system, while allowing easy recall should there be something wrong with the updates or new data.

Verifying the Corrections

A quality control process will need to be designed or use an existing verified procedure already implemented to check the corrections made. It will not be sensible to verify every change made, but the process should allow the user to select a random number of records and confirm that corrections were made correctly.

Updating the Master Database

Once the Tehsil cadastre update team makes edits and it has been verified that they were updated correctly in the database the master database can be updated. If edits are being made on a daily basis, the master database may be updated on a daily basis as well, but

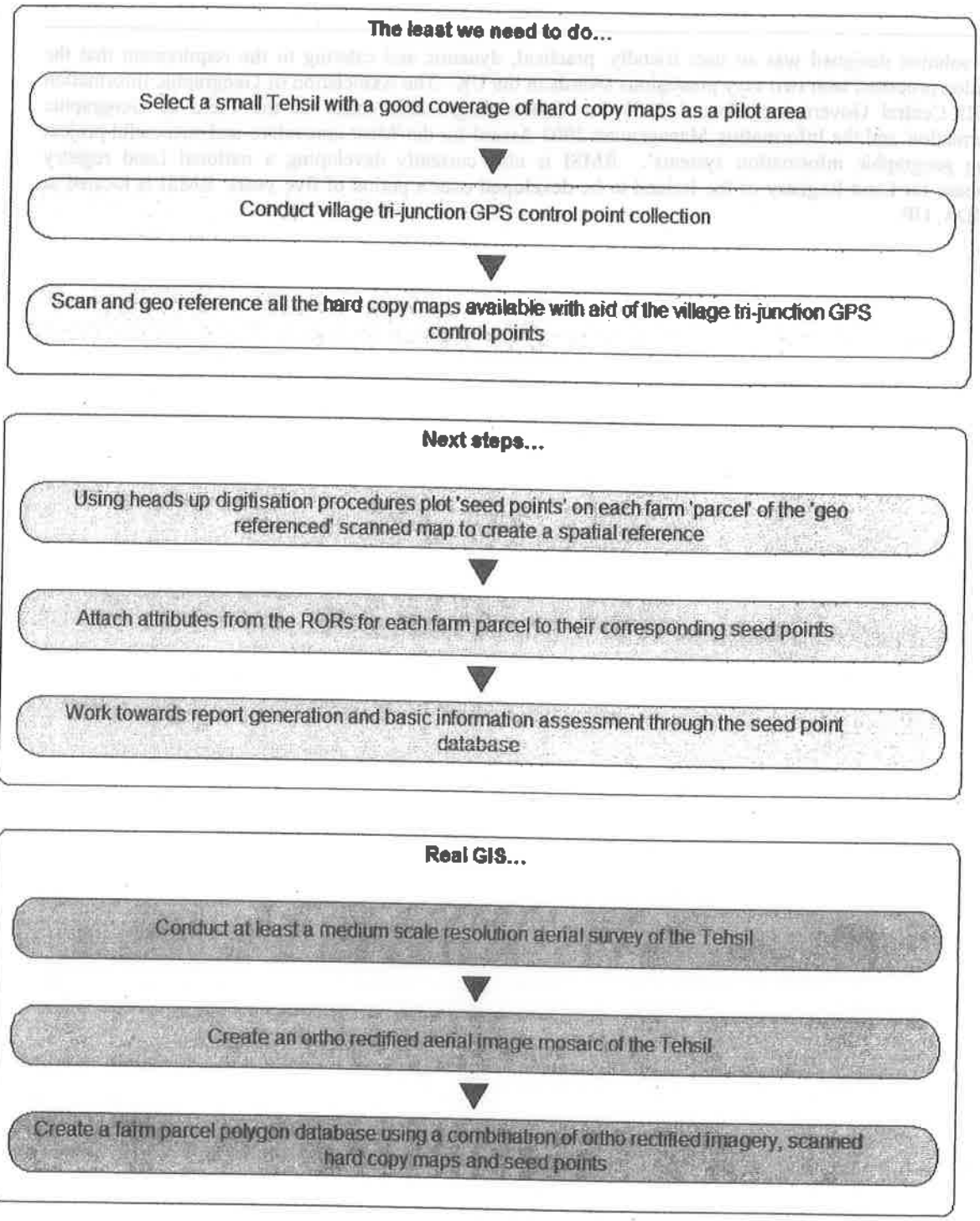
regardless the frequency of update, it has to be ensured not to skip the correction-verifying step.

Epilogue

The above thoughts are submitted to this workshop, with the intent of stressing that the need to go beyond the computerization of RORs is real. To bring about reforms to the land management, we will have to find innovative ways and means by which a state level LIS sees light of the day. Vast existing expertise of the Survey of India must be capitalized. If financial constraints exist, we must pool in other prospective user departments to share the costs and reap the benefits. Private sector organizations may be invited to contribute towards any of the following three partnerships:

- Infrastructure partnerships for providing hardware support
- Technical Partnerships for Providing Software/Database support
- Solution Partnership for developing technical solution support

Participation of private sector on BOT/BOOT concepts may also be explored. A suggested road map for the development is provided below:



• An Indian GIS organization "RMSI Private Limited" created the LIS for Wales and Northern Ireland. An end-to-end solution was provided to the Government of Wales, and Northern Ireland. RMSI not only created the LIS but also conceptualised and designed solution for maintenance and updation of the digital data.

The solution designed was so user friendly, practical, dynamic and catering to the requirement that the solution proposed won two very prestigious awards in the UK– The Association of Geographic Information (AGI) Central Government Award 2003 for 'Outstanding Achievement in the Field of Geographic Information' and the Information Management 2003 Award for the 'Most innovative and successful project using geographic information systems'. RMSI is also currently developing a national Land registry database for Land Registry of the Ireland to be developed over a period of five years. RMSI is located at NOIDA, UP.

Chapter-4

One Country – One LIS

T. Raja Rao
P. Raj Shekhar

National LIS – Diversity of Survey Records and Systems

Land Management in India is a State subject and different States have adopted different methodologies for creation, maintenance and updation of Survey Records. In the southern states, Field Measurement was carried out using baseline/G-Line, Triangulation and traverse methods and measurements were recorded on the sketch or in the form of a ladder table. In many of the northern states, Plane Table Survey was undertaken and maps generated in various scales (like 1:500 to 1:2000 in Goa, 1:4000 to 1:8000 in States like Orissa, Maharashtra, Mizoram etc). There is a vast diversity both in terms of how survey was conducted, how measurements were recorded, what records are maintained, methods of mutation and also Survey Symbology and standards. Many a time, even within a State, different approaches were adopted, for example in Andhra Pradesh, Coastal Andhra region uses Triangulation techniques for field measurement whereas Telangana uses baseline method. In Gujarat, some villages have cross-staff tippans (using baseline survey), some villages have chowk tippans (many fields surveyed on a fixed grid of baselines).

Creating Awareness about Benefits of Computerization

Despite various efforts by Govt. of India to mobilize State Govt. departments to submit proposals for computerization of survey records, progress achieved in 5 years was insignificant. Most States had not initiated computerization of cadastral records due to lack of awareness and also lack of appropriate technologies. In 1998, Ministry of Rural Development presented a technology for computerization of cadastral survey records, in the Revenue Ministers Conference at New Delhi, which was attended by Revenue Ministers, Revenue Secretaries and Directors of Survey from across the country. In the forum, MoRD presented the technology of VISIONLABS, which was highly appreciated, and declared that technology for Computerization of Survey Records is now available and cannot be a bottleneck for undertaking pilot studies.

Subsequently, various pilot projects covering computerization of one or two talukas in each State were initiated under the centrally sponsored scheme of MoRD, to gain experience and assess available technologies. A major objective was to test available technologies with large volume field data on pilot basis in each State and if successful, adopt it for the rest of the areas in the State.

Due to various problems like lack of awareness about computerization, changing specifications and long process of Quality Check for 100% error free computerization,

most of the projects undertaken by different agencies were highly loss making. However, the contribution of these projects in terms of creating awareness, educating Govt. Staff and Officers and making Land Information System (LIS) a realizable goal was monumental.

Initially, the feeling was that computerization is like creating a photocopy using digital means, however, with numerous demonstrations and training programmes, the Revenue and Survey Officials realized the benefit of a Land Information System. Today, no one is asking the fundamental question of why computerization (the way many were asking 6 to 8 years back). People are more focused on methodologies and technical and financial issues of generating a State Level and National Level LIS.

Technology Challenges

Various software solutions were tried by different States and most States concluded that the most important aspect in an LIS is that it should be tailored to Indian Context, because the art and engineering behind Cadastral Survey is a 100 year old system handed over across generations of Surveyors. The methods of creating cadastral records used by the software should follow exactly the traditional approach, with the additional benefits derived from computer environment, namely, accuracy and consistency.

These pilot projects lead to the creation of software technology in the context of Indian background that

- Was customized to the needs of individual states/regions
- Had features for computerization of cadastral records that no other imported software had

Another major technical challenge was to reproduce using digital means maps with 100% accuracy. Accuracy of computer plot outputs depends on a variety of factors like accuracy of scanner, accuracy of digitization and digital plotter equipment error. Many States using imported software failed to achieve the desired accuracy levels, but many other states using innovative indigenous technology achieved the required results.

VISIONLABS LIS Solution VISION MapMaker Professional was assessed and acknowledged as the best LIS technology available by 16 States, out of which 12 States have successfully completed pilot projects using VISIONLABS software and services. These States include Andhra Pradesh, Kerala, Tamil Nadu, Karnataka, Pondicherry, Maharashtra, Gujarat, Orissa, Goa, Mizoram, Meghalaya and Tripura. After the successful completion of the pilot project, the State of Goa awarded the work of statewide computerization of Survey Records to VISIONLABS. Today, Goa has become the first State in the Country to have 100% of Survey and Land Records computerized and available on a State-Wide network, with issue of information to public from e-Kiosks, achieving the goals of computerization–namely–preservation, maintenance and transparency of information using Information Technology solutions. Govt. of Kerala has also de-facto standardized on VISIONLABS LIS and is using it for a statewide

computerization in a phased manner. Over 150 copies of software are procured for use at every talukas level.

Success of Pilot Projects

The pilot projects have been highly successful in terms of proving technology, learning administration of execution of such projects and making the respective state Govt. departments fully aware and capable of answering future technology needs.

However, the query remains as to why in some states, the pilot projects were not concluded and final payments were not made despite the agency having successfully computerized all available records. This has generally happened in States where Govt. Officials have shown indifference towards the work. On the other hand where concerned Senior Officials have taken a keen interest, the projects were completed rapidly and successfully.

A disturbing factor is that after the pilot project, some of the States went in for reinventing the wheel. Instead of accepting a proven available technology, they have tried to redevelop the LIS. What these States have not realized is that any new development would take 8 to 10 years of field testing and that too with vast volumes of survey data, the way VISIONLABS LIS has been tested, before it can be practically deployed and utilized on ground. Also, such so called free software has no guarantee of support and sustenance.

Need for Indigenization

The rationale behind indigenization is best exemplified by our Hon'ble President of India Dr. A.P.J. Abdul Kalam, who has spent a lifetime of service to the nation on building and promoting Indigenous Technology.

Indigenous LIS/GIS Solutions deployed in large volumes will lead to saving of Crores of Forex, promotion of local industry and local employment opportunities from scores of service and support centers for LIS.

In Summary: *One Country – One LIS*

States should standardize on the technology, which has proven to be reliable and operational during the pilot projects. Government should not attempt to re-invent the wheel or experiment now with new developments. The stage of technology pilots is long gone. Most States have concluded their pilot projects with various technologies and now Govt of India should take a decision on standardization on the best, most successful and widely used of the available LIS technologies.

There is an acute need now to implement a National Integrated Land Information System, which addresses not only each States local needs, but is also capable of Integrating the e-Infrastructure of LIS across the country.

Chapter-5

Comprehensive Modernization of Land Records (CMLR)- Technology Architecture

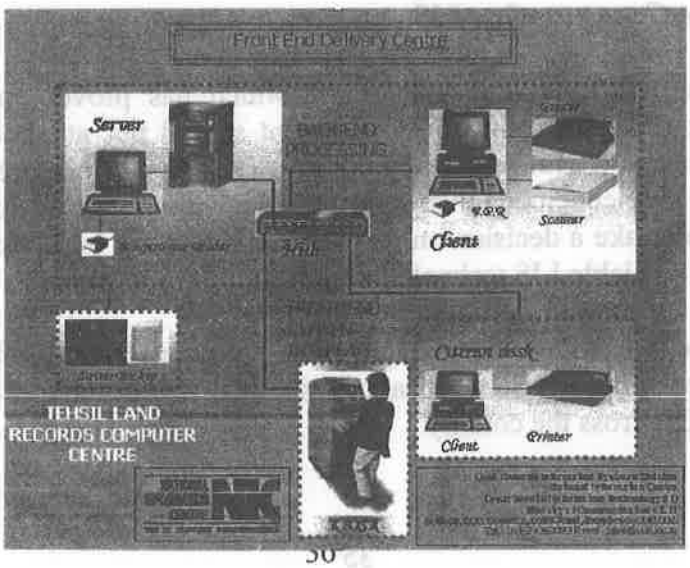
D.R. Shukla
Vinay Thakur
Ganesh Khadanga
D.S Venkatesh

Introduction

Computerization of Land Records (CoLR) Project has been successfully implemented in several states of the country. The Bhoomi project of NIC Karnataka is a testimony to this. However, under the CoLR project attempt was made only to computerize the attribute data. The interactions of Revenue Department with other traditional service providing agencies like Registration, Survey Department and Local Bodies are not taken up for computerization. Under Comprehensive Modernization of Land Record (CMLR) it is proposed to integrate land records maintenance process with the Registration Department and Survey and Settlement Department.

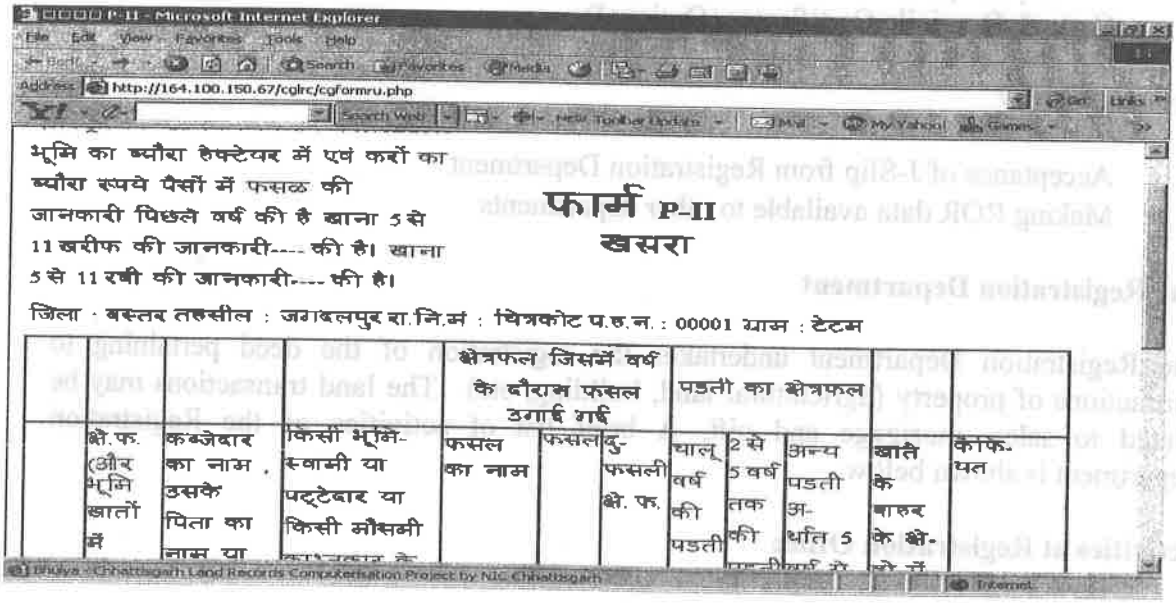
Existing Land Records Solutions

Ministry of Rural Department has approved setting of Tehsil/Taluk computer center in 3407 Tehsils, out of which 3139 Tehsil centers have been set up with computer facility and certified copies of record of right (ROR) are being issued from 2668 Tehsils. Ministry of Rural Development has sanctioned Rs 370.57 Crores for CoLR and out of this Rs 258.85 Crores has been utilized as on 31.10.2005. NIC is providing the technical consultancy and application software. All Tehsil/Taluk level Computer Centres are equipped with a server, two clients and in some States the front-end delivery is done through a kiosk as shown in Fig.



Many States have stopped manual distribution of ROR and also put data on Internet for easy access and dissemination as shown below.

1. MP	http://mpbhuabhilekh.nic.in
2. Chhattisgarh	http://cglrc.nic.in
3. Rajasthan	http://appanakhata.raj.nic.in
4. Delhi	http://districts.delhigovt.nic.in
5. Andhra Pradesh	http://ccla.ap.gov.in
6. Uttar Pradesh	http://bhulekh.up.nic.in/



Some more States also have computerized Registration process but two processes i.e. Land Record Computerisation and Registration are being carried out on standalone bases with different in user perception, local objectives and at time limited resources lead to widely different level of computerization and success. Another issue is updation of cadastral maps. Though textural records are being updated regularly, spatial extents of land holding are often not updated and remain undone. Further CoLR data is being maintained at Tehsil, Registration data is maintained at SRO level and there is always a gap/delay in synchronizing the data resulting in backlog.

The Revenue Department

The Revenue Department administers the land records data. It further issues the ownership of title (ROR) to the public. A brief list of activities of the Revenue Department is shown below:

- Maintenance of Land Records
- Accept the application for mutation
- Collect the application fee

- Generate Notice
- Dispatch of Notice to Parties
- Fixing of Notice in Public Places
- Hearing of Parties at Tehsil
- Issue of Tehsildar Order
- Updating the Registers

Public Interactions

- Certified Copies of ROR
- Certified Copies of Jamabandi
- Caste & Domicile Certificates (Optional)

External Entity

- Acceptance of J-Slip from Registration Department
- Making ROR data available to other departments

The Registration Department

The Registration Department undertakes the registration of the deed pertaining to transactions of property (agricultural land, building, etc). The land transactions may be related to sales, mortgage and gift. A brief list of activities of the Registration Department is shown below:

Activities at Registration Office

- Scrutinize Deed Docs
- Valuation of Immovable Property
- Sale of Stamps
- Check Stamp Duty Fixed
- Collecting Relevant Fees
- Issue of Receipt
- Collect Party Details
- Collect Admission
- Identify the parties(photo & Thumb)
- Checking the genuineness of the Transactions
- Checking the ROR/Adhikar Pustika
- Maintaining Indexes
- Attach to a BOOK
- Storage of the Registered Deed
- Fee Book
- Receipt Book
- Order File
- Account Books

- Sub Index Registers
- Transfer Duty Register
- Surcharge Duty Register

Public Interactions

- Registration of Deeds
- Encumbrance Certificate
- Certified Copies

External Entity

- Reporting of Registration for Mutation

Survey and Settlement Department

The Survey and Settlement Department conducts cadastral survey and maintains the basic cadastral maps of each village. A brief list of activities of the Revenue Department is shown below:

Activities of Survey and Settlement Office

- Notification for Survey
- Demarcation.
- Kistwar Cadastral recess work.
- Khanapuri & Janch Rent Settlement.
- Attestation and Draft Publication, Objection Hearing & Disposal.
- Appeal
- Re-Janch
- Final Publication.
- Revision

Public Interactions

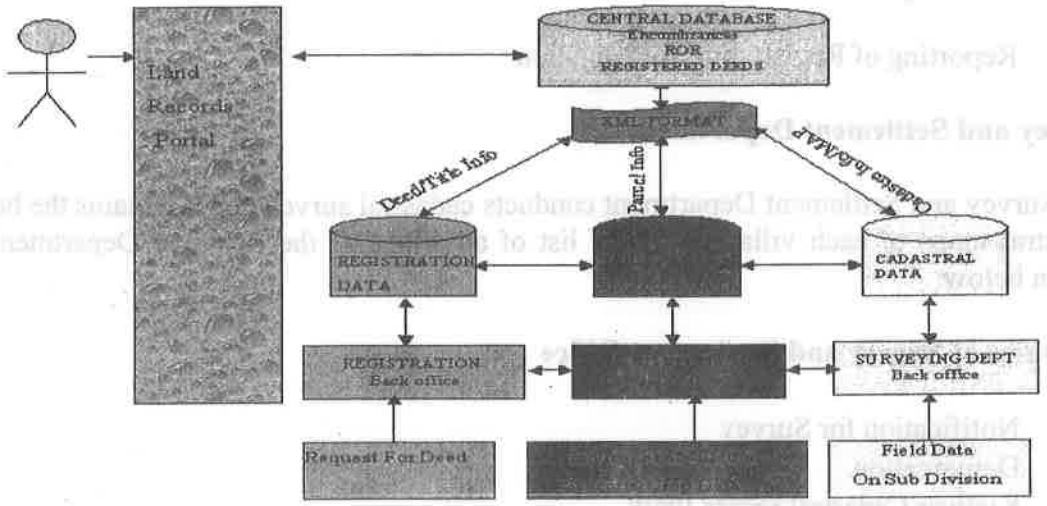
- Objection Hearing on Draft Publication of ROR
- Making cadastral data available to Revenue Department

It is observed that these departments function independently without much interaction which has led to the following:

a. Backlog of mutation cases
b. Non-updation of Khasra/khatauni/Girdawari
c. Cadastral maps are not showing actual ground partions
d. Multiple Registration of the same property
e. Non availability of data to registration department
f. Decreased coordination between the departments

Recognizing these pivotal issues it is proposed to develop a system which are integrated in nature and a common pool of data related the title/ownership may be maintained at a central location. The layout of the proposed integrated system is shown below:

Fig- Proposed integrated solution for Title Registration, Survey(Cadastral Maps) and Land Records



The Central Database : The central database will have the data related to the following entities:

a. The latest ownership attribute data in the form of the ROR
b. List of Registered deeds and Indexes
c. Latest cadastral Maps of a Village (Village / FMBs)

Revenue /Land Records Department

The land records databases will contain the attribute data on land parcels. The Land Records Department Front End Delivery Counters will carry out the day today activities of land records department.

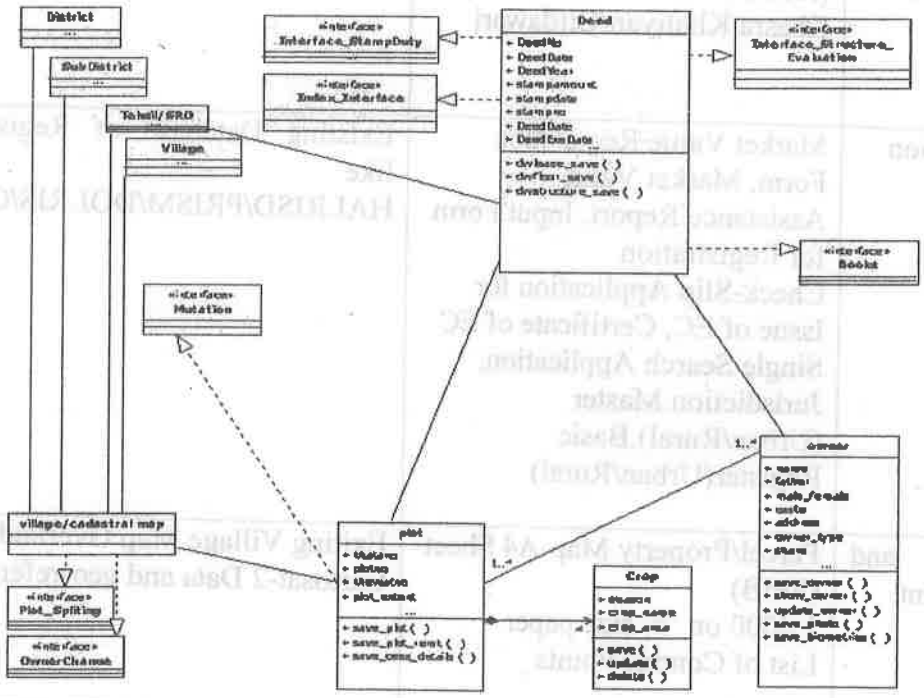
Registration Department

The Registration databases will contain the data related to registration of deeds. The Front End Delivery Counters will carry out the day today activities of registration department and reduce turnaround time.

Surveying and Settlement Department

The Surveying Department of the respective State is responsible for preparation of the cadastral maps and its updation because of mutation. The State Surveying Department has prepared the village maps during last decades for the States. These maps were prepared using the traditional tools and chain surveying or plain table surveying. However, these maps are not accurate and have not been updated for the last few decades.

Recently it has been proposed to modernize these maps through modern technology. Though aerial photography is capable to provide most accurate surveying data for preparation of village maps, it cannot be considered as a viable solution because a vast aerial extent of the country needs to be photographed. Again the cost of aerial photography may be too large for the Govt. to carryout the project. Hence an intermediate approach of using the satellite imagery of 1 or 0.60-meter resolution (IKONOS/Quick Bird/Cartosate-II) was proposed to be taken up. The exiting village maps may be overlaid over the satellite imagery and an up-todate geo-referenced village map can be prepared. Once the geo-referenced village map is prepared the same can be utilized for storage and retrieval and updation through suitable software.



Technical Architecture: The interaction among these departments and a higher-level class diagram of the model are shown in the figure. Integrated System will be using the uniform coding and data structure. The System will consist of a set of key classes, business rules along with XML to provide seamless integration of multiple processes.

CMLR Portal

Through this portal the citizen will interact with the various departments.

Portal services for the citizen:

1. Request for ROR
2. Request for mutation application
3. Status of the mutation application
4. Request for other certificates like caste/encumbrance/income

Portal services for the service providers like surveying team/deed writers

1. The survey team can provide the surveying details for division of a plot
2. The deed writers can provide the service for writing a deed

Content of the Central Database

Sr No	Register	Basic Database
Revenue	Conclusive title (ROR) from Khasra/Khatiyan/Girdawari	Existing Land Records Database
Registration	Market Value Requisition Form, Market Value Assistance Report, Input Form for Registration Check-Slip Application for Issue of EC, Certificate of EC Single Search Application, Jurisdiction Master (Urban/Rural),Basic Register(Urban/Rural)	Existing Database of Registration like HALRISD/PRISM/DOLRIS/CARD
Survey and Settlement	Parcel/Property Map-A4 Sheet (FMB) 1:4000 on 'o' size paper List of Control Points	Exiting Village Map Overlaid over Cartosat-2 Data and geo-referenced

Acknowledgement: The authors gratefully acknowledge the inputs/suggestions received from Department of Land Resources, Ministry of Rural Development, Government of India and Director General, National Informatics Centre, Government of India.

Chpater-6

Bhoomi:
Key Learnings & New Initiatives

Rajeev Chawla
B.V. Sarma
P.V. Bhat

Introduction

In ancient times land revenue was possibly the only source from which a Government derived entire income. Further, its incidence was on a large section of the population as a major proportion of the people relied on land for their livelihood and existence. Thus, tax on land proved to be the primary source of the State's wealth. The revenue collected varied among regions and also depended upon the regimes.

India's independence ushered in the era of the welfare state and accordingly land revenue or the tax on the agricultural land also witnessed a reduction. Further, other sources of taxation became the primary sources of income for the Government. However, the importance of land records cannot be undermined due to the decline in the importance of land revenue. Land records form the base for all land reforms and hence regular periodic updation of land records is essential in all States.

Land records form the basis for assignment and settlement of land titles. These records must stand the test of legal scrutiny. Land is a very precious source and the land records system must safeguard the rights of the legal owner of the land. Issues of land rights not only raise legal complexities but also socio-economic issues pertaining to land records. The state needs to ensure the maintenance of an accurate and genuine land records system to further its policy objectives of land reforms, protection of legal rights over land, and efficiency in maintenance and updation of these records. Manual maintenance of land records does hinder effective collation and analysis of the data contained in them.

Bhoomi Application

Bhoomi, the software for land records management has been fully designed and developed in-house by National Informatics Centre (NIC), Bangalore, a Central Government Organization, using the state-of-art technology.

Bhoomi is an online system to carry out the mutation on live data with built-in workflow automation in local language (Kannada), for ease of use and operation by the officials. The mutation updation process on Bhoomi gets fully synchronized with the fieldwork

done by the revenue officials. The system has been integrated with fingerprint technology to ensure foolproof authentication, for each updation and approval by the revenue officials. Bhoomi provides two public interface modules- manned kiosk to deliver land records on demand by the farmers and touch screen kiosk to access the details of land records without intervention by the revenue officials. It facilitates the scanning of the field mutation order passed by revenue authorities and also notice served on the public, so that they could be referenced later for various purposes. It also generates various analysis and pendency reports in textual and graphical forms.

Tight integration of the business rules of land records with the application system has made it very difficult for the user to deviate from the rules. For example, the revenue officials cannot update or approve the mutation by deviating from the first-in-first-out rule. However, the senior officer can deviate by giving valid reasons. This helps the Government to serve the public impartially. It also will not allow for carrying out certain types of transactions to take place on Government lands and thereby assists the Government in controlling the lands from being encroached.

Bhoomi has brought transparency in maintenance and updation of land records. Currently, the land records are in the public domain. Any individual for any land parcel in the taluk may obtain copies of the land records by providing the owner name or survey number. Farmers may know and take print out of the status of their mutation requests at the kiosk.

Implementation Challenges

Bhoomi project team has faced numerous challenges during implementation of this scheme in the last five years. These challenges have been handled and overcome successfully by the Bhoomi project team, Revenue Department, Government of Karnataka (GoK) under the leadership of Mr. Rajeev Chawla, IAS, Special Secretary (Bhoomi).

Many actions have been taken to improve the uptime of computers at Bhoomi kiosks by providing generators, etc. More than 1000 officials have been trained on the Bhoomi application for smoother operations at the Bhoomi centres. Around 108 Village Accountants (VA) have been trained on advanced topics to provide implementation support at the Bhoomi centres. Numbers of regional level workshops have been conducted, for the revenue officials, to create the awareness of the new system. Facility managers with service level agreements have been appointed to maintain the hardware at the centres. Facility managers have also been assigned with the responsibility of supply of pre-printed stationery to the Bhoomi centres. The printing process has been made more secure to deal with the problem of fraudulent certificates. In the process of mutation, the discretion power of the officials has been curbed.

Technical Challenges

One of the important aspects for Bhoomi's sustainability is the constant improvements that have been made in the applications and systems, in response to the feedback received from various stakeholders. The software developer of BHOOMI, NIC, Bangalore, has been constantly improving the BHOOMI applications with new enhancements and plugging the loopholes in the system. In last 5 years, BHOOMI application has undergone many changes and presently the version 4.0 of the application is running the tahsil offices. The tight integration of the business process in the application and synchronising the field work in the application was one of the critical phases of the Bhoomi development. Building the uniform application for the whole state was the other challenge faced in development of the application as Karnataka State has been formed out of four regions, which were ruled by different kings, hence, maintained the land records system differently.

Providing the user-friendly application in local language was the biggest task, keeping in mind the awareness and education of the end-users. Training and creating awareness to the end-user about the new system was toughest task. Bhoomi has been interfaced with number of external devices – bio-metrics, scanner, barcode, PKI. These interfaces have been done at the application level for better security and process.

Impact Analysis

Quick availability of ownership certificate across the counter has resulted in hundreds of owners getting their RTCs (Records of Right, Tenancy and Crop inspection Certificate - the name of the land records document in Karnataka) on a daily basis. For getting this document, their dependency on the VA has been reduced and at present, they get it at their own convenient time. Use of Touch Screen Kiosk by the public at the taluk office indicates the enthusiasm and the interest of the farmers. Farmers are themselves learning how to operate the kiosk by observing the operations carried out by the previous user. This is also helping the rural people to understand, know and use the computer without much difficulty, and fear has been removed from their minds.

Farmers also apply for mutation and expedite the process by reviewing the status of their request online, presenting documentary evidence to supervisors in the event of their requests are not being processed within the stipulated time period. With the computerized system, administrators quickly determine the number of approved and overdue mutation orders.

By the end of Oct 2005, the total revenue generated through issuance of RTC is more than Rs.550 millions. The average monthly collection is between Rs. 15 million and Rs. 20 million. More than 1 million farmers are utilizing this on a monthly basis. The various

independent agencies have conducted the evaluation of the Bhoomi system and showed the significant impact on effeciency in delivery and corruption.

Key Learnings

Bhoomi is of great success and it has been considered as one of the model e-governance project to be studied and replicated in other e-governance projects by Government of India. Well acceptance of the system by officials of the department and in particular by the Public shows the success of the project. The technology and implementation methodology adopted in this project has helped to get the national and international awards like the Silver at CAPAM 2002, Finalist in Stockholm Challenge 2002 and Silver at National e-governance conference 2003.

Many lessons have been learnt on execution of this project. The following paras will explain some of the learning for building the e-governance projects.

- Citizens are the main beneficiaries in any of the e-governance projects. It is necessary to build the required citizen centric interfaces to make the project a success. Citizen centric e-governance projects are sustainable as it reduces the delay, provides accountability and brings in transparency in the system. It also gets the support of Public as well as the Political System.

- Even though the business process re-engineering is a necessity in any of the e-governance projects, but incorporating all these process re-engineering affects the implementation as it may not be accepted at the field by the officials and it may de-rail the project itself. However, the same can be incorporated in a phased manner.

- By incorporating the business rules into the e-governance system, the discretion available to the officers can be controlled, hence resulting in better government service to the public.

- Generally, the employees resist whenever the new system is being imposed in their work culture. Hence, avoid using and involving unwilling staff in the new system to make it successful.

- Intensive and well-organized training on the e-governance application helps successful implementation of the project. The training can be imparted to the selected willing and young employees. Moreover, there is a need to have regular training updation schedules to update with the latest developments of the e-governance project and collect the feedback and suggestions.The security of the e-governance system is an important requirement to ensure non-tampering of the critical data by inside or outside users of the system. The database of the system has to be blocked for access by anybody except through authorized programs.

- The software system has to be architected and designed in such a way as to incorporate the business processes and maintain the current, history of the e-governance requirements with log of transactions

- To provide the better accountability of the activities (entry/approval) done on the e-governance system by the officials, the transactional level bio-metrics (finger print) authentication may be interfaced.

- The alternative systems (manual or existing system) have to be stopped wherever the new e-governance system is going to be provided. If this is not done, there may be a chance of failure of the e-governance system.

- There is a necessity to provide legal support for the procedures and formats of e-governance system, wherever required.

- Imposition of user charges with better delivery of services makes the e-governance system more viable and sustainable. Collection of service charges from the public helps to reinvest and improve the system.

- The e-governance system has to be driven by the identified project officer of the user department. He should own the project, monitor closely and guide the field officials in operationalisation of the system.

- It is essential to interact closely and regularly with field officials to get the suggestions and feed back on the new system. This also creates an environment of belonging towards the project, among the end users.

New Initiatives

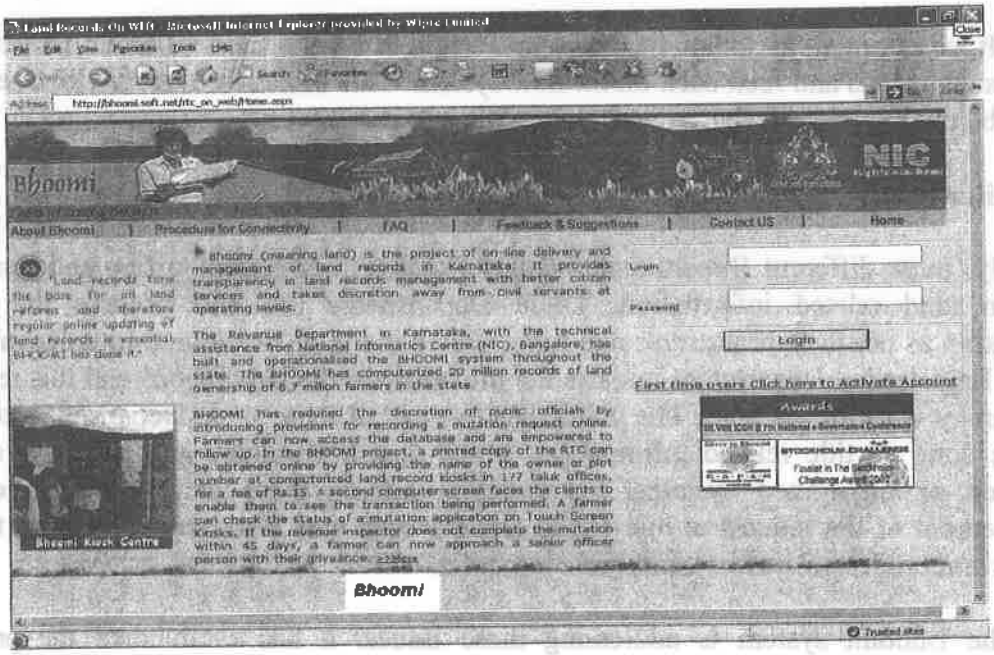
Presently, three different Departments namely, Registration, Tahsil office and Survey, maintain land related information. These Departments use and process the land information as per their procedures and rules, which are inter-linked and interdependent. In fact, Registration Department initiates the mutation on the land record and this results from survey work of the land. The public has to visit all these three Departments to get changes done on title related information, which cost him money and time. As such, integrated or interlinked systems do not exist among these activities. Further, a misplacement of the request at one of the Departments may also occur. Besides, these systems and processes are not transparent to public.

Now, the Bhoomi system is addressing these issues. It has established the proper handshake with Kaveri system of Registration Department. The sale transactions are generated and sent on daily basis from Registration Department to Bhoomi system electronically through the State Data Centre (SDC) and Bhoomi collects and processes them as per the business processes. Bhoomi is also getting integrated with the Survey activities. Every mutation of Bhoomi generates the requests for survey, and stores the progress of the survey activities. It also captures the map details in the image form and

records in the system. Bhoomi front-end also delivers the image of these maps to the public on demand.

Financial institutions sanction loan/advance to the farmers against their lands. The farmers have to furnish the land records copy with the details of the financial aspects recorded against his name in the land records. As a result, the farmer makes repeated visits to the Land Records Department and Financial Institutions. To overcome this difficulty, a new approach is being worked out to integrate Bhoomi and Financial Institutions, so as to electronically process the request and exchange the data.

Bhoomi system has changed the style of delivery of land records in Karnataka. Manually operated kiosks have been established in each Tahsil Office to deliver land records documents to the public on demand which have been criticized by various stakeholders of the system. Presently, Government of Karnataka is interacting with private agencies to establish private kiosks at the village level, using Private Public Participation (PPP) model. In this model, the private agency would setup and operate the kiosk at the village and Government of Karnataka would provide the access to their data to serve the public. In this process, service charges collected will be shared as per agreement. The private kiosk operator at the village would download the land records documents from the Central system and deliver to the farmer. This avoids the farmer visiting the Tahsil Office for land records, thus saving his time and money.



It was observed that there was no mechanism for senior officers to monitor the performance and pendency of the Bhoomi system. Moreover, these officers were not able to know the reasons why the mutations were being rejected. A web based monitoring system has been developed to ease out the above concerns of senior officials, by way of

generation of various pendency / analysis reports. In this process, the officer drills down to the individual transactions to query its status. The web based system also ranks the revenue inspector under various categories (state-level, district-level and taluk-level) based on various parameters. This has become a good tool for senior officers to evaluate the comparative performance and also to build competitive spirit within the staff.

It has also been observed that fake land records documents are in circulation in Karnataka. To overcome this issue, Bhoomi system has adopted latest technologies, namely, affixing holograms on the documents along with encrypted barcodes. This has ensured further authentication of the land records documents by the department.

Land Records documents in Karnataka include the season-wise and cultivator-wise crop details. In the Bhoomi system, these details are to be prepared by the village accountants in the field and fed into the system at the taluk center for all the three seasons. The speed of data feeding is not as per expectations, and this had led to a delay in availability of the crops on the land records document. To overcome this problem, around 200 village accountants have been given simputers (hand-held device) on a pilot basis. With this hand-held device, each village accountant visits the field and captures the cultivator-wise crop details into this device directly and uploads these crop details directly from the simputer to the SDC and in turn, the same flows to the Bhoomi system. This way the crop data is made available immediately to the farmers. The pilot of this has been proved to be successful. The crop details of 5 - 6 seasons have been completed using these simputers in the last 2 - 3 years, on an average of about 600 villages every time. Government of Karnataka is planning to extend this program to other villages for crop updation process.

To improve the crop updation process, in addition to the usage of simputers, crop updation through telecentre is also being piloted at the Mandya taluk. This provides the faster availability of crops for new season in the BHOOMI and helps to build self-sustainability for private telecentres.

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Chapter-7

e-Dhara
Land Records Management System, Gujarat

Vilasini Ramachandran
Sharad Raval

Background

Land records are being maintained for various purposes including levy and collection of various taxes and land revenue. For longer time land revenue was the principal source of reenue for the state in India. Cadastral survey was completed in the year 1960 for the entire state. This survey served as the basis of the land records. Transfer and changeover take place over lands due to Sale, Inheritance, Hier, and Distribution etc. These mutations are brought in records by way of updating the land records manually by Talati at the Villages.

"The Bombay Land Revenue Code, 1879" is the governing law for land Records in the State. Requisite changes and amendments have been effected in the Code from time to time. This Land Revenue code is uniform across Gujarat

The importance of instant availability of these land records has become significant in this era of development. Record of Rights (ROR) is maintained, updated and is needed for various purposes such as - for obtaining crop loans, hypothecation of land, getting electricity connection, subsidies etc. Land records are updated with crop data every season and this information is used for various analysis purposes. Land records also form the basis to carry out mutations such as changes in ownership title due to inheritance, sale, acquisition, inheritance etc.

Land records are extremely important since land is the primary source of sustenance for a majority of population. However, the manual system of record keeping has become cumbersome, opaque, susceptible to manipulations and hard to administer. Traditionally, Talati maintains this data in a manual register known as Village Form 6. He is the custodian of this data and carries out all changes to when authorized by competent revenue officer (Circle Officer, Dy mamlatdar-Land, Mamlatdar etc.) who approves for changes in the land records.

Computerisation of Land Records in Gujarat

Revenue Deparment took the initiative of digitizing 7/12 and 8A by Computerization of Land Records Project. It took mammoth efforts of 8000 manmonths to digitize 1.5 crore

land records across the State. Data digitization was not an end to the problems faced with manual records. Tasks viz. online validation of data at the time of data-entry, bulk printing of 4 types of verification prints of 1.5 cr. records, verification of prints with manual original record by multi-level revenue officials, corrections in computerised data as suggested during verification, display of computerized record for public observation at village etc. need to be charted out and completed in time, else digitized data become obsolete before put to use.

It was envisaged that if dizitised data is not put to use and manual system is still continued, computerized data shall in turn become only an archived repository of land record data and nothing more than that.

A complete system consisting of (1) Issuance of computerized ROR from dedicated counter in Taluka office and (2) Receiving mutation application and processing it in online mode was envisaged to be in place immediately.

The key factor in introducing computerized ROR as the only legal record in force was stopping of the manual record. A preparatory exercise of free copy distribution for public verification prior to stopping of manually maintained land records at village level was taken-up. The exercise included activities viz. updating computerized data, first hand on-screen verification, bulk printing of free copy in computerized format, verification of prints with manual original record by multi-level revenue officials, distribution of free copy, accepting objections thereof, conciliation of objection with manual record, Tehsildar's order to carry out correction followed by correction process. 97% of the landholders have been given the free copy of the computerized RORs. Certificates from the revenue officials are obtained as regards the distribution. This exercise brought awareness about new system in end-user citizen and affirmation of data quality from end-user.

System of regular and as & when updating of computerized record according to registered mutations decided to be established. Receiving mutation application and processing it in online mode through computer which in turn updates computerized ROR data needed a complete Computerized Land Record Management System in place. Thereby, e-Dhara Land Records Management System was conceptualized to manage land records by using IT as a tool. The system was designed to provide prompt issuance of computerized ROR across the counter & online updation of land records to implement the project in a controlled fashion, initially at Junagadh district on pilot basis. Within pilot district Vanthali Taluka was selected as Pilot Taluka, based on which district wise roll out of e-Dhara was done.

The new system brought about a sea change in the way land records were maintained and administered in the Junagadh District. The system not only simplified the process of record keeping but also provided many collateral benefits.

The State has initiated online mutation state-wide implementation roll-out Plan. Required minimum hardware as per revised guidelines of GOI to implement online mutation

management system is not provided to talukas. GOI fund for this purpose has been received very recently. During 15-08-2004 to 31-03-2005, each district started online mutation operations at least in 2 talukas as pilot work. The State implemented online mutation operations in all 225 talukas as on 01-04-2005.

Objectives of e-Dhara System

The primary objective of Computerisation of Land Record Project was to achieve Complete Computerisation of Land Records across the state. Elimination of manual records, computer controlled mutation process, and self sustainability are the leading objectives of e-Dhara system.

Other objectives of the system include:

1. Visible improvement in quality of services provided to citizens
   - Allowing farmers / citizens easy access to their records
   - Infuse transparency in providing the services to citizens

2. Ease of administration
   - Facilitating easy maintenance
   - Prompt updation of land records
   - Making land records tamper proof

3. Reduction in service delivery time i.e. to speed up delivery of ROR without delays, harassment or bribery.

4. Platform for providing more citizen centric services

5. Ensuring self-sustainability of the system

Transformation of processes

Processes are the set activities involved to be performed in a pre-planned order by the authorized entities. Processes provide checks and controls to ensure the activities are performed in the specified timeframe. Any well-designed process will help to improve quality of the services (QoS) and effective flow of information. Processes form the backbone of any system

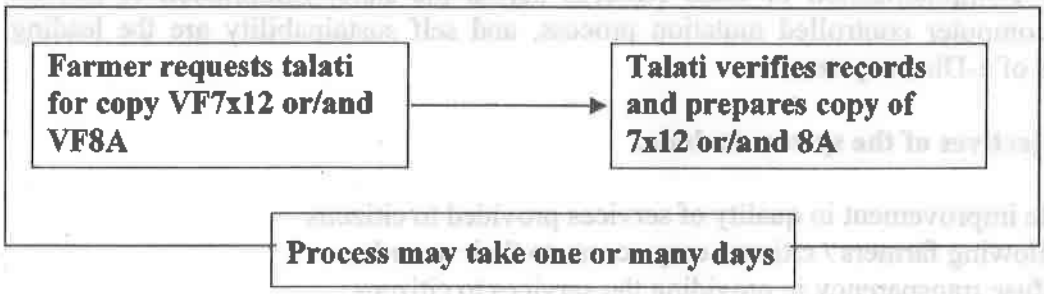
e-Dhara Land Records Management System is designed on the basis of transformation manual process for maintaining & updating land records across the state.

Manual process (followed in pre implementation stage) and computerized process (followed in post e-Dhara implementation) are discussed as below. It provides an insight into value addition done to improve quality of services provided to citizens.

Land records system provides services to farmers through the issue of Saat Barah (VF7/12), account information VF8A and Mutation entry - transfer of right over land under different categories. The following two major processes formed the backbone of the land record system.

(A) ROR issuance process
(B) Mutation Process

(A) Manual Process - RoR Copy Issuance



ROR documents show the details of land ownership, survey number, type of land, irrigation methods, crop details etc. This document is basically used by farmers for land transactions (mutations), obtaining crop loans, concessions linked to size of the land holding etc. Revenue administration owns and maintains the data required to produce ROR.

- **Request for ROR**
  Farmer makes an oral request for 7/12, 8A or VF 6 with the talati by giving the survey number or Khata No., of his land or other details such as block, entry no, Khata no, village, area, & name to identify his land details.

- **Issuance of RoR**

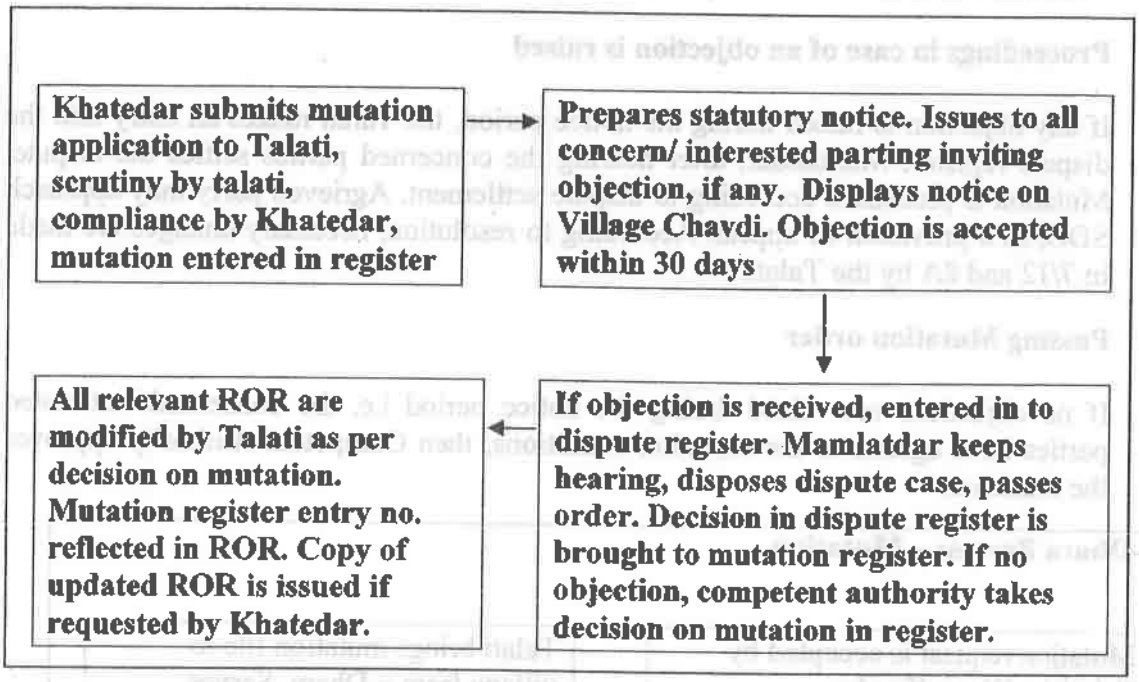
  After receiving the application, the Talati verifies the details in his register and prepares the 7/12, 8A or 6, signs it, stamps it and gives it to the farmer.

e-Dhara Process - ROR Issuance

Khatedar does not require submitting an application for getting computerized print of ROR. While requesting for ROR Print, if Khatedar is not aware of his survey no(s) or Khata no(s) or farm name(s), Bhulekh Software allows Data operator to search requested ROR based on survey no(s) or Khata no(s) or farm name(s) or Khatedar Name. Only after getting confirmation from Khatedar, Operator prints 7/12 or 8A from computer. e-Dhara Dy Mamlatdar or any nominated personnel signs and stamps requested computerized RoR, which is handed over to the applicant. User charges of Rs. 15/- is collected from the applicant. Signature of applicant for receiving computerized demanded RoR is taken in RoR issuance register.

(B) Manual Process - Mutation

When a change of ownership or transaction takes place, Khatedar files request for initiating the mandatory process known as mutation for effecting necessary changes in the ROR. Mutation process involves obtaining consensus from all concerned parties of the transaction and inviting objections from those interested if any. Once all the objections are cleared, mutation orders are passed effecting the change of ownership or record of transaction resulting in new ROR, which the owners can obtain.



Mutation process involves the following steps:

- **Types of Mutations**

  There are 35 identified mutation types. Many of these differ marginally. Court decree and Order of a Competent Authority are the mutation types, those do not require notice generation for hearing of objections.

- **Submission of the Mutation Application**

  A written application with related documents is submitted to Talati for the mutation operation. Talati verifies the application and takes-up mutation process or else informs applicant for compliance accordingly. Talati chooses appropriate mutation type, makes an entry in mutation register.

- **Issuance of notice – 135D**

  Talati prepares notice. This notice is served to khatedars concerned, relevant parties (buyers, sellers, direct beneficiaries, banks, as per the case) and any other interested

parties. A copy of the notice is displayed at Gram Chavadi for public scrutiny. Objections to the mutation raised witin 30 days of the notice received is accepted or else the mutation proceeds further.

- **Proceedings if no objections are received**

  If objection is not raised during the notice period, a competent authority approves the mutation. Talati makes the necessary changes to the 7/12 and 8A form.

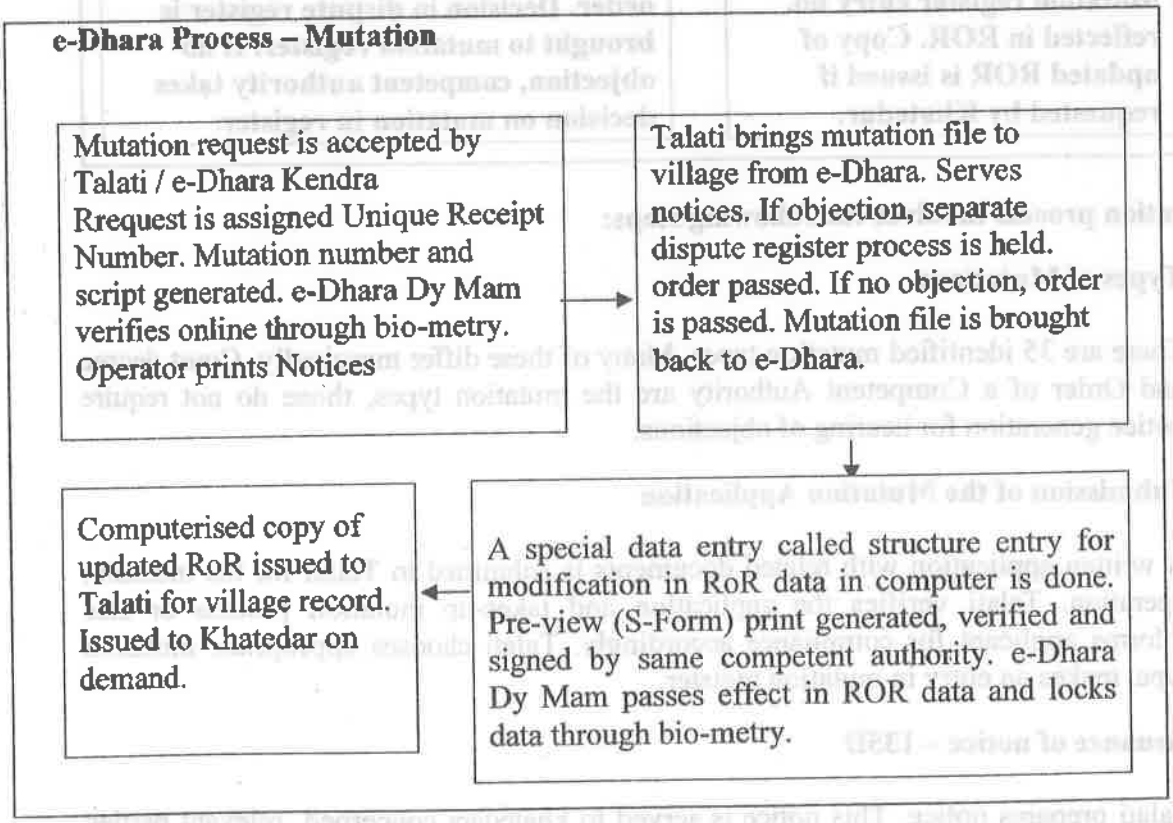
- **Proceedings in case of an objection is raised**

  If any objection is raised during the notice period, the Talati makes an entry into the dispute register. Mamlatdar, after hearing the concerned parties settles the dispute. Mutation is processed according to dispute settlement. Agrieved party may approach SDO, as a provision of appeal. According to resolution, necessary changes are made in 7/12 and 8A by the Talati.

- **Passing Mutation order**

  If no objections are raised during the notice period i.e. the concerned/ interested parties have agreed to the mutation conditions, then Competent Authority approves the mutation.

e-Dhara Process – Mutation



- **Updation of land records**

  Talati makes all necessary changes to the 7/12 and 8A or makes new ROR as case may be, as per approved mutation. A new 8A Khata is created, if required. Updated and/ or newly created ROR now carries this mutation entry number from VF6 register. There is no system of verificiation & counter sign of updation in 7/12 with the same sense as the order passed on VF6. In cases this leads to land related disputes.

- **Issue of ROR**

  Talati issues new 7/12, copy of 8A Khata and form 6 entry, to the applicant on demand.

Details

1. As per mutation type, application formats are prescribed. Mutation Application forms planned to be kept at point of public access like Mamlatdar office, TDO Office, banks and in villages at Panchayat and Sarpanch's office.

2. Applicant can submit application to Talati at village or at e-Dhara Center. In both cases, mutation-request is accepted and acknowledged through Bhulekh Software.

3. In application, postal addresses, telephone nos. of khatedars, separate application form for separate mutation type, necessary supporting documents attached, consistency of application detail with computer data etc. are scrutinized first.

4. The operator enters basic details in computer from application; generates 2 copies of Acknowledgement receipt from computer. Applicant gets one copy of receipt.

5. e-Dhara Dy Mamlatdar verifies application detail, attachment of supporting documents and basic details entered by Operator in the system and authenticate it biometrically. System generates a unique mutation entry number. System generates mutation note. Operator writes relevant details. e-Dhara Dy. Mamlatdar verifies and does biometric authentication. Operator generates notices from system and keeps with Mutation case file.

6. Talati collects mutation file from e-Dhara Center. Talati follows the mutation process i.e. serving notices and taking acknowledgements from party and wait for 30 days.

7. Mutation file after competent authority's approval is submitted to e-Dhara Center for further probable proessing.

8. Business rules for every mutation type are source coded to effect land records in same logical sense of mutation order. A structured entry is made to direct computer to log necessary changes in land records as per source coded business

rules. A printout showing preview of likely changes before actual effecting land records is taken. The same competent authority approves this print (S-form). This is a unique feature of e-Dhara system.

9. Scanning of office copy of notice bearing signatures of all khatedars, mutation order and S-form are compulsory before biometric authentication for effecting land records for changes as per mutation.

10. One copy printout for village record of each updated land records 7/12, 8A and computerized mutation is provided to talati. In village, old land records are replaced with these updated ones. Old records are kept in a separate file.

11. The process completed mutation file becomes a permanent record residing in e-Dhara record room.

Crop Updation

A set of complete computerized record is given to Talati as village record. As and when ROR gets updated in computer, an updated copy of ROR shall be provided to the concerned Talati.

For Crop updation, the following process is followed:

a) Writing crop detail every season in village copy of RoR
b) Data Entry of crop detail in computer

Crop module of BhulekhSoft allows to carry forward previous detail of crop to next year season if asked. Due to this unique feature, operator enters crop details for only those cases, which have undergone crop change.

Mutation types processed by Software:

Sr. No	Mutation Type	Sr. No	Mutation Name
01	Sale	02	Vasiyat
02	Gidft	04	Vechani
03	Inheritance	06	Land Allotment
04	Co-partner-admission of right	08	Hakk Kami
05	Admission of tenant	10	Ganot Mukti
06	Admission of Boja	12	Boja Mukti
13	Giro dakhal	14	Giro Mukti
15	Identification of fragment	16	Tukdaa Kami
17	Non-Agricullture	18	Sharat Badli (Tenure)
19	Survey Sudhar	20	Jodan
21	Ekatrikaran	22	Land Acquisition
23	Orders	24	Notification under Sec 4
25	Identified under LA Sec 6	26	KJP

27	Survey Adal Badal	28	Kabjedar Namfer
29	Sagir Pukht	30	Hyati Ma Hakk Dakhal
31	Hyati Ma Vechani	32	Land Khalsa
33	Lease Patto	34	Bija Hakk dakhal
35	Bija Hakk Kami		

Computer acknowledges following Supporting documents with mutation request:

Sr	Mutation Type	Document
1	Varsai	OC of Death Certificate Computerized 7/12 and 8A
2	Hayati ma Hak Dakhal (Right entry during life)	If Bojha exist, then certificate of Bojha Mukti.
3	Vechan / Survey Adal Badal	Registered Copy of the Sale deed. Proof that buyer is a Khatedar (for purchase of agricultural land). If sale by affidavit then certificate of Bojha Mukti. If land sale of minor then certi. from certifying authority. Computerized copy of 7/12 and 8A.
4	Will	Certified copy of Will. In case of agricultural land then proof from person of being Khatedar benefiting from the will. Copy of Probate if required.
5	Gift	Certified copy of Registered document. In case of agricultural land, the beneficiary has to produce proof of being Khatedar.
6	Co-partner Right Entry	Registered Document copy to enter co-partner. Person entering as co-partner to produce proof of being a Khatedar.
7	Bojha / Giro Dakhal	Copy of deed from bank / co-op. society.
8	Vechani (Distribution)	Affidavit of all interested persons/parties. If Bojha exist then Bojha Mukti certificate. Computerized copy of 7/12 and 8A.
9	Minor to Major	Age proof (School leaving Certi.or birth certificate)

Comparison of Manual & Computerized System

Sr	Process	Practice in Manual System	Practice in e-Dhara	Key Features
		RoR Issuance		
1	Application	Application mainly verbal since Talati knew the khatedars.	Application not required. Khatedar has to specify his survey/Khata no. for getting computerized RoR	Banks/Sahakari Mandalis/Talati can get computerized RoR on behalf of Khatedar. Khatedar can get computerized RoR through his representative or Talati.
2	Issuance	Available with Talati only within the village.	Available anytime at e-Dhara Kendra. One set of RoR sale copy given to talati for availability from village	Consumption points like Sub Registrar, Banks, Taluka co-op society etc are tehsil HQ level
3	Cost	Officially Fifty paise, but was to be retained by Talati.	Available on payment of Rs. 15 per Survey Number or khata.	The basic objective of Self-sustenance of system is met by User charges collected. Cost is no bar. Well accepted. There is a collection of Rs. 1.7 Cr in 5 months.
4	Traveltime	Mostly available within the village. Khatedar may travel to Subregistrar, Banks etc at Taluka for using RoR.	Significant for villages far from Taluka center. Computerized sale copy RoR is available at village.	e-Dhara center is additional outlet, where availability of RoR is assured.
5	Authorized Signatory	Talati himself since all documents in his possession.	e-Dhara Dy. Mamlatdar & Mamlatdar	
		Mutation Process		
1	Application for Mutation	Written application	Compulsory Application in standardized format.	Standardize application forms available with Talati and e-Dhara Kendra

2	Key Supporting Documents	Brought by applicant as specified by Talati.	Brought by Applicant as mentioned in application form.	Standard list of documents according to mutation type
3	Pending Supporting Documents	Brought by applicant as specified by Talati.	Applicant is suggested to resubmit application. Endorsement given. Application is accepted, Pendancy specified in computerized receipt. Mutation not initiated till pendancy cleared.	Standardized list of supporting documents
4	Application Verification	Talati himself verifies.	If submitted at village, Talati verifies. If submitted at e-Dhara, Dy Mamlatdar verifies.	Application in prescribed format with all necessary supporting documents only is processed through computer
5	Generating VF6 Entry number	Entry registered with a unique mutation entry number. One entry may contain multiple mutation types.	System generates mutation entry number & doesn't allow back date mutation entry. System does not permits multiple mutation type in one entry.	Applicant can track application status by specifying mutation entry number at e-Dhara Kendra.
6	Mutation Text	Descriptive Mutation script by the Talati and no uniformity.	Standardized mutation text generated by system.	Uniformity across the State.
7	Entry Verification	Not Done	Done by e-Dhara Dy. Mamlatdar	Immediate rectification in case of errors.
8	Notice generation and print	Containts all necessary details but no standard pattern was followed. Not verified by higher officer.	Standardized notice format generated by system. Verified by e-Dhara Dy Mamlatdar.	

9	Preparing Mutation File	All relevant papers were tagged together in a bunch, not in file.	At e-Dharra Kendra, mutation file is created, consisting of Mutation Application, Supporting Documents, VF6 print, notices.	Brings uniformity in system & leads to structured decision making while entry certification.
10	Serving of Notice	Done by Talati	Done by Talati but monitoring by e-Dhara System.	Notices not served result to increase in court cases. Important document and hence being scanned as permanent evidence.
11	Notice Period	There was no check, except competent authority, for certification of immature entry.	Above competent authority, system doesn't permit any structure entry before the notice period.	
12	Objections, if any	Recorded in Takrari Register. Hearing Conducted & case resolved	Recorded in Takrari Register. Hearing Conducted & case resolved. Section of Takrari Register and Order scanned in computer compulsory.	System checks for scanned order for Takrari entries before certification by competent authority. All relevant documents being scanned can be used for future reference.
13	Mutation Decision	Taken by Certifying Authority	Taken by Certifying Authority. Copy of scanned decision build up repository in system.	VF 6 being scanned can be used for future reference

14	Structure Entry	There was no such system.	Structure entry provides human logic to system but under strict specified business rules as source coded for making necessary changes in data as per decsion on VF6 entry.	Human intervention for data tampering completely eliminated. A unique feature. Not applied except Gujarat.
15	S Form	There was no such system.	It is a preview of likely changes happening in data. It is a check to ensure correct pattern of data Updation visualized in mutation order. Competent authority signs it.	System incharge is assured of correct pattern of data Updation due to mutation order.
16	Structure Entry locking	There was no such system.	System checks for Scanning of signed S form before authentication of Structure Entry. Assured System incharge now allows changes in data.	Changes in data now updates front end document viz 7/12 & 8A. Copy of scanned S Form builds up repository in system.
17	F form	There was no such system.	It is a tool for post facto auditing of identical sense in VF6 decision, Structure Entry & updated RoR.	It is postview of sequential activities regarding particular mutation entry right from application receipt till RoR Updation.
18	Updated ROR	Components viz Time, Understanding, logic & quality of Updation of RoR is human oriented.	Components viz Time, Understanding, logic & quality of Updation of RoR are system oriented.	Updation of RoR is timely, precise, logical & qualitative.

Crop Updation				
1	Field Survey	Talati surveys agricultural lands & ascertain crop details on field	Talati surveys agricultural land & ascertain crop details on field	
2	Form 12 Updation	Talati manually updates crop details in manual 7/12	Talati manually updates crop schedule generated from system.	
			Based on updated crop schedule, crop details are entered into sytem	

Roles and Responsibilites

e-Dhara Land Record Management System (LRMS) is a new system replacing an age old and long established manual system. It is almost identical with manual system. But e-Dhara is computer controlled and has flavor of management change in it. System Talati, Operator, e-Dhara Dy Mamlatdar, Mamlatdar are the key functionaries of e-Dhara. Of course, for some period, functionaries of e-Dhara would find them in new dimensions, challenges, adjustments. Functionary has to play his role responsibly. Abridged roles and responsibilities of these functionaries may be listed as follows:

1. Computer Operator

- Data entry related to RoR Issuance & Mutation application.
- Entry of mutation details in Bhulekh.
- Printing acknowledgement receipt and handing over the same to the applicant.
- Printing computerized Vf6 & 135D notices
- Putting relevant documents & handing mutation file to e-Dhara Dy Mamlatdar
- Scanning mutation orders & Office Copy of notice in Bhulekh
- Carrying Structured entry details in Bhulekh
- Generating S form and getting it signed from relevant Certifying Authority
- Scanning signed S form
- Generating F Form
- Printing final copy of ROR after approval by e- Dhara Dy Mamlatdar
- Update season-wise crop details in computer
- Generating MIS reports as required by higher ups
- To take scheduled periodic & daily backups.
- Manage the asset to prevent from breakdown and if any, then shall lodge a complaint to the respective vendor through Mamlatdar, Prant Officer and DIO.

2. **e-Dhara Dy. Mamlatdar**

- Signing computerized ROR
- Receiving request for RoR issuance & Mutation
- Verifying mutation application for content, number of mutation in one application, supporting documents & actual details present in computer
- Compare mutation application with basic data entry by operator. Approve application receipt data entry to generate mutation entry number
- Lock Kachi entry through bio metric authentication, preparing mutation file
- Hand over mutation file to Talatis for notice circulation and enter details in his register
- Receives mutation file from Talatis brought after village level process
- Get S form signed
- Lock Structure entry through biometric authentication
- Hand over updated 7/12, 8A and VF6 print to Talati
- Bio metric authentication after every stage of scanning relevant documents
- Managing accounts of user charges.
- Countersigning backups as per back up plan.
- To provide MIS and other reports as required
- To ensure consumables for e-dhara Kendra and procure if necessary
- To ensure relevant records are managed in the record room.
- To maintain check on mutation pendency.
- Maintaining relevant registers.
- Preparing MIS reports as required by higher ups.

3. **Village Talati**

- Display application format and list of supporting documents in Gram Chavdi notice board of the concerned village.
- Issues Vardi Book Receipt against mutation application received at Village.
- Verify - Application and supporting documents, Supporting documents are okay, Single mutation is applied etc. detail in application.
- Submit the application at e-dhara Kendra and get receipt, Mutation print and Notice print
- Get additional notices printed from e-Dhara If required any
- Receive mutation file from e-Dhara Center, with acknowledgement in e-Dhara Register
- Maintain village level Inward / Outward register specifically for mutations.
- Serve notices to concerned and take Acknowledgement signature in notice O/c.
- Mention postal details if notices sent through post.
- Conduct Panchnama and maintain all reference documents in mutation file.
- Submit the mutation file to e-Dhara Kendra after certification by Competent Authority
- Receive updated RoR from e-Dhara

- Replace old RoR with updated RoR received from e-Dhara Center.
- Provide details of crop updation to e-Dhara Center, in prescribed format.
- To distribute free copy of computerized RoR as a part of scheduled Promulgation

4. **Certifying Authority**

- Periodic visits to Village & overall monitoring of e-Dhara at Village level.
- Ensure mutation entries gets certified in computerized VF6.
- Signing 'S' form as soon as it is generated

5. **Mamlatdar**

- Ensure that the citizens receive prompt service and regularly take feedback on quality of services.
- Ensure availability of application forms, consumables as and when required
- Tap pendency in e-Dhara operations
- Ensuring that e-dhara Kendra is not subject to any downtime.

6. **Prant Officer (SDO)**

- Periodic reviews of e-Dhara Kendra – Application Receipt, Pendency, RoR Issuance, Complaints and feedback from citizens.
- Smooth functioning of the Talukas under his supervision.
- Receiving MIS and ensuring low pendency.

7. **District Nodal Officer**

- Monitoring activites of e-dhara Kendra and ensuirng the services are up without any downtime.
- Check MIS reports and take corrective actions.
- Introduce new initiatives based on feedback from users.
- Reviews progress of e-Dhara Kendras with Prant officers and Mamlatdars during RO meeting.

8. **District Collector**

- Custodian of e-Dhara Kendras
- Reviews Progress & monitoring during RO Meeting
- Issuing necessary orders for execution and streamlining of e-Dhara operations.

9. **District Informatics Officer (DIO)**

- Ensuring latest software updates available to the talukas.
- Gather errors/bugs from Operators & sending it to NIC/ SMC.

- Coodinate to verify that hardware & software are working fine and operations are not hampered due to hardware / software problems.
- Ciculate necessary recommendations on various MIS to developing team in the state.
- To ensure latest virus updates are available and installed.
- Liasoning with hardware vendors for faults/breakdowns.

Training & skill enhancement

Upfront training is a major element towards changing the mindset of all level functionaries and setting up of the new system.

The Data Entry operators, all Dy Mamlatdars & Circle Officers, Mamlatdars, and Talatis planned to be thoroughly trained on e-Dhara Land Records Management System, before operationalization in a Taluka.

Sr. No	Functionary	Topics - Content
1	Operator	Correction Module - Bhulekh Mutation Module - Bhulekh Front Office Module - Bhulekh MIS reports - Bhulekh Scan Module - Bhulekh Crop Updation Module - Bhulekh Functional Module e-dhara Process flow Roles & Responsibilities System Maintenance Hardware Backup
2	Village Talati	Bhulekh Overview Functional Module e-dhara Process flow Roles & Responsibilities

3	e-Dhara Dy. Mamlatdar	Correction Module - Bhulekh Mutation Module - Bhulekh Front Office Module - Bhulekh MIS reports - Bhulekh Scan Module - Bhulekh Crop Updation Module – Bhulekh Administration module - Bhulekh Functional Module e-dhara Process flow Roles & Responsibilities System knowledge Password management Backup
4	Mamlatdar	Bhulekh Overview MIS reports - Bhulekh Administration module - Bhulekh Functional Module e-dhara Process flow Roles & Responsibilities Password management Backup
5	Prant Officer (Sub-divisional officer)	Bhulekh Overview MIS reports - Bhulekh Administration module - Bhulekh Functional Module e-dhara Process flow Roles & Responsibilitie
6	District Nodal Officer (e-Dhara)	Bhulekh Overview MIS reports - Bhulekh Administration module - Bhulekh Functional Module e-dhara Process flow Roles & Responsibilitie

Specific Trainings for skill enhancement:

1) All e-dhara staff; provided with hands on training on new process and the procedures.
2) Extensive training of operators/ e-Dhara Dy Mamltdar on backup, new versions of software modules
3) A set of selected personnel from District Administration who are enthusiastic, willing to learn and shoulder responsibility is selected for trainers training
4) All level all personnel covered under basic training so as to take-over in case of transfer and accidental vacancy

Topics covered:

Functional Sessions:

- Conceptual Introduction to land records
- Basics of mutations and the origination of mutations
- Need for ROR, 8A and VF6
- Conceptual Introduction to e-Dhara System
- Terminologies and concepts in e-Dhara LRMS

Technical Sessions:

- Briefing on various Modules - Report & Query, Scanning, Mutation, Administration, Crop, Taluka & Correction
- Hands-on in Bhulekh training on all mutation types.
- Hands on Gujarati Typing
- Session on Backup Management, Basics of Hardware set at e-Dhara.

Orientation Sessions

- Process flow
- Roles and responsibilities
- Registers and book-keeping in e-Dhara system
- Software overview - especially MIS and Monitoring features

Administrator Sessions

- Outline of Bhulekh
- Application structure
- Mutation process flow
- ROR issuance
- Utilities and reporting tools

Training Batch Configurations:

Training	Location	Batch Participation	Days	Type
e-Dhara staff	District Data Centre	6	1-2	Hands-on
Village Talati	Taluka HQ	All Talatis of Taluka	2	Workshop, PowerPoint
Orientation e-Dhara Dy Mamlatdars	State Level	40	2	Workshop PowerPoint
Orientation Taluka Mamlatdars	State Level	40	2	Workshop PowerPoint
Orientation Prant Officers (SDO)	State Level	40	2	Workshop PowerPoint

Communication Plan

Government Resolutions and Government Circulars are channelled extensively for communicating the policies, procedures, guiding principles, roles and responsibilities, delegation of responsibility and authority, issue resolution procedures relating to e-Dhara implementation down the District and taluka administration. To communicate the objectives, benefits and to draw attention of a citizen, a communication plan is designed at the State Level. All district administrations implemented across respective districts.

(1) Approaching Political Commitment

Objectives and benefits of e-Dhara communicated at Co-ordination Committee Meetings at District level. MLAs, MPs, Ministers involved in the inauguration of e-Dhara Kendras, which elevated the stature of the project in the eyes of district administration & Citizens.

(2) Khatedar's Feed back

Citizen satisfied with the quality of service provided at e-Dhara Kendra, spreads the benefit of services to others.

(3) Address communication

Benefits of system and its services communicated at Public meetings, Gram Sabhas held at Village level. Banks, Sahakari Mandalis requested to spread benefits of e-Dhara at Village level.

(4) Mass Communication

Mass communication program is done through following means:

Advertising through Television	In local cable channels
Posters	At Collectorate, SDO office, Mamlatdar office, Gram Panchayat Office, Taluka & Distrcit Panchayat Office, Sahkari Mandli offices, Post office
Banners/ hoardings	At Collectorate, suitable junctions etc
Cable TV footage Scrolling	In local cable channels
Meetings	With banks/Sahakari Mandalis/GEB Managers
Training workshops	Of Talatis
Notice boards	At e-Dhara Kendra

Technical Aspects

1) Software

Software for e-Dhara is known as "Bhulekh Soft". It is developed by NIC, Gujarat unit. The software is based on Client-Server architecture capable of running on Windows platform (98SE, 2000, ME & XP). Bhulekh installation on server requires any Windows OS (98SE, 2000, 2003 or Win NT) with SQL Server (7.0 or 2000). Software has been designed in Visual Basic 6.0 as the front-end whereas the backend database chosen is SQL 7.0 and 2000. For MIS Crystal Reports Version 7 has been used while for the Gujarati Language Interface, GIST SDK from C-DAC has been used.

Minimum RAM required for the server is 128 MB while for client is 64 MB RAM on Windows Platform.

The software has five key modules while an additional module has been designed for other Forms, which spools data entered from Form 12 of 7/12.

- **Front Office Module**

This module facilitates mutation application receipt, application verification, mutation entry number generation & acknowledgement receipt printing. Also, the module provides for VF6 mutation entry, printing, verification and locking for generating of notices.

- **Mutation Module**

This module facilitates structure entry, S form generation depicting changes to be effected, Final form, and effecting update to RoR.

- **RoR and Query Module**

In this module no data entry can be made. This only meant for viewing and verifying the records. An elaborate MIS is possible at Village level. The intended users are Talatis, Revenue Officials. The module can be run over a dial-up line.

- **Crop Module**

The module facilitates checklist generation, crop data entry, carry forward previous season crop data and data entry for changes.

- **Admin Module**

The module facilitates configuring user id, password and biometric fingerprints for all categories of users.

- **Correction Module**

The module facilitates correcting 7/12 and 8A based upon Talati or Public verification. Strict timelines have been built into this module.

- **Other Forms**

Currently Village Form 13 relating to summary of crop, trees and irrigation sources and Village Form 16 depicting information on irrigation sources and equipment used have been included.

2) Hardware

To operationalize e-Dhara at taluka center, the following hardware components are minimally required.

Sr. No	Item	Quantity	Configuration
1.	Server	1	P4 - 2.4 Ghz with 512 GB RAM (pref 1 GB), 80 GB HDD, DAT Drive, 17" Color Monitor, Internal CD-Writer
2.	Client	Based on work load (Minimum 3)	P4 - 2 GHz with 128 MB (256 pref), 40 GB HDD, CD Rom, 17" Color Monitor
3.	Printer – DMP	1	180 Col Printer
4.	Printer – Laser	Based on work load	HP 1150 or higher (atleast 14 PPM)
5.	Bio Metric Device	2	-
6.	CD Writer	1	-
7.	UPS	1	2 KVA Online with 30/60 Mins Backup, SMF Batteries & Cabinet
8.	Generator	1	5 KVA
9.	Scanner	1	Legal size
10.	Switch	1	24 Port 10/100 I/O
11.	Rack	1	19" Wall mounted Rack
12.	Air Conditioner	1	1.5-2 Tons
13.	LCD Projector	1 at District HQ	With Ceiling Mount Kit, Cables & Projection Screen

Note:

(1) Hardware provided for talukas are as per GOI's guidelines of 1999. The States, which started program earlier and have marched ahead face a serious problem of existing outdated hardware. Hardware requires urgent replacement.

(2) As per original guideline, a fund of Rs. 3.8 lac was released per taluka. Insufficient and short hardware is available, whereas full length e-Dhara business is operational in case of Gujarat,

As mentioned in 8.1 regarding Software, BhulekhSoft of e-Dhara requires 128 MB on board memory for Server and 64 MB for client. Hardware procured in year 2001 has gone outdated. This hardware cannot take giant load of issuance of RoR, crop updating, online mutation etc concurrently.

Where as, Self-sustainability factor has not still brought enough collection for this purpose. Moreover, day-to-day requirements like stationery; consumables, technical manpower etc. have a higher priority, which need to be met from user charges collection. GOI needs to look in this matter and allocate fund for replacement of the hardware for those tehsils which have been operationalised in all respect and whose hardware was brought before 2002.

3) Backup

Backup is the most important aspect in the land record computerization process. Different intervals at which backup is required to be taken on different devices is designed to ensure utmost safety of computerized land records. A detail back-up plan designed is as under:

Backup Plan

Sr	Frequency	Action by	Device to be used	Steps to follow	To be kept at
1	Daily	e-Dhara Dy Mamlatdar	2 DAT-cartridges to be used Each will be used on alternate days	Each to be used on alternate days. In a day only one backup has to be taken.	e-Dhara Kendra
2	Weekly	e-Dhara Dy Mamlatdar	1 DAT Cartridge and 1 re-Writable CD	On the last working day of every week two back-ups to be taken. One on DAT-cartridge and another on CD	e-Dhara Kendra
3	Monthly	Mamlatdar	1 DAT Cartridge and 1 re-Writable CD	On the last working day of every month two backups to be taken. One on DAT-cartridge and another on CD	e-Dhara Kendra

4	Monthly	Mamlatdar	1 single-Write CD	On the last working day of every month a backup to be taken on a single-Write CD and to be sent to District Collectorate for safekeeping and with a purpose of offsite backup maintenance	District Collectorate
5	Monthly	Mamlatdar	1 single-Write CD	On the last working day of every month a backup to be taken on a single-Write CD and to be sent to State for safekeeping and with the purpose of offsite backup maintenance	State Head Quarter
6	Yearly	District Collector	1 single-Write CD	On the last working day of Revenue year. 1 write CD to be kept at the Collectorate.	Collectorate
7	Yearly	District Collector	1 single-Write CD	On the last working day of Revenue year. 1 write CD to be kept at Mamlatdar Office.	Mamlatdar Office
8	Yearly	District Collector	1 single-Write CD	On the last working day of Revenue year. 1 write CD to be kept at State	State Headquarter

Back up schedule

Daily Tape Back up (Every Monday, Wednesday, Friday) To be changed every six month	Daily Tape Back up (Every Tuesday, Thursday, Saturday) To be changed every six month
Weekly Tape Back up (Every Friday) To be changed every Twelve month	Weekly CD Back up (Every Friday) To be changed every Year

Key Learnings and critical Success factors

Land Records Management System is a comprehensive project of not only the maintenance of data on a computer but also of updation of that data whenever a change in Record of Right is required. Thus the computerization is not a one-time job but requires a continuous effort and updation. It needs to be strictly ensured that any change when required on ROR, is done on the computer itself instead of doing it manually first and then putting it on computer as a batch updation. Now, when manual ROR is complimented by computerized system, it is essential that mutation be carried out using Bhulekh Software as a continuous process thus avoiding any vacuum.

Significant insights are gained by analyzing implementation stages, methodology adopted, list of processes realigned, activities that were modified to suit the business needs and the features, which were successful. Insights helped to learn lessons from success and mistakes and an opportunity to identify process improvements that can significantly help in planning and roll-out execution. Below are few procedures, activities and briefs describing e-Dhara implementation.

1) Preparing guidelines

- For updation/ of manual records
- Process of data entry
- Verification of data entered

2) Identify and appoint in-charge of e-Dhara

Incharge of e-Dhara on or before e-Dhara operationalization is very significant. Of course, full-time incharge could not available for 6-7 months.

3) Functional Training

Functional training is essential and unavoidable to following functionaries:

a) Talatis
b) Dy Mamlatdar
c) e-Dhara Dy Mamlatdar
d) Circle Officer
e) Mamlatdar
f) Prant Officer

A technical overview during functional training session is also helpful.

4) Technical Training

Technical Training is essential and unavoidable to Data entry operators. A functional overview during functional training session is also helpful.

5) Data backlog Completion

Before operationalizing e-Dhara, data backlog of Pramanit and Kachi entries should be completed by operators at e-Dhara. Talatis should be called at Taluka Office and Backlog activity should be completed before stipulated timeframe.

6) Public Verification through Free Copy Distribution

The key factor in introducing computerized RoR as the only legal record in force is stopping of the manual record. A preparatory exercise of free copy distribution for public verification prior to stopping of manually maintained land records at village level should be taken-up. The exercise includes activities viz. updating computerized data, first hand on-screen verification, bulk printing of free copy in computerized format, verification of prints with manual original record by multi-level revenue officials, distribution of free copy, accepting objections thereof, conciliation of objection with manual record, Tehsildar's order to carry out correction followed by correction process. This exercise brings awareness about new system in end-user citizen and affirmation of data quality from end-user.

Public verification through free copy distribution should largely be publicized with a clear message that the exercise is preparatory to stopping of manually maintained land records at village level. District Administration issues a Public Notice stating – Commencement & Closure date of Public Verification activity, Objectives of Public Verification and procedure of reporting corrections.

7) Hardware Installation & Networking

All necessary hardware be installed at e-Dhara Kendra. Necessary software products should also be installed, if required. Hardware be networked prior to implementation.

8) Software deployment

RDBMS & DBs be installed on Server prior to installing Application Software. All modules of Application Software shall be deployed on Clients and Server.

9) Closure of village manual books for e-Dhara operations

Before operationalization at Taluka, references of last mutation number and Last Khata number should be taken from Talatis and fed into relevant software module. Verification & remarks in village manual books is done.

10) Configuring thumb impression for bio metric authentication

Bio-metric authentication should be configured through registering thumb impression of the concerned users (Viz. Mamlatdar, e-Dhara Dy Mamlatdar, Circle Officer, operator) using proper Application Module.

11) Software Testing

Every Software Module version should be thoroughly tested for bugs/errors, and should be reported in prescribed format to NIC – GSU & SMC. A printout of reporting format, email /written communication should be kept for future reference. Taluka should be made operationalised, only after the testing of delivered and rectified versionof Module.

12) Mock run of operations

Mock runs of operations prior to Taluka Operationalization should be conducted. Mock runs shall be conducted in the presence of Prant Officer, Mamlatdar & e-Dhara Dy Mamlatdar respectively. Mock-run gives insight into administration's preparedness and builds confidence to actually take-up operatioanlisation. Problems faced during mock run may be closely viewed and solutions to problems may be drawn out.

13) Ensuring availability of standard mutation text and application forms

Mutation application forms with a list of supporting documents for mutation type should be made available at e-Dhara Kendra prior to operationalization. It should also be made available at village panchayat office.

14) Preparing Registers in prescribed format

All prescribed registers should be prepared before operationalization.

15) Communication Plan

Press notes should be released highlighting e-Dhara operationalization. Publicity through radio and TV campaign shall reeinfoce this.

e-Dhara Operationalization should be inaugrated in mass presence of khatedars, possibly political executives should preside the event.

16) Implementing Back Up plan

For data security and backup, circulars were issued and also ensured that these are complied with. A backup plan for all talukas was designed and implemented.

Chapter-8

Status on Computerisation of Land Records in Tamil Nadu

K.A. Mathew

Computerization of Land Records programme involves Revenue Administration, Land Administration and Survey and Settlement Department. The close co-ordination of these Departments is essential for the successful implementation of Computerization programme.

Computerisation of Land Records Programme

The 'Tamil Nadu Info-system for Land Administration and Management' (TAMIL NILAM) project was introduced with the objective of computerizing land records data for the benefit of the public with 100% financial assistance from GOI. Computers and accessories have been installed in all the 206 Taluks of the State. The main component of the programme is computerization of the alpha numeric data of the permanent village records contained in 'A'-Register, 10(1) Chitta and Adangal.

The objectives of **TAMIL NILAM**

- Faster processing, on-line mutation and continuous updation of land data.
- Secure, error-free and up-to-date data which will drastically reduce land related litigations.
- Easy access, retrieval and utility of land records information.
- Issue of computerized extracts of land records to the public, across the counter.
- Development of digitized spatial data-base.
- Integration of alpha-numeric data with spatial data to move towards a comprehensive management information system in a GIS environment.
- To facilitate timely, accurate planning and effective execution of schemes by various governments, departments, governments and private agencies.
- Progressive capacity building of the personnel to bring in attitudinal change.
- Create wider awareness among the general public to enable everyone to demand and avail IT enabled services totally bereft of any hassle.
- To continuously fine tune the programme to usher in total transparency.
- Eliminate corruption through increased transparency.

Of the 206 taluks in the state 201 taluks have come on-line and they are fully operational in the transaction mode. The Government have banned the issue of manual extracts and declared that only computerized land extracts are now valid. As on 28.11.2005, 48.5

lakhs computerized land records extracts have been issued to the public realizing Rs. 9.83 crores by way of user-charges.

Touch Screen Computer kiosks

Recognizing the important role-played by computerization in enhancing efficiency, the need for a front-end terminal that would act as an interface accessible to the public was keenly felt. So it was decided to provide 'Touch Screen Kiosks' which would enable the public direct access to data relating to their own land. The Honorable Chief Minister inaugurated the Touch Screen Computer Kiosk (TSCK) in Andipatti Taluk of Theni district and the facility was simultaneously launched by the District collectors in the other model taluks in the districts on 15.04.2002 itself.

The public will be able to avail the following services:

- Information on land matters and obtain extracts
  Obtain birth and death certificates
- Information on O.A.P./ Destitute pension
- Guide line value of land
- General information on various welfare schemes of the Government

The new initiative has introduced transparency, user friendliness and eliminated the red-tapism and saved the public from unscrupulous middle men and corrupt elements. With the State funds TSCK have been installed in 97 more taluks bringing the total number of taluks with kiosks to 127. Funds for installing TSCKs in the remaining 79 Taluks have been sought from the Government.

Adangal Data Entry

In addition to 'A' Register and Chitta, GOI have also approved Adangal (cultivation data) data entry. Data entry of Adangal has been outsourced through ELCOT and data entry is being carried out in all taluk offices. Once the computerization of Adangal data is completed, Jamabandhi will be automated and demand notices for collection revenue can be generated through computers.

E-Governance Initiatives

e-Governance initiatives under which seamless delivery of services is ensured on-line are an important component of good governance. It was announced that emphasis will be placed on improving service delivery in key areas with a high public interface such as Metro Water, Transport, District Administration, Corporation of Chennai, other Urban Local Bodies, TNEB, Hospitals etc., as a key element of good governance supported by e-Governance initiatives. The Government constituted a committee under the Chairmanship of Special Commissioner and Commissioner of Revenue Administration for effective monitoring of electronic delivery of services in a quick and transparent manner to alleviate any inconvenience to the public in G.O.(Ms.).No.406, Revenue

(SS.II(2)) Department, dated 16.11.2004. Plans are underway to introduce several more e-governance initiatives to usher in smart governance.

Need for Digital signature based Public Key Infrastructure (PKI) and hosting of Centralised Data ware housing

Current Model: The data currently resides in MS-SQL based relational databases in Taluks and are accessed by the personnel through client terminals connected to the server through a local area network. The mutations to the data consequent to various transfers, inheritances, etc., are carried out using the 'Tamil Nilam' Software of NIC. An audit trail for tracking such mutations is created by capturing the operator ID and storing it in a session information table. Various administrative reports are generated out of the same client- server application. Currently more than 200 databases exist around the state and the authentication and accountability requirements are being taken care of locally. Similarly, patch managements and other software maintenance activities are also carried out locally.

Proposed Model:

To manage the accountability and security of this sensitive data better, it is proposed to move all the data to a central data processing center and permit access to the Taluk level personnel using a web interface. In addition, a Public Key Infrastructure (PKI) based access and mutation controls are to be brought into force. This is expected to increase the manageability of the data several fold simultaneously ensuring accountability for every participant.

The Model is also expected to address requirement like Business Continuity by enforcing a proper Disaster Recovery (DR) policy as well as establishing a Disaster Recovery site. The storage and archival mechanisms are also to be moved into systems of higher reliability and separate storage arrays with a suitable log-term backup media. The physical access to the computing systems involved would also be highly regulated in the proposed setup and every physical and logical access to the systems by the administrative personnel requires to be logged and monitored. The centralized model is expected to make the task of applying patches an orderly and simple process.

Ensuring widest and easy access to land related data at the firka and village level by the public would require a full-fledged centrally hosted data warehousing. The following would be absolutely essential for hosting an effective data warehousing infrastructure.

A. Digital signature based Public Key Infrastructure (PKI) would ensure

1. Security of the data and data warehousing operations.
2. Elimination of the need for manual authentication of the land records extracts (physically signing and affixing office seal) every time when such extracts are issued.

3. Ensure accountability on the part of every participants.

4. Gradually move towards obtaining authenticated extracts of RoR on the web.

B. Connectivity

A full-fledged centrally hosted data warehousing will be possible only when an always on broadband connectivity covering all the 206 taluks is made available. It will be realized only when TNSWAN becomes fully operational.

In the proposed model, entire data will reside in the central Server. Thus the security of the data can be ensured to a very high level. As an interim measure, plans are underway to introduce a system of uplinking the incremental changes in the data at the taluks to the central server on a day-to-day basis. Under this system, the data will reside in the taluk as well as in the central server. The incremental changes carried out during the day will be up linked through dial-up connection. The proposed model would also permit parallel access to Land Records to other departments like Registration, Highways, Agriculture and any other department which carries out land related activities.

Digitization of 'Field Measurement Sketch (FMS)'

Digitization of Filed Measurement Sketch (FMS) is the best way to preserve the Survey data relating to land. Various departments concerned with land like Highways, Railways, Irrigation, Agriculture, Forest and Other Departments which may need land data for their activities will be able to access, retrieve and utilize data for effective, accurate, and quicker planning.

It is absolutely essential to digitize the Field Measurement Sketches (FMS) to carry forward the progress made in the Computerization of Land Records Programme. The graphic survey data has to be inter-linked with the alphanumeric data already available. This will not only enable automatic updating of alphanumeric date but also the survey records database. By making suitable modification in the Computerization of Land Records software, it will be mandatory for the provision of subdivision measurement data for carrying out all mutations of land records where there is involvement of sub-division. Thus both alpha numeric Data and the graphic survey data will be automatically updated instantaneously. This will facilitate issue of ROR which will carry not only the alpha numeric data pertaining to ownership but also graphic survey details of the field concerned.

With the financial assistance from Government of India, Field Measurement Books (FMBs) and Village Maps have been digitized on a pilot basis in four taluks viz, Chingleput, Kodavasal, Gobichettipalayam and Erode.

The digitization of FMB in the pilot project cost Rs. 100 per FMS. NIC has developed software for digitization called COLLABLAND. By using the software developed by NIC, the cost of digitizing can be drastically reduced to under Rs. 10/- per FMS. In the light of the development of COLLABLAND software by NIC, FMS digitization in the entire state can by completed at an estimated cost of under Rs. 10 Crores.

Effecting sub-divisions using the digitized field measurement data can be carried out accurately and with ease using the digitization software. Effecting the sub division in Field Measurement Sketches by traditional method will normally involve measurement in the field followed by office process work which may take three days in the most expeditious disposal of such cases. However, using the digitization software the entire office process work will be automated and the sketch can be plotted within 5 minutes. Digitizing of all FMS using the software developed by NIC will make a lot of economic sense besides ensuring accuracy, easy access, retrieval and utilization of the data by the General public and various departments connected with land related activities. This will considerably reduce land related litigations.

Digitization of FMS using COLLABLAND software has been taken up on pilot basis in 2 districts viz. Perambalur and Pudukottai. On receipt of funds from Government, digitization of FMS will be taken up all over the state. Once the digitization of FMS is completed the spatial data will be integrated with the alphanumeric data (A-Register and Chitta) already available in the computers and thereafter, extract of Land Records can be issued along with the Filed Measurement Sketches.

Survey using Global Positioning System/Total Station

This technology-Digital Survey using GPS and Total Station device is a new one to this department. In this method, survey control points are established with Geo-coordinates and the data obtained is directly transferred to a personal computer and digital maps are generated. This process will yield highly accurate survey field data.

Objectives of the Scheme are

- To establish grid system to enable accurate geo-referencing.
- Further layers of updated land use details can be superimposed.
- Survey using GPS and Total station usher in accuracy and unassailable finality to the survey records.
- Survey using GPS and Total ensures Millimeter accuracy. Compared to the traditional methods of survey, Total Station survey results in huge savings in term of time, money and man-days while ensuring absolute accuracy and lending itself to easy access retrieval and utilization of data.

Using GPS and Total Station, a pilot project was taken up in Konathi village of Chingleput taluk of Kancheepuram district and completed. Town Survey in 7 villages in Chennai Corporation has been taken up by the department personnel using Global Positioning System/ Total Station equipment. So far survey work in 5 villages has been

completed. This survey staff adapted to the new technology, fast and growing in confidence with every new village taken up for survey with this method.

The data given below pertaining to survey carried out using GPS & Total station will bear ample testimony to the facts stated above.

Comparison between conventional method of Survey and survey using GPS/ Total Station

Sl. No.	Name of the village	Area in Sq. K.M.	Conventional Methods (Survey)				GPS/Total Station (Survey)			
			Time			Man Days (Appx.)	Time			Mandays
Cadastral Survey			Y	M	D		Y	M	D	
1.	Konathi	1.08	5	0	0	6250	0	4	0	750
Town Survey										
1.	Alandur	1.63	2	6	0	10800	0	10	0	3600
2.	Tahirumangalam	0.04	0	3	0	122	0	1	0	33
3.	Adayar Bit I &II	2.63	2	9	0	14000	1	0	0	4680
4.	Venkatapuram	0.91	2	11	0	4320	0	6	0	1440
5.	Ayanavaram	5.65	5	9	0	28000	1	0	0	9360

The above information regarding the usage of modern equipment was conveyed to GOI and they called for a proposal for sanctioning of funds for resurvey of the entire state using GPS and Total Station. Based on the proposal sent by this department, GOI have sanctioned funds for the resurvey of the State using GPS and Total Station. On release of funds from GOTN, resurvey will be commenced.

The Re-survey of Nilgris district (using Global Positioning System/ Total Station equipment) will commence immediately after the Government notification.

C-STAR (Centre for Survey Training and Research), a Centre of excellence in collaboration with Anna University- a highly renowned Technical Institution in the State- has been set up under SRA & ULR scheme. Headed by a Professor of Anna University, the C-STAR is giving in-service training on ETS to these department officials in batches.

Chapter-9

Computerization of Land Records in Madhya Pradesh

B.M. Sharma
Rajeev Agrawal

A. Computerization of Non-Spatial Data

Introduction

The system of preparation and maintenance of land records is a very important factor to know the ground realities related to ownership and possession of land. Simultaneously, the text and maps are needed to keep it dynamic and responsive.

Madhya Pradesh had quite early accepted the blessings of modern technology. The pilot project of computerization of land records was started in 1988 and Morena was the first district, which was completed in 1991. After the success of this pilot project, the GOI sanctioned two more districts in 1989-90 and four districts in 1990-91. A proposal was also submitted to GOI for the computerization of seven tribal districts and after that 19 more districts were sanctioned by the State Government in 1991-92. At present all the 48 districts are under the coverage of this programme. The land records Madhya Pradesh includes the following details: -

a. The survey or plot numbers.
b. Area of the survey or plot numbers.
c. Name of the owner or owners with rights and native place.
d. Soil name topographical recognition.
e. Name of crop or crops with sown area.
f. Name or names of all occupancy tenants and Govt. leases.
g. The rent or Land Revenue, if any, payable or not.
h. Means of irrigation if any.
i. Anything else which is of importance either to the farmers or to the Govt.

The land records are prepared and maintained for many purposes and list of these records is as follows:

i.	The Khasra (ROR)	P-2
ii.	The Jamabandi (Kistbandi Khatauni)	B-1
iii.	Kistbandi Maujawar	B-2
iv.	Combined Maujawar Kistbandi	B-3
v.	Village wise demand and collection	B-4
vi.	List of demand of Patel	B-5
vii.	Jamabandi Goshwara	P-7
viii.	Arrear details	B-7
ix.	Milan Khasra	
x.	Land classification	
xi.	Rabi Jinswar	
xii.	Kharif Jinswar	
xiii.	Jayad Jinswar	

Objectives

With the explosion of computer culture in the country, the impact in the area of land records has become very significant. The state of Madhya Pradesh has always been a strong votary of mechanization of land records to reduce the workload of already overburdened grass root level land records functionaries, ensuring its accuracy and at the same time minimizing the possibility of unauthorized interpolation in land records.

Above all, the most important objective is to make available computerized copies of record to the concerned and needy land holders just to safe guard their legal rights and the maximum benefits of rural development programs to the farmers in the state. The Government of India has conceived the objectives in the Memorandum of Expenditure Finance Committee (EFC Memo) is given below:

(a) To facilitate easy maintenance and updating of changes which occur in land database such as changes due to availability of irrigation/natural calamities / consolidation/ or on account of legal changes like transfer of ownership, partition, land acquisition, lease etc.

(b) To provide for comprehensive scrutiny to make land records tamper proof, which may reduce menace of litigation and social conflicts associated with land disputes.

(c) To provide required support for implementation of development programs for which data about distribution of land holdings is vital.

(d) To facilitate detailed planning for infrastructural development as well as environment development.

(e) To facilitate preparation of annual set of records in the mechanized process and thereby producing accurate documents for recording details such as collection of land revenue, cropping pattern, etc.

(f) To facilitate variety of standard and adhoc queries on land data.

(g) To provide database for agricultural census.

Beyond these objectives the state of Madhya Pradesh, where computerization of land records is being counseled in a big way, has focused the future vision to the extent of the E-Governance. The main stress is especially on-

1. Storage of data on CD as electronic media.

2. Regular modification of data on the basis of Agriculture Year from 1st July to 30th June.

3. Use of computer technology on grass-root level like Patwari & Revenue Inspectors.

4. Intensive computer training to all Revenue & land record staff engaged in this program.

5. Net-working of computer program to facilitate the on-line mutation.

6. Digitization of cadastral maps in the State.

Implementation of the Scheme

The Eight Five Year Plan (1992-97) and the Ninth Five Year Plan (1997-2002) have envisaged the fulfillment of all five principles of National Land Reforms Policy, that is, abolition of intermediaries, tenancy reforms with security to actual cultivators, redistribution of ceiling surplus land, consolidation of holdings and updating of land records. The general theme indulges the content of all Plan documents has emphasized that land is an asset which provides the primary and secondary needs of people. Most of the problems of the people in the villages are due to land related issues. Planning and maintaining land record is a pre-requisite before any land reform policies can be successfully implemented. To achieve this, latest information technology is a must for quicker storing, processing and retrieving of information database in land records. Therefore, Computerisation of Land Records is an essential step to achieve all these goals especially if we have to realize the goal of decentralized planning and administration. Although, amongst all the pilot projects sanctioned by GOI, Morena district of Madhya Pradesh was the first to complete the project in 1991 but the coverage and implementation of the scheme remained slow and problematic. In the year 1999-2000 there were only 12 districts which have completed 100% input of the [illegible]. These districts were: Morena, Sheopur, Datia, Gwalior, Guna, Indore, Satna, Harda, Hoshangabad, Rewa, Vidisha and Ujjain.

But, nothing was achieved even after the completion of data input because there was no plan for modification of the old data and DOS based system was not much efficient to match with the objectives of the scheme. In the year 2000-2001 the scheme was reviewed and a special drive was started to complete the input of data and the task was only finished in the month of Feb. 2002. Another problem was related to the year old data and the modification process was not adopted in the districts. The Commissioner Land Records emphasized the importance of modification of data and made special efforts in this connection. And now, out of 55,694 villages, the data of 53732 (96.47%) villages are updated. The staying behind 100% record updation is due to electricity problem in rural areas and the patwari is over burdened with other government schemes as well.

In Madhya Pradesh we are planning that patwari will have computerized copies of Khasra and B-1 in his basta (bag) instead of hand written documents. As soon as any mutation/ modification takes place, the patwari will record it in a 'Sanshodhan Panji' and based on it patwari will get the records updated at LR computer center and will get the latest printout of the ROR so that the patwari will have the latest computerized records with him. This will make computerized record up to date and this will be a proper synchronization between patwari and computerized record. The continuous monitoring has enabled us to make a considerable progress in almost all the areas of land records including provisions of hardware and software. The ultimate object of providing computerized land records can very well be judged by the fact that while average rate of distribution of computerized records was only few hundred copies per month during last several years now it has risen to more than forty thousand copies per month which is a quantum jump, similarly while only 4 districts of Madhya Pradesh were distributing computerized records in July 2001, now all the districts are distributing the computerized copies. The state Government has collected Rs. 3,30,25,338/- as revenue during the period 01.04.2001 till Oct 2005.

Government Initiatives

The central and the State Governments have been seized by the recurring problem of inadequately maintained land record system as it had made administration of Land Reforms difficult and had served to neutralize their benefits. A weak land record system had also been viewed as a systemic weakness that has helped the perpetration of atrocities upon Scheduled Castes and Scheduled Tribes. The following are the major initiatives taken by the Government of India for computerization of land records:-

(a) The Conference of Revenue Ministers of States/UTs (1985) advocated that Computerisation of Land and Crop based data be taken up on a pilot project basis as a technology proving exercise in one Tehsil/revenue Circle of each State/UT, as a Central Sector Scheme.

(b) A Study Group (1985) comprising representatives from Ministry of Agriculture, Central Statistical Organisation and from the State Governments of Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttar Pradesh also recommended computerization of Core Data in land records to assist Development planning and to

make their records more accessible to people. However, Planning Commission considered that it would be premature to take up this scheme at that point of time.

(c) A workshop on Computerisation of Land Records (1987) reviewed the experience of different States. The Computerisation of Land Records made at their own initiative and recommended that Government of India should fund this program on pilot project basis. The Department of Rural Development accordingly selected 8 Districts in eight States for Pilot Project on Computerization of Land Records.

While approving pilot projects in 1988, Government of India took the following decision:-

i) A time frame for pilot project should not be more than 6-8 months.

ii) The States should clearly bring out benefits that would accrue as result of these pilot projects and these should be highlighted in project reports.

iii) The State Governments should show a clear commitment to Computerisation of Land Records.

An officer with knowledge, training and experience in handling computers should be made incharge of project and should be posted in district chosen for the purpose. Initially Land Reform Division of Department of land resources under the Ministry of Rural Development Govt. of India (GOI) sponsored the scheme of computerization of Land Record in the year 1988-89 with 100% financial assistance as a pilot project in eight districts of India namely Ranga Reddy (A.P.), Sonitpur (Assam), Singhbhum (Bihar), Ghandhi Nagar (Gujarat), Morena (M.P.), Wardha (Maharashtra), Mayurbhanj (Orissa) and Durgapur (Rajasthan) with a view to remove the problem in the manual system of maintenance and updating the Land Records. It was finally decided to computerize the text data of land records to achieve the objectives.

During the 8th Plan the Scheme was approved and the provision of total expenditure under the scheme was Rs. 59.42 crores. The National Informatics Center (NIC) was the core body to supply installation and maintenance of the hardware, software and other peripherals. NIC was also the responsible for the training and technical support for the implementation of the scheme. The Ministry of Rural Development has provided funds to the State Government for site preparation, data entry work. Since the inception of the scheme the Ministry has released Rs. 37.92 Crores upto 30.09.2004. Madhya Pradesh is the State who has received the highest amount only due to its good work.

Present status of the scheme

Hardware

In the year 1999-2000 the new Pentium-II systems were installed in 140 tehsils of the state and in the year 2000-2001. Pentium-III systems were installed in rest of the tehsils. In the year 2001 with the introduction of the new software these systems were required to be upgraded, and on the recommendations of NIC the P-II and P-III systems were upgraded.

Central Government has also provided computer system for District Data Centre one Xeon based server with three PIV based client machines. Some SDO offices have also provided computers with server and client machines. Computer Systems are also provided to newly formed tehsils, now all the 272 tehsils are having computers for Land Record project, and presently the department of land records is using the best available latest operating systems and machines.

Manpower

To make a tahsil self-reliant, it is necessary to train the tehsil staff in computer basics, and as per directions of Government of India the State Government is engaged in training of tehsil staff. Thus by the end of October 2005 the number of computer trained officials/employees has reached 10478 which is the highest in comparison to in any other Government organization.

Software

Initially the computerization of land records had been begun in DOS based software but the future requirements compelled to opt SQL window based software. Now the computerized DOS based data has been ported on the window platform and version 2.0 of the BhuAbhilekh software is successfully working all over the states while version 3.0 is in progress with certain modified modules, utilities and queries.

NIC's Role

NIC played a major role in developing the application and facilitating the implementation at the Tahsil level. NIC is involved in the computerization of land records projects throughout India. NIC, Madhya Pradesh unit has undertaken the responsibility of redesigning the LRMS to suit the requirements of the user in Madhya Pradesh and is still playing an active role in the continuous development and sustenance of the same. NIC, District center has also played a crucial role in the implementation of LRMS right from the beginning till date. In particular, NIC is responsible for-

- Redesigning and implementing the Windows based application at the Tehsil center.
- Implementing all the change requests and upgrades as required for the System.
- Development of new version of the application.
- Handling the support calls at the District center and also at the Gwalior center.

- Conducting training sessions at regular intervals.
- Administration and maintenance of the back-end database.

Bhu-Abhilekh

Bhu-Abhilekh is an application software product designed and developed by NIC for the office of the Commissioner, Land Records & Settlement, Government of Madhya Pradesh, to deliver excellent grass root governance within the domain of Land Management. Computerization of Land Records (CLR) is a joint venture of National Informatics Centre (NIC), Ministry of Rural Development (MRD) and State Government. BHU-ABHILEKH is an ISO certified "G2C" and "G2G" software implemented upto tahsil level.

Features of BHU-ABHILEKH Ver 1 & 2

- System Workflow
  - Captures complete workflow with minimal human intervention
- Mutation
  - Provision for all possible types of Mutation
  - Generation of notices in the prescribed formats
  - Scanning of supporting documents for storage, retrieval and printing
  - Restricts backdated data entry and manipulation
  - Automated updation of revenue records
- Reports
  - Generation and issue of periodic reports including computerised copies of the *Record of Rights* (ROR) (P-II), *Khatauni* (B-1) etc. to the landowners on pre-printed, plain and A4 size stationary.
  - Facility to extract exclusive data of diverted land and individual liability
- Menu-driven and modular
- Multi-user Client-Server Model
- Automatic DSN Creation

- Forced Backup (weekly)
- Restore
- Audit trail
- Data Entry
  - Local Language (Hindi) Interfaces
  - Support for both GIST and Remington Key Board layout
- Data Security
  - Bio-metric authentication
  - Password and role based authorization
- ISO Quality Certification
  - BHU-ABHILEKH Version 1.0 has been Product Certified (ISO 12119) for quality requirements and testing (ISO 9126-1 and

9126-2) for quality model by STQC Directorate, Department of Information Technology, Government of India.

Features of BHU-ABHILEKH Ver 3.0

1. BHU-ABHILEKH Ver. 3.0 is a superset of BHU-ABHILEKH Ver 2.0 is under pilot implementation at 6 tehsils places.
2. Facility to print/extract exclusive data of diverted land and individual liability.
3. Facility to provide data entry/modification Patwari halka wise rights to data entry operators to work for his halka only.
4. District/ Tehsil /R.I./ Halka / Village and Year-wise backup facility.
5. Faster crop modification based on selection of Crop and Group of Khasras.
6. Faster Lagan Collection entry based on selection of group of Khasras.
7. Incremental backup and restore facility.
8. Detailed online help.
9. Automatic creation of new numbers based on Patwari Manual.
10. Additional reports of B2, B3 and Crop Girdawari.
11. After installation of Ver 3, use of previous versions will be restricted.
12. All the general users are restricted, Tehsildar is created as "SuperUser". Tehsildar will open new user account for a particular operator by his name and will assign his rights.

Computerized data can also generate- (a) Land holding pattern (b) Irrigation pattern (c) Tenancy details (d) Land use pattern etc. in addition to the land records mentioned above.

In addition, the program is prepared which enables generation of data with any number of permutations and combinations. It may be fully utilized to generate indications, which would be extremely useful for the purpose of planning, policy formulation and decision-making in relevant areas.

BHU-ABHILEKH Web site

Forty-Eight districts (223 Tahsil) data are hosted on the web with address **http://www.mpbhuabhilekh.nic.in** for dissemination of Records of Rights (ROR) in local language.

Safe preservation of data

As land records have a great legal value and these documents are authentic so the safe preservation of data is highly required. In the early years of the scheme cartridge tape drives were installed in the computers and the data was stored in cartridge tapes as well as backup floppies. As floppies are not sound back-up system, and backup tapes are outdated the data backup and storage is kept on CD's for all the tehsils. The computer made restricted to minimize the possibilities of mischief tampering and interpolation. The securities through password have been incorporated at various stages in the program. As soon as program is loaded it will ask for the password.

Impact of Computerization

Computerization of Land Records and its process like mutation has added values to the citizen and district administration. The process developed through automation is simple and secured to the extent possible. Computerization process reduces the manual work done by the Patwari and revenue officials, and improves their efficiency level engaged in preparing various kinds of reports. This has also made a significant change for a common man and minimized his dependency on Patwari and revenue inspector. The ROR is available at the click of a button with the web hosting of data on web. The citizen can view his ROR from anywhere at any time. Automation of Mutation process has reduced the turnaround time of mutation requests. FIFO (First in First Out) method and transparency in the computerized system has curbed corruption for mutation processing. Computerization process has also increased in the revenue of Madhya Pradesh government from the distribution of computerized copies of ROR and B1 as per the following chart and the progress in going on:

Financial year	No. of copies of ROR & B1.	Revenue Collection (Rs.)
2001-2002	3,88,477	34,79,765
2002-2003	5,57,898	55,13,287
2003-2004	5,80,489	60,91,043
2004-2005	7,93,548	91,88,006
Till Oct 2005	6,65,872	87,53,237

B. Computerization of Spatial data through modern technology

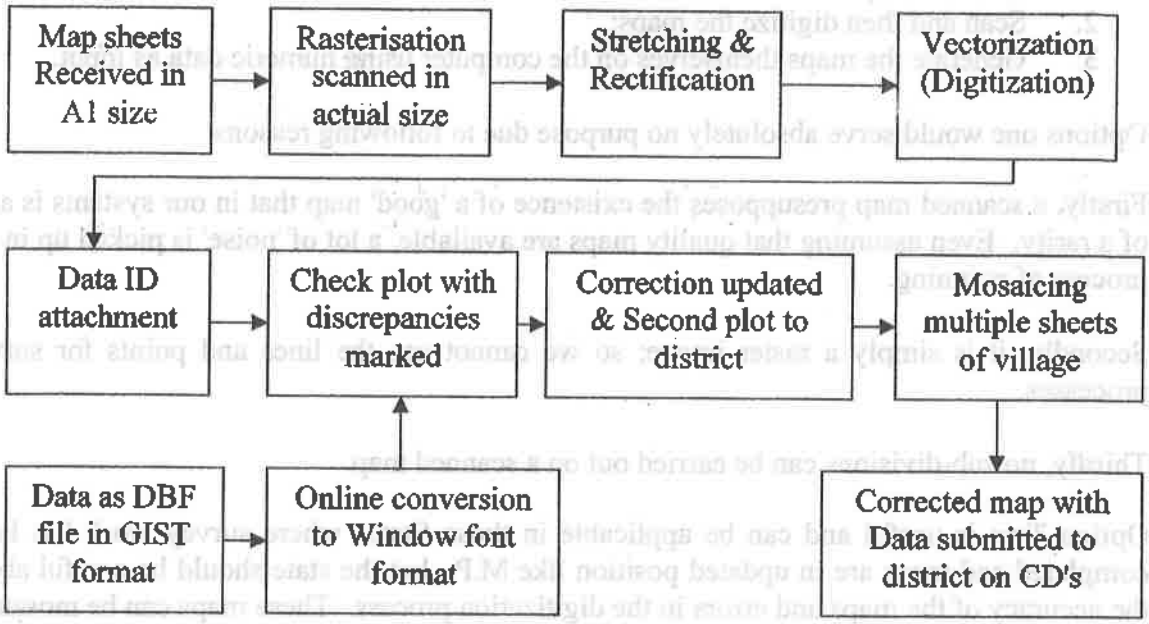
Introduction

Government of India has laid a major emphasis on digitization of cadastral map, which is considered as one of the most important component of the on going program on computerization of land records. Therefore to accelerate the program necessary funds are required.

Digitization is a process of converting a spatial data into computer compatible format. Maps after scanning comes into raster format. This raster format is made of pixels and unintelligent format. Thus in simple words digitization is a process of converting a raster format into vector format. There are some of the areas where GIS can help and other areas can be explored. The Department of Land Records of Madhya Pradesh is only one to use all the four GIS platforms – Auto Cad, Map Info, Arch Info and Micro Station in pilot projects. Nearly all the GIS platform will suit the needs of the department but however, customized application software will have to be developed in preview of future volume of job.

Methodology

The process of digitization of cadastral maps is enclosed below in flow chart.



Projects : Operationalization

Government of India have sanctioned funds for digitization of cadastral maps for 12 tahsils of Madhya Pradesh with details given below.

Digitization - Pilot projects

Year of Sanction	Name of District / Tahsils	No. of villages /Map Sheets	Status
March 1999	Guna / Raghogarh	340/706	Operationalized
	Shivpuri / Shivpuri	208/621	
February 2000	Mandla /Niwas	803/1773	Operationalized
	Dindori / Dindori & Shahpura	194/462	
March 2000	Hoshangabad/ All 7 Tahsils	913/2284	Operationalized

Is Digitization Good: Scanning v/s Digitization

We have three options –

1. Simply scan all existing maps and create a computerized data base of these scanned maps;
2. Scan and then digitize the maps;
3. Generate the maps themselves on the computer using numeric data as input.

Options one would serve absolutely no purpose due to following reasons:

Firstly, a scanned map presupposes the existence of a 'good' map that in our systems is a bit of a rarity. Even assuming that quality maps are available, a lot of 'noise' is picked up in the process of scanning.

Secondly, it is simply a raster image; so we cannot use the lines and points for survey processes.

Thirdly, no sub-divisions can be carried out on a scanned map.

Option Two is useful and can be applicable in those States where survey work has been completed and maps are in updated position like M.P., but the state should be careful about the accuracy of the maps and errors in the digitization process. These maps can be mosaiced at the village level and onwards and can be used for MIS purposes.

Option Third, is not possible because of operation of settlement has been closed down.

Legal Sanctity of the Digitized Cadastral Map-

The Government of Madhya Pradesh has already issued a notification for issuing authorized copies of these maps from the computer centres situated in tahsils

Percentage of Accuracy of Digitized Cadastral Maps Vis-à-Vis Ground Realities

After completion of the pilot projects of district Shivpuri and Guna (tahsils Shivpuri & Raghogarh respectively) certain observations were made by technical consultant of this department which are narrated below:

- The area calculated by computer of a digitized map does not always match with the textual data obtaining on original map.
- There was problem of subdivision on maps required due to division of holdings.
- It was not possible to mosaic the village map into tahsil and further say district map.
- The information of other departments was not available in digitized maps.

Detailed discussions were held with various technical experts and user agencies at CLR and government level to resolve the issues and following conclusion were drawn:

The difference between area of digitized map as calculated by computer from textual data obtained from the manual map can be due to two reasons, firstly there may be procedural error which crept into process of digitization, secondly it may be due to the fact that the original map itself is not a correct representation of the field & after a length of deliberations, we came to the opinion that in the present scenario it would be advisable to reduce the procedural error to zero so that the digitized map is exact replica of manual map, to import the textual data and attribute as it is to the digitized map. Because for several decades these very maps are being accepted by various courts of law and there are provisions in Madhya Pradesh Land Revenue Code to correct the maps following a prescribed procedure, secondly the de-novo resurvey would involve not only huge expenditure but also inordinate delay.

Planning of Digitization of Cadastral Map-

- A proposal of Rs. 17.58 crores approved by State Cabinet on 18.04.2004 for the digitization of all village cadastral maps.
- In current financial year 2005-06 Rs. 7.00 crore has been sanctioned.
- Bid document has been prepared & sent to the State Govt. for approval, after approval tenders will be invited.

C. Integration of Computerized Land Records data with Registration department

Requirement of Integration

Presently, there is a large difference between registration process and the mutation. There is no provision in Registration Act for this linkage but we find a little provision in the MPLRC under Section 112 i.e. when a document purporting to create, assign or extinguish any title to or any changes on land used for agricultural purposes, or in respect of which a field book has been prepared is registered under the Indian Registration Act, 1908 (XVI of 1908), the Registering Officer shall send intimation to the Tahsildar having jurisdiction over the area in which the land is situated in such form and such times as may be prescribed by rules under this Code. Even the provision as stated above, there is no proper link between the registration and mutation. Practically, we do not find any consolidated record of registered properties in tahsil/district offices of Revenue Authorities. Even at so many places, registration authorities are also not serious to send this information to the Revenue Authorities because there is no provision in Registration Act regarding this. Resultantly, Bhu-mafias and cheaters can sell the property two or three times or both.

Even today there are provisions in the Registration Act which inspire us not to adopt a mechanical view in respect of the documents purported to be registered. S.82 of the

Registration Act provides for penalty for making false statements, delivering false copies or translation, false personation and abetment. It is to be noted that S.82 uses the words "Whoever falsely personates another and in such assumes character presents any document." This is quite a different matter from saying "Whoever falsely assumed a fictitious name" (Emperor V. Rangammal, AIR 1935 Mad. 913). This section has been enacted with a view to punish acts which are not offences under the Penal Code. This section talks personation of character and not of name. In such a case if someone who is not owner of the land or property and personates himself as such commits crime under this section. S.21 of the Act provides for description of property of maps or plans. The provision of this section are positive and imperative and not merely directory. If the document contains no description of the property "sufficient to identify the same, the refusal to register was held proper (Saiyed Mahmud V. Mohammed Zubair 6 A.L.J. 627: 3 I.C. 506). Under S.3 of the Transfer of Property Act registration of document is deemed to be notice to all. It stands to reason that the description in the document should be such that any person making a search of the registry should be able to ascertain the property dealt with. Therefore it would be more useful to add following words in the sub-section (1) S.21of the Registration Act.
"Houses and lands shall also be described by their cadastral survey numbers and cadastral maps and the instrument shall be accompanied by the relevant ROR, Khasra, Khatiyan etc. and a copy of relevant cadastral map." (In Bombay, there is almost similar amendment in vogue). S.22(1) also gives powers to the State Government to make rules about description of houses and land by reference to Government maps or surveys. This section mentions "not being houses in towns," thus exempting buildings of the urban areas from such rule making. In Punjab the words "not being houses in towns" in sub-section (1) of S.22 were omitted by Punjab Act VIII of 1941. Thus, it is suggested to delete the words "not being houses in towns" from sub-section (1) of s.22 of Registration Act.

The Merger of Tahsil and Sub Registrar Office

In whole of the country, the Registration Department and the Land Management Department are different. Therefore, the merger of these two departments will be difficult. Even the idea of merger of both departments is principally good, but if it is not feasible, then these two departments should be closely linked. After the computerization of both departments, linking between these two departments will be easy. In Madhya Pradesh, at most of the places, tahsil offices and Sub Registrar Offices are situated in the same campus and at so many places tahsildar is working as a Sub Registrar also.

To save the inconvenience of general public, the process of registration and mutation should be closely linked as under:-

- In Madhya Pradesh, the computerization of land records is 100 percent completed. The Registration Department can get benefit of this computerization.
- Secondly, almost at all places, the tahsil offices and the registration offices are situated in the same campus or in some places the Tahsildars are doing the job of Sub Registrar. Therefore, the tahsil office and Sub Registrar Office can be linked easily via LAN (Local Area Networking).

- The Registration Authority should be bound to send the whole information regarding the property which was registered during the day on every day to the concerning tahsil and after getting this information, Revenue Authorities must enter the details of transfer in the column number 12 of Khasra. A software can be developed where after getting the information of transfer of land from registration office, the land record will be automatically updated.

- A provision in Registration Act should be incorporated that before the execution of transfer deed, Registration Authority will get the latest legal position of the land proposed to be transfer from tahsil office through Local Area Networking (LAN) and he will attach the latest khasra copy of the said land. This khasra copy will be certified by a Registrar and will be a part of the sale deed.

- After getting the information of transfer of any property from Sub Registrar, the Tahsildar/Naib-tahsildar shall be bound to initiate the mutation proceeding himself. He will inform to both parties (Seller and Purchaser) and will pass an order of mutation. During this process, Revenue Authorities will contact personally to seller through subordinate agency and get certification that registered property was sold out actually. Revenue Authorities will also have the power to call seller and purchaser both for the implementation of this process.

- District Collector or Sub Divisional Officer shall review the linkage between registration and the mutation per month.

Integration Software-

NIC has developed a prototype to integrate Land records department with the registration department and the same was showcased in Elitex 2005. As soon as registration process take place at Registration office, the operator may get the status of Khasra on his screen and after data entry of registration process, a file is generated in the land records system, but for this process the Land records system and registration department system should be on LAN. This will initiate mutation process automatically at Land Records Office under the head "data from registration department", based on this information, land records office may generate notices, general proclamation, register etc like any normal mutation process.

Conclusion

The recognition and the importance of the scheme is undoubtedly acceptable in all quarters of the Government for the good governance. The scheme has won the award of excellence for the 'Best IT usage for masses' during the year 2002-2003 by the Computer society of India Bhopal chapter. The purpose of the implementation of the scheme is to use the technology as a tool for better management and maintenance of land and related assets. The complete success of computerization of database is only possible after computerization of cadastral maps. As soon as the records are digitized the whole phenomena can change the rural scenario. The need of time is to do all necessary efforts to encourage the latest

technology for the setup of a effective modern system of governance. Now the time has come to in corporate the experiences of success, the recommendations of authorities, the special emphasis on HRD and timely evaluation of performances which is made during the short term. As the Madhya Pradesh has a glorious past to implement the scheme so the present is excellent and splendid and hoped the same for the future.

Chapter-10

Computerisation of Land Records in India: An Assessment

Ashish Vachhani
N.K. Kumaresan Raja
Hari Charan Behera

Introduction

Computer culture has paramount effect in today's management process. The Information Technology (IT) application has been realized for data base management to facilitate in data collection, storage, retrieval and processing facilities in the domain of public service delivery. Computerization of land records is one of such area which could catch public attention in late 1980s. The Ministry of Rural Development, Government of India planned and executed the operationalisation of computerisation of land records along with the technical support from National Informatics Centre (NIC). Subsequently, the hundred percent centrally sponsored scheme on computerisation of land records was extended to almost all the states. The two decade history of modernization of land records through computerisation has transformed the traditional process of land records management. Significant changes in the revenue functioning has undertaken in recent years and the custodian legacy of land records by lower revenue functionary has revived with the new management strategy.

Computerisation of land records (CoLR) includes both spatial and non-spatial data computerization. While non-spatial data is gaining faster momentum to be incorporated in the process of computerization the incorporation of spatial data is relatively low in India. Non-spatial data such as record of rights (RoRs), crop details, and others have been taken into account under the process of computerisation. However, the fact remains is that the progress in computerization of land records work in not equally or uniquely distributed. The physical achievement under computerization of land records progress as documented by department of land resources, Government of India shows that out of 5261 tehsils in 3521 tehsils the data entry has been completed; the mutation backlog updated completed in 1918 tehsils; 3460 tehsil level computer centres are ready to provide e-service with regard to land records. In 2923 tehsils the computerized RoR is being distributed and still in 1361 tehsils the manual copies of RoR are being distributed (DoLR report as on 31st Jan, 2008).

The state wise progress report on computerization of land records shows that Gujarat and Karnataka are leading states as far as achievement of CoLR program is concerned. In Gujarat out of 225 tehsils in 223 tehsils the computerized copies of RoR are being distributed. Similarly 162 tehsils out of 175 tehsils in Karnataka, the computerized copies of RoR have been distributed (ibid.).

Distribution of Computerized Record of Rights

In the case of RoR distribution, Gujarat and Goa are leading the front. As per the latest report (ibid.) by Department of Land Resources, Ministry of Rural Development all 225 tehsils in Gujarat and in all 11 tehsils of Goa the computerized RoR is distributed. The important feature is that the manual RoR distribution has been completely stopped in these states. Karnataka, Tamil Nadu, Rajasthan, Maharashtra, Haryana, Himachal Pradesh are also forerunners in fast achieving the target. Apart from north eastern states, other states such as Bihar, Jharkhand, Kerala, Punjab and Uttaranchal are lagging behind as far as computerisation of land records program is concerned. The details can be seen at annexure-2.

Primary Study observation

The present study is an attempt to understand the progress and achievements by some states selected for primary study. The objectives of the study are;

- To examine the ease and speed with which the cultivators are able to obtain the land records and the procedure for the same.
- To find out the extent to which:

i) CoLR has reduced and changed the workload of the revenue functionaries.

ii) It has minimized the possibilities of interpolation of land records and rent seeking behavior.

iii) A comprehensive database on various facets of land is available for helping in land reforms, and

- To explore the possibilities to upgrade the facilities by removing the existing bottlenecks.

Methods Adopted

The present study is a result of fieldwork carried out in four states from three different regions of India to provide a brief account about the computerization of land record program in India. These states are Rajasthan, Tamil Nadu, Karnataka and West Bengal. The primary study was conducted by the Centre for Rural Studies, Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie. The selection of villages in each state varies in sample sizes. In Rajasthan the total number of sample districts undertaken for the study is six. In Tamil Nadu it is four; and in West Bengal and Karnataka the sample districts are three and one respectively. The detail about the number of tehsils/ taluks and blocks undertaken for the study is shown in table-3. While selecting the villages, the following two aspects have been considered in order to minimize the biasness viz., (i) distance to the tehsil/taluk offices, and (ii) population size. At the spatial level, villages located remotely, located in mid way and near the tehsil/taluk offices were selected for the study. At the demographic level, villages with low, average and large population sizes have been selected but villages with extremely small or extremely large population were avoided.

Table-3 Sample districts and tehsils

States	*Districts*	*Tehsil/Taluk/Block*
Rajasthan	Jaipur	Sanganair, Chomu
	Bundi	Hindoli, Bundi
	Sirohi	Rewdar, Pindwara
	Dungarpur	Semalwara. Sagwara
	Nagaur	Deedwana, Ladnu
	Bikanair	Nokha, Loon Karansar
Tamil Nadu	Vellore	Arakkonam, Thirupathur
	Coimbatore	Pollachi, Avinasi
	Thirunelveli	Nanguneri, tenkasi
	Thanjavur	Thruvidaimarudur, Pattukkottai
West Bengal	Hoogly	Mogra, Chinsruha, Polba Dodpur
	Nadia	Chakdah, Nakashipara
	Burdawan	Khandaghosh, Bardwan-I
Karnataka	Gulbarga	Afzalpur, Aland, Chicholi, Chitapur,Gulbarga, Jewargi, Sedam, Shahapur, Shorapur, Yadgir

a) Respondents

The total respondents are divided into 4 social groups such as Scheduled Caste, Scheduled tribe, Other Backward Classes and Others. In Rajasthan the total respondents are 1987, in Tamil Nadu the total respondents are 1122, in Karnataka the total number of respondents are1478, and in West Bengal the total number of respondents are 210, and. The proportion of the Scheduled Caste, Scheduled Tribe, Other Backward Class and others members in Rajasthan are 18.4%, 8.25%, 44.6% and 28.8% respectively. Similarly in Tamil Nadu, the proportion of Scheduled Caste, Scheduled Tribe, Other Backward Class and others are 7.0%, 0.1%, 89.3% and 3.6% respectively. In Karnataka the percentage of SCs, STs, OBCs and Others respondents were 9.0%, 6.0%, 42.0% and 43.0% respectively. The percentages of group-wise respondents in West Bengal are 21.7%, 2.9%, 6.3% and 69.1% respectively.

The detailed distribution of respondents is shown in the following figures.

Fig-1: Distribution of respondents (in percent)

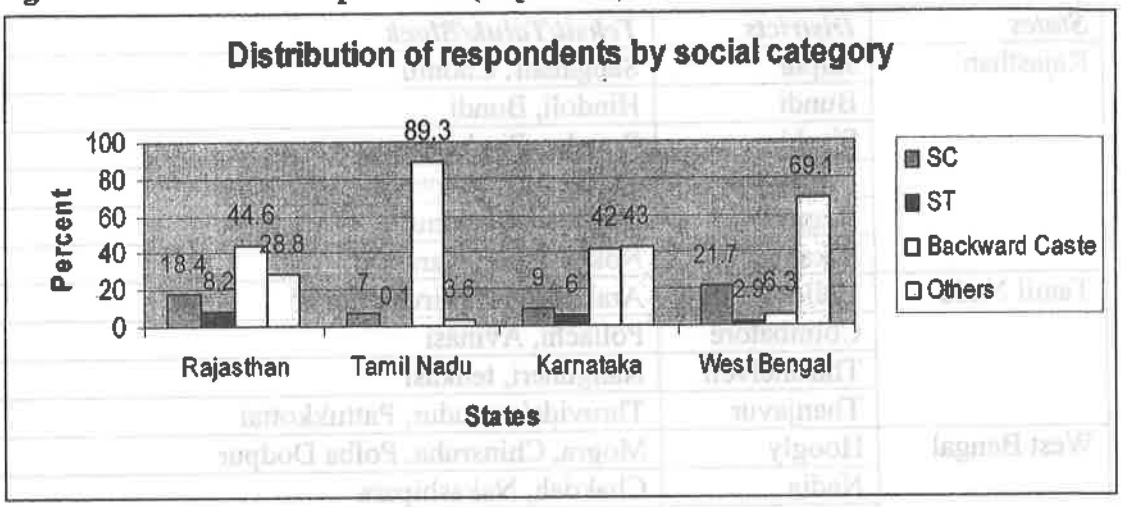
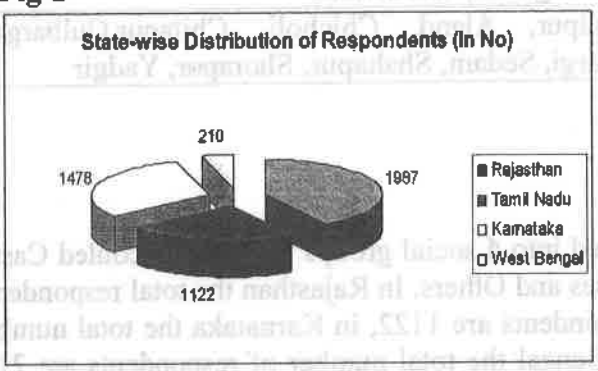


Fig-2



b. Distribution of Ownership Holdings

Ownership holding is divided into 5 major divisions. These are marginal, small, semi-medium, medium, and large. Based on land holding size, the distribution of number of respondents is given below.

Table-4

States	Marginal		Small		Semi-medium		Medium		Large	
	No.	Area In Ha.	No.	Area In Ha.	No.	Area In Ha.	No.	Area In Ha.	No.	Area In Ha.
Rajasthan	613	385.11	441	673.07	406	1143.75	371	2273.64	147	3123.37
Tamil Nadu	393	217.41	310	421.61	261	666.17	134	737	24	389.47
Karnataka	111	83.75	296	436.22	430	1162.84	435	.....	198	3136.98
West Bengal	155	57.46	36	50.62	17	41.93	2	8.35	0	0.00

Analysis and Findings

One of the main objectives of computerisation of land record program is the quicker delivery of services. So in order to examine the ease and speed of the work flow under computerisation of land record program in the states the time taken to obtain computerized RoR in the 4 states was taken into account.

Table-5 Persons who obtained RoR/RTC after computerisation (in percent)

States	Same day	1-3 days	3-7 days	More than 7 days
Rajasthan	95.8	3.5	0	0.7
Tamil Nadu	66.6	21.0	8.6	3.8
Karnataka	86.0	11.2	NA	NA
West Bengal	12.4	31.5	49.4	6.7
Total	65.2	16.8	20.7	3.8

Table-6 Persons who obtained RoR/ RTC prior to computerisation

States	Same day	1-3 days	3-7 days	More than 7 days
Rajasthan	8.3	16.3	17.6	58.8
Tamil Nadu	56.3	16.6	16.1	11.0
Karnataka	59.7	0	22.1	18.2
West Bengal	1.2	0	14.3	84.5
Total	31.4	8.2	17.5	43.1

The comparison of above two tables shows that after computerisation of land record program a large percentage of people in Rajasthan and Karnataka obtained Record of Right (RoR/RTC) on the same day. In Rajasthan there is leap jump in the percentage of people obtaining RoR from 8.3% to 95.8% from before computerisation (8.3%) to after computerisation (95.8 %). In case of Tamil Nadu, more than 65% of respondents obtained RoR on the same day. However, in West Bengal this percentage is still low in comparision to the other 3 states. Most of the respondents in Rajasthan, Tamil Nadu, and West Bengal obtained computerized patta within one week of applying and only 43.9 percent respondents in West Bengal could obtain RoR within one week.

In sum, prior to computerisation there were only 31.4% respondents who could obtain patta on the same day. More than 43% of respondents obtained patta in more than 7 days. From the above tables it is found that computerisation has helped in easy flow of information and prompt delivery of service. There is improvement in delivery of services in some states, but West Bengal has not shown any improvement. Tamil Nadu also does not progress much in quick delivery of service.

Reasons for Delaying in Delivery of Computerized RoRs

The common problem which is derived out of primary study is that in majority of cases delaying occurred due to irregular power supply and breakdown of the computer system. In many cases, it is realized that whenever any hardware or software related problems occur, there is no expert available to repair at tehsil/taluka headquarters. In the case of Rajasthan it is a very crucial problem. In this state it was found that there is

now state level agency for providing service at tehsil level. So it is difficult to expect timely service from this agency. Absence of adequate kiosk operators is also an important issue for delaying of service in all the states. Some issues were realized due to rectification or modification of the existing mistakes found in the record. The surprise part in West Bengal is that the computerisation has not benefited much in easy flow and reduction in the consumption of time.

In addition to the above issues, the other concern is that the lack of adequate trained personnel to provide prompt service. With the absence of present trained person there is no alternative person to render the service towards distribution of computerized patta and while operating the Kiosks. According to Shrestedars in Karnataka computerized land record information is more accurate than manual records, but irregularity (non-attendance) of village accountant to their area of operation sometimes made it difficult for farmers to obtain RTCs and for the village accountant it was easier to prepare wrong documents. On the other hand, they also said that farmers often have to travel a long distance to obtain RTCs. Corrections and changes in the records due to land transactions also require a lot of time. Delay is also caused due to necessity of tahsildars thumbprint of entries and he is often not available to do this.

In addition, there are issues associated with the technical aspects of computerized program, which causes delaying in work. In some states the technical problems occur while updating and retrieving data that consequently leads to delay in the work. Many states except Karnataka have no online mutation module in the software. In Karnataka the work flow automation system has been excellent and the computerized system synchronizes very well with the manual system. The database here is dynamic and designed with current requirements.

Accuracy of Computerized Land Records

From amongst the persons who had already obtained computerized documents in Rajasthan, 96.2 percent of the respondents were satisfied with the accuracy of computerized system. Only 1.1 percent persons found that computerized system was not accurate and the remaining were not able to comment anything. Tamil Nadu too had very impressive result as far as respondents' opinion is concerned. 88.0% of respondents in Tamil Nadu were quite satisfied with the accuracy of computerisation program while only 9.4% respondents had negative opinion about the accuracy of computerized land records.

Table-7 Opinion about accuracy

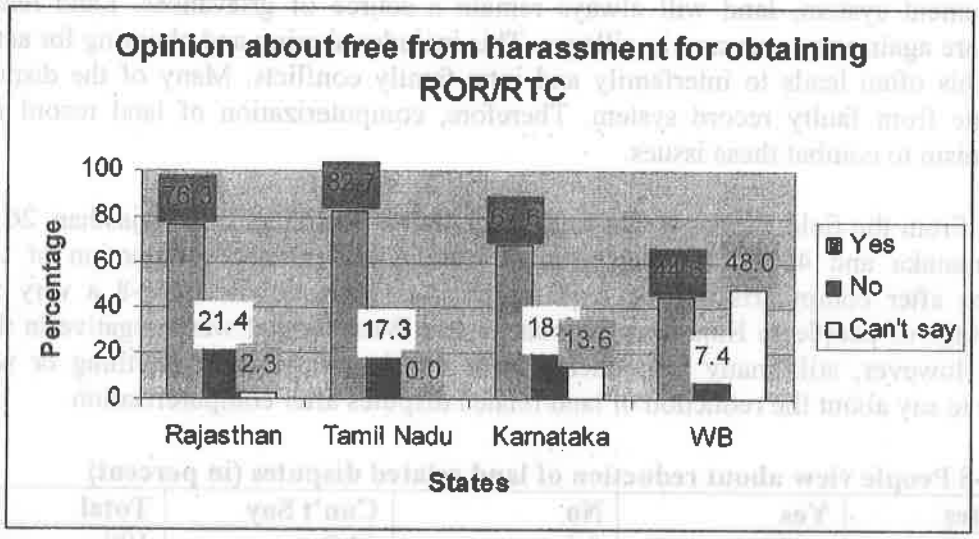
States	Opinion about accuracy of computerized land records (In percentage)		
	Yes	No	Don't know
Rajasthan	96.2	1.1	2.7
Tamil Nadu	88.0	9.4	2.6
Karnataka*	44.2	11.3	44.5
WB	43.4	7.4	49.2

* The opinion about computerisation in Karnataka and West Bengal is low may be due to the fact that the computerisation of land record was comparatively recent during the time of fieldwork. The system was new as a result 44.5% of respondents were unable to opine about the accuracy of computerized land records.

Opinion about the Easiness of CoLR Program

From fig-3 it is found that majority of the respondents strongly opined that the computerisation of land records is free from harassment. The respondents who positively opined the easiness and about the harassment free activity of CoLR also strongly favoured computerisation program. It was also viewed that in the states where people have never gone to the centre or applied for computerized patta could not say about the harassment. It is not that the computerisation programme is 100% free from harassment, however, respondents view provide a satisfactory figure about the new program. Some respondents as shown in the table are not satisfied and opined negatively about the programme.

Fig-3



Rent Seeking Behavior

Prior to computerisation, many respondents opined that they used to give more than the prescribed fee for obtaining the record of right, however, this has been reduced after the computerisation. From Gulbarga district study in Karnataka it was found that only 8.9 % respondents paid the prescribed fee. This was again visualized that among the people who were paying more than the prescribed fee, the marginal farmers consists of 22.4%, small farmers 15.8%, semi-medium farmers 14.5%, medium farmers 12.7% and large farmers 11.3%. it indicates that the marginal farmers were mostly discriminated. However, after computerisation the percentage of people paying only the prescribed has reached to cent percent. In Tamil Nadu 24.8 % percent was the case where the respondents paid the prescribed fee. After computerisation, the percentage has gone up to 69%. In Rajasthan it was found that more than 46% of the respondents used to pay more than even Rs. 50.00 prior to computerisation. The observation in the sate was that awareness was lacking among the farmers regarding the prescribed charges and this was more prevalent among the small and marginal farmers. But West Bengal case was exceptional where it was found that 64.1 percent of the respondents paid between Rs 1.50 to Rs 10.00. This fee looks reasonable since in West Bengal the cost of RoR depends on the number of pages of RoR. 25.8 percent of the respondents paid between Rs 25-50. 10.1 percent of the respondents paid more than Rs 50.00 for RoR. So the

figure shows that the rent seeking behavior was reduced drastically in many states despite instances of rent seeking that exists in some part.

Reduction in Disputes

Land from time immemorial has been a source of pride for its owner and a means to generate revenues for the governments. Land has always been considered as a status symbol deriving its strengths from area, location, fertility of soil and other such factors attached to it. Land is also the cause of agrarian unrest. Boundary or ownership amendments take eon to corroborate, because much of our land records are either untraceable or manipulated with the procedural red tapes. All of these shortcomings in our existent systems can be effectively alleviated with a little persuasion and persistence on modernization of the current style. With the lacking of efficient and up-to-date management system, land will always remain a source of grievances. Land related issues are again very common in villages. This includes sharing and claiming for actual size. This often leads to interfamily and intra-family conflicts. Many of the disputes originate from faulty record system. Therefore, computerization of land record is a mechanism to combat these issues.

From the field studies it was found that 40.8% respondents in Rajasthan, 26.0% in Karnataka and 43.0% in West Bengal were confident about reduction of land disputes after computerisation of land record. As shown in the table-8 a very few percentage of people in Rajasthan, Karnataka and West Bengal were negative in their view. However, still many respondents were unable to comment anything or were unable to say about the reduction of land related disputes after computerisation.

Table-8 People view about reduction of land related disputes (in percent)

States	Yes	No	Can't Say	Total
Rajasthan	40.8	5.4	53.8	100
Tamil Nadu	NA	NA	NA	NA
Karnataka	26.0	7.4	[illegible]	100
West Bengal	43.0	[illegible]	51.9	100

The task ahead with regard to the land dispute reduction won't be hundred percent successful until there is recorded of tenancy. Though it is often difficult to cover the tents under concealed tenancy but the record of tenancy should be made compulsory. It is found that the record of land leasing-in and leasing-out needs to be properly recorded and stored in under computerization of land record program. From Karnataka study it was found that only 18 tenants were recorded prior to computerization and same status continues after the computerization. Computerization of land records has not helped much in reduction of disputes or people are still not aware if there is any drastic reduction. There are several reasons for not having reduction in disputes one of which is that the computerization has not included some other important aspects such as inclusion of crop details, record of tenancy, mutation of records, etc.

Mutation

The process of mutation is a difficult task and needs several procedures to maintain. In 1957, it was decided that the powers under section 135 of Rajasthan Land Revenue Act should be exercised by the Panchayat concerned instead of tehsildar. The inspector of land records after verification forwards to the sarpanch for necessary order. The tehsildar has no power to review the orders of Panchayat. The Panchayat has also the power to sanction the mutation cases as per the rules the matter may be reported to the tehsildar. He may order within 30 days for the disposal of mutation. One of the unique features of 'Bhoomi' software in Karnataka is 'online mutation' module which is incorporated in the software. There has been a synchronization of computerized activities. Even though the land record system is computerized, the revenue officers have to carry out their fieldwork as usual. There has not been any change in their roles and responsibilities. About 88.5 percent farmers indicated that time required for finalization was within three months. Very few respondents (11.5 percent) opined that time needed for mutation prior to computerization was more than three months.

We already mentioned in the beginning that after the computerisation still same process of mutation is continuing. After completion of mutation manually, the mutation entry performed in the computer. According to revenue personnel, the online mutation operation as seen in Karnataka may not be possible in Rajasthan due to the involvement of Gram Panchayat in mutation procedure. Therefore, we asked similar question with the respondents about the facilitation of Panachyat in mutation process; it is evident from the respondents' opinion about the involvement of the Panchayat in the process of mutation, which facilitates the process of mutation.

According to our study, 86.1 per cent of the respondents stated that the role of Panchayat in revenue matter is helpful and therefore this practice should be continued without any major modification. Only 12.6 per cent of the respondents are against the above statement.

In Karnataka the mutation process includes the parallel continuation of manual and computerized process. The process for updating the computerized RTCs generally follows the old process with a few more steps. In case of a sale registered with the registration office, the registration officials now send the J-slip along with copies of the deed and other relevant transaction documents directly to tehsildar where they are forwarded to the computer operator. The computer operator prepares a checklist for the transaction using the information J-slip and verifying it against the current computer records. The checklist is then verified and approved by the Shristedar.

Updation of land records also depends on filling for mutation after the registration of land. Presently there are many delays and omissions in applying for mutations; as a result updation of land records becomes tedious. Also, farmers often do not report transaction within the family either because they are discouraged by the attitude of the revenue staff or due to the internal family problems.

Reduced Work Burden

One of the objectives of CoLR is to reduce the work burden of the officials concerned in the land record distribution and management. In manual record system a revenue officer associated with the computerization was dealing with maintenance of multiple

registers. However computerization of land record was meant to use a single system for keeping and storing all relevant records overcoming the work burden of register work of Patwaris or revenue inspectors (RIs).

In states like Tamil Nadu, the Key Resource Person, who has already been trained to use computer for maintenance and updation of records pointed out that a key resource person is currently doing all the records management apart from doing all the routine office work. In addition, he has to maintain other records such as records pertaining pension, pay certificate, birth and death certificate etc. Therefore, Key Resource Person should be let free from routine clerical work.

The case of Karnataka is different. Here the village accountants get enough time due to computerisation process. The computer operator does the data feeding and other related work. So the burden of village accountant has been reduced. In West Bengal, the computerisation of land record program has been in offline model as a result the reduction of time is not possible so far. The continuation of manual operation does not help much in reducing work pressure of the concerned officials.

Software and other technical issues

The software used in Rajasthan is called 'Apna Khata'. As far as mutation program in Rajasthan is concerned the mutation doesn't reflect the real benefits of computerisation as it doesn't ensure automatic updation of land records. The state government is still providing printing hard copy of land records and updation of database in offline model, which makes it out of sync with current status of land records and, therefore, is not very useful.

It needs online mutation which can work only in a workflow automation system. The security in *apna khata* software is provided by the traditional password system, which is prone to hacking. Presently, Rajasthan government has computerized only RoR. The *khasra* providing crop details still remain to be computerized.

The software used in Tamil Nadu is called Tamil NILAM. This software is being used in all taluks not only to issue RoR and A-Register but also several welfare programs like Old Age Pension, birth certificate, community certificate, etc. It is in Tamil Nadu 201 taluks out of 206 taluks in the state have come online. Unlike Rajasthan, there is ban on issue of manual extract of land records notified in the state gazette and computerized land records are only valid in the state. Karnataka governments have declared manual records invalid in the state. Now it is necessary for other states to amend to stop manual issuance of ROR.

Conclusion

The analysis of above discussion elucidate that the program has been an effective mechanism to bring greater governance through which the service delivery has been prompt and cost effective for majority of small and marginal landholders. The new system has been helpful to reduce time and cost for obtaining patta. This program is leading to extend harassment free support and services to the end users. This has too reduced the work burden of majority of revenue officials and easing out the delays persisting in century old traditional land record management system. Despite that the new system has not been effective enough may be due to delays in incorporating some

urgent technical requirements such as online mutation system, updation of database providing details about crop details, record of tenants, etc. It is need of the hour that the official should take adequate step to generate the opportunity to provide needful services for the day ahead. Revisional surveys to be carried out every thirty years have been more or less abandoned. As a consequence, updating of records is suffered and they no longer represent the ground realities relating to ownership and possession. Without the latest picture of the actual conditions of the land how can land reforms be meaningfully effected. The survey and settlement department should carry out mandated revisional survey every thirty years as per the norms. All ongoing survey and settlement operations should be expedited.

Maintenance of land records has taken a back seat in today's age. The revenue staff needs to be properly trained for maintaining land records. The village land records are maintained at three levels, the village level, the taluk level, and at district inspector of land records office. However at the district and taluk level, there is poor upkeep of land records. Though the CoLR program has eliminated much of malpractices associated with land records but unless the online mutation comes into force a level of mischief can still be done. There is an urgent need to rationalize and strengthen land registration offices with a view to modernize the maintenance, storage and retrieval of land registration documents.

For effective implementation of land reforms, a complete and accurate ground level database is required. For achieving this in the era of science and technology, we need a complete computerisation of land records. This process has already been started but what is needed is speedy implementation. Although our states have moved ahead but even then there are infrastructural hitches, which need to be resolved fast.

Annexure-I

Computerisation Of Land Records Progress Report

(As Available On 1/31/2008)

State Name	Total Tehsil	Data Entry			Verification/Validation			Mutation Backlog Updated			Tehsil Level Computer Center			Type of Software		Computerized Copy of ROR is being distributed	Manual Copy of ROR is being distributed
		Completed	Going On	Not Started	Completed	Going On	Not Started	Completed	Going On	Not Started	Ready	Under Progress	Not Ready	Data Entry	Mutation		
ANDAMAN & NICOBAR ISLANDS	7	2	1	1	2	0	2	2	0	2	2	0	2	1	0	0	1
ANDHRA PRADESH	1125	813	50	0	471	229	163	56	173	538	844	2	16	813	795	485	332
ARUNACHAL PRADESH	149	42	0	0	1	0	42	1	0	41	3	0	40	40	40	0	1
ASSAM	155	118	22	15	109	13	33	94	9	48	14	0	134	134	17	103	75
BIHAR	533	1	29	0	2	17	11	1	0	27	0	0	12	28	0	0	12
CHANDIGARH	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
CHHATTISGARH	98	98	0	0	85	13	0	40	58	0	98	0	0	95	96	85	67
DADRA & NAGAR HAVELI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAMAN & DIU	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELHI	27	16	0	0	13	3	0	0	0	15	0	3	12	16	15	9	6
GOA	11	11	0	0	11	0	0	11	0	0	11	0	0	11	11	11	0
GUJARAT	225	225	0	0	225	0	0	225	0	0	225	0	0	224	224	223	0
HARYANA	68	67	1	0	53	15	0	27	36	4	48	11	9	67	67	51	43
HIMACHAL PRADESH	109	100	7	1	88	19	1	70	30	2	102	3	3	107	107	63	76
JAMMU & KASHMIR	59	0	1	1	0	1	1	0	1	1	0	0	2	2	2	0	2
JHARKHAND	210	5	0	124	2	0	128	2	0	117	24	45	55	12	4	2	33
KARNATAKA	175	167	0	0	167	0	0	165	2	0	167	0	0	148	165	162	23
KERALA	63	22	41	0	10	48	5	9	38	16	60	3	0	60	56	0	15
LAKSHADWEEP	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADHYA PRADESH	272	265	7	0	247	23	2	140	98	15	256	11	5	263	246	240	71
MAHARASHTRA	357	357	0	0	356	1	0	279	78	0	354	2	1	283	329	345	298

MANIPUR	38	7	8	23	7	9	22	2	1	24	1	0	20	15	12	5	15
MEGHALAYA	32	0	0	32	0	0	32	0	0	32	0	0	13	0	0	0	0
MIZORAM	22	0	2	20	0	2	20	0	2	20	1	0	1	2	0	0	2
NAGALAND	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ORISSA	171	161	6	3	158	10	3	88	69	13	168	0	3	122	166	151	58
PONDICHERRY	7	7	0	0	6	1	0	6	0	1	4	2	1	4	4	3	2
PUNJAB	72	0	0	3	0	0	3	0	0	3	0	0	3	0	0	0	3
RAJASTHAN	241	239	2	0	225	16	0	166	75	0	241	0	0	181	216	204	152
SIKKIM	9	8	0	1	7	1	1	7	1	1	6	0	1	8	8	8	1
TAMIL NADU	206	204	2	0	201	1	4	201	1	4	206	0	0	87	165	189	23
TRIPURA	31	30	0	1	23	1	7	4	18	9	21	1	9	22	22	22	9
UTTAR PRADESH	300	287	0	0	287	0	0	287	0	0	287	0	0	285	286	263	22
UTTARANCHAL	47	1	0	0	1	0	0	1	0	0	1	0	0	1	1	1	0
WEST BENGAL	341	268	48	0	203	113	0	34	261	21	316	0	0	316	294	298	19

Source : http://dolr.nic.in/gis/Statewise_Progress_report.asp

Annexure-II

Computerisation Of Land Records Progress Report

(As Available On 1/31/2008)

All India	Total Tehsil	Data Entry			Verification/Validation			Mutation Backlog Updated			Tehsil Level Computer Center			Type of Software		Computerized Copy of ROR is being distributed	Manual Copy of ROR is being distributed
		Completed	Going On	Not Started	Completed	Going On	Not Started	Completed	Going On	Not Started	Ready	Under Progress	Not Ready	Data Entry	Mutation		
India	5261	3521	227	225	2960	536	481	1918	951	954	3460	83	342	3347	3348	2923	1361

Source : http://dolr.nic.in/gis/India_Progress_report.asp

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Chapter-11

ICT Based Integration of Land Records (HALRIS) and Land Registration (HARIS) in Haryana

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Introduction

The Department of Revenue, Government of Haryana deals with maintaining and updating of revenue records, transaction by way of sale, mortgage, collection of revenue, consolidation of holdings, etc. The functionaries of Revenue department come into close contact with general public in connection with various activities/transactions dealing with immoveable property. The department also operates a large number of Acts and Rules, which have a direct bearing on the public. The department plays a crucial role in matters fundamentals to the existence of the citizen. The perception of the general public, especially rural masses, about image of the state government is to a large extent determined by the performance of Revenue Department and the way the revenue functionaries' deal with the citizen. With a view to streamline the working of revenue establishment the process of Computerization of Land Records (CoLR) was started under 100% centrally sponsored scheme. The CoLR scheme was started in Haryana in the year 1990-91. Rewari district was taken up as a pilot district for computerizing land records. Subsequently the scheme was extended to all districts by the year 1997-98.

Property Registration Computerization, Haryana Registration Information System (HARIS): During the year 2000, the Haryana Revenue department decided to computerize the registration of property documents at all Tehsils / sub-Tehsils of Haryana, in technical consultation with NIC-HRSC, in a phased manner. The NIC-HRSC developed the Haryana Registration Information System (HARIS) and first Tehsil was launched in June 2000. As on today, HARIS is implemented at 100% Tehsils & sub-Tehsils.

Haryana Land Records Information System (HALRIS): Though significant progress was made under CoLR scheme and almost 92% Jamabandi data was digitized, this data was not fully used for citizen services due to various reasons like that Patwari who is the key functionary in the verification and finalization of the data due to lack of knowledge and heavy workload, Patwaries had shown very little interest in data finalization. This resulted delay in data verification and finalization. Jamabandies were taken for data entry without standardizing the way of writing. It was found that each Patwari uses multiple ways of writing the shares of owners/cultivators in the same Jamabandi. Semi-automatic new Jamabandi generation module was there for updating the existing data for the next Jamabandi period, but this was used only in few districts where Deputy Commissioner

(DCs) took the personal interest. There was no provision for online capturing of transactions taking place in villages and Tehsils. The CoLR software was having various stand-alone modules and there was no provision for incorporating on-line mutations and automatic updation of jamabandi. To address all such issues, development of HALRIS was initiated by NIC-HRSC as a workflow based integrated Land Records System during the year 2002-03. The implementation was taken up on pilot basis at Ambala Division and one in Tehsil of Sirsa District.

HALRIS ## HARIS Bridge: Once the HALRIS was in place, a need was felt to integrate the Property Registration System and Land Records system in a workflow environment. HALRIS has been integrated with property registration (HARIS), which provides a complete solution for the management of Land Records in the State and improved delivery of Government to Citizen (G2C) services related to Land Administration. It has added new dimensions to the delivery of services to the public in the state. Much desired solution of online updating of Land Records is now available through HALRIS ## HARIS Model, which will help to bring the Land Records from bag of Patwari to whole world and shall bring transparency in making ROR available on anytime, anywhere basis.

Achievements: The HARIS implementation has resulted in greater transparency, ease of service delivery and increase in revenue collection. The Average increase in Revenue collection from Stamp Duty has been recorded up to 40%. HARIS has forced Collectors/DCs to restructure their Collector rates segment wise, control area wise & prime area wise. The HALRIS implementation has started at all districts. On 17/08/2005, Chief Minister Haryana has directed all DCs to finalize all jamabandies by 31/12/2005. Out of total 7081 jamabandies, 5429 have been ported in HALRIS, 1336 jamabandies have been finalized and 473 jamabandies have been made on-line. The HALRIS ## HARIS bridge has received Silver Icon award at 8th national e-Governance conference in Feb, 2005 at Bhubaneswar. The technical paper has been published at conferences at IIT Delhi and at IIM Bangalore.

Sustainability Factors: In Haryana, District Red Cross Society (DRCS) & District IT Society (DITS) have been found handy for implementing the project, as the Dy. Commissioner is chairman and controller of both societies. DRCS / DITS is taking service charges from each applicant as budgetary support for sustainability of the project. State government is generating Rs. 5-6 Crores as service charges from the project. Till date more than Rs 1800 lacs have been collected as service charges.

Evaluation of Model: The implementation through DRCS & DITS has been found to be very successful and sustainable model in Haryana. The State government is replicating this model in other e-Governance projects too.

Replication: HARIS has been successfully replicated in Delhi, Himachal Pradesh, Orissa, Uttarakhand and has also been taken by J&K.

HALRIS ## HARIS BRIDGE
Situation before the Initiative

Land Records

Though significant progress was made and almost 92% Jamabandi data was digitized, this data was not fully used for citizen services due to various reasons as Patwari is the key functionary in the verification and finalization of the data. Due to the lack of knowledge and heavy workload Patwaries had shown very little interest in data finalization. This resulted delay in data verification and finalization. Jamabandies were taken for data entry without standardizing the way of writing. It was found that each Patwari uses multiple ways of writing the shares of owners/cultivators in the same Jamabandi. Contractual staff was used for data creation. No nodal officer has been assigned exclusive responsibility of owning the project at districts.

The revenue staff at Patwari level required extensive training, but the Patwari had shown very little interest in the implementation of the project. Jamabandies were not updated and Revenue officials were not available for data verification. The whole implementation responsibility was passed on to the contractual Data Entry Operators, who had no domain knowledge.

The Semi-Automatic Jamabandies Creation Software was available. This software module was supposed to be operated to update the entered Jamabandies. This exercise was done only at places, where DCs took personal interest. In the absence of execution of this module, the period of Jamabandies has been varying even in the same Tehsil of a district.

The software for Nakal services was available and they were started only in some districts, where the DC took the personal interest. Even at districts, where Jamabandies were updated, no public counters were established to facilitate the issuing of copies of Record-of-Right (Nakal). Various modules of Land Records System were mostly stand-alone and there was no linkage between Land Records and Property Registration System. There was no workflow automation.

Property Registration

Section 17 of the Indian Registration Act, 1908 mentions the documents of which registration is compulsory like instruments of gift of immovable property, sale deeds etc. In addition, there are some documents mentioned in Section 18 of which registration is optional like lease of immovable property for any term not exceeding one year. The document to be registered is presented in triplicate before the Sub-Registrar within four months from the date of its execution. After registration a copy of the same is returned to the concerned party. The second copy is kept as a record in the Tehsil and the third copy is sent to the concerned circle Patwari for entry in the revenue record. The work-culture & age-old procedures brought about problems in the office of Sub-Registrar, which include:

- Lack of high degree of transparency in valuation of properties and calculations of stamp duty & registration.
- The system is not user-friendly to fulfill the desires of public
- Delays in providing the services & office record maintenance.
- Problems in voluminous document management

These issues called for radical reforms so that rigid & complex system can be simplified to bring the transparency and one-stop service to the common man.

Mutations

The circle Patwari enters the registered documents in the Mutation Register within one month and the same is presented to the Circle Revenue Officer (CRO) on his next visit. The CRO gives his sanction/refusal to the mutation within two months. In case of dispute/refusal, the mutation is sent to the superior revenue officers for decision. The concerned Patwari enters documents like wills/inheritance in the mutation register after the affected party presents the same to him. This is then presented to the concerned CRO for his assent. All the mutations/changes in revenue record are included in the later Jamabandies, which are made every 5 years.

The Land administration workflow before computerization is shown in figure-1.

Strategy Adopted

Revenue department, Haryana in technical consultation with NIC-Haryana, decided to computerize the registration of documents at all Tehsils/sub-Tehsils of Haryana in phased manner. Sub-Registrar Offices, where project was to be implemented, were consulted for inclusion of all features in the software. The software was developed under name HARIS (Haryana Registration Information System).

The questions of integration of property registration with Land Records were discussed with Revenue Department, Haryana and finally it was decided that Land Records System be converted on to client/ Server platform with the following goals & objectives:

Development of necessary software to link registration with Mutations so that mutation notice can be generated immediately after the registration of document – doing away with second visit to CRO's office for mutation entry, Development of user-friendly Integrated Land Records Software in windows based environment, so that Nakal (Copy of Record-Of-Right) can be generated and issued to general public at Tehsil level and new Jamabandies can be generated automatically Linking of Registration & Land Records for the transactions related with the agricultural property, using a workflow based approach,

so that complete solution can be provided to citizens through a single window. Replacing the manual deed writing through computer generated Deeds with a linkage to registration.

Development of HALRIS Solution

Keeping the goals, objectives and critical technical issues in mind NIC-HRSC developed the following software tools to give the complete solution to land administration problems.

Revenue Directory – Revenue directory software is used for generating the unique code to each and every revenue entity like Districts, Tehsils, and Revenue estates in the state. This database is used as master database for all other software applications. Village centric design is followed to make the transaction data independent of the boundary level changes in the state. This means there is no need to change the village code in the transaction data if that village moves to some other district or Tehsil.

Land Records Porting (LaPort) – LaPort software is developed for porting the data from Unix/Foxbase to windows. Its main job is to consolidate and standardize the data.

Data Acceptance Module (DAM) - DAM software is used to check Data processed by LaPort for database constraints like primary and foreign keys. Finally it exports the data into MS-SQL server database of HALRIS.

Haryana Land Records Information System (HALRIS) – HALRIS is the core application for land records management. It has following main modules:

Jamabandi Editing – this module is used for editing the Jamabandi data exported from DAM. It supports all the cases to regularize the cases earlier entered in unstructured way.

New Jamabandi Entry – This module is used for entering the new Jamabandi.
Jamabandi Printing – Jamabandi Printing module is developed to print the Jamabandi data. In this module user can set the no. of lines in the page making it suitable for printing on multiple type of printers like Dot Matrix, laser etc.

Jamabandi Nakal – Nakal module is used for giving the copy of Record of Right (ROR) to the public. This module can generate the nakal for selected khewat, khatoni and khasra.
Mutation Entry – Component approach is followed in the development of mutation entry module. So that both HARIS and HALRIS applications can use this module.
Mutation Verification - This module is used for capturing the verification report of mutations.

Mutation Sanction - This module is used for mutation sanctioning and rejection by the Circle Revenue Officer (CRO)

Mutation Incorporation – This module is used for incorporating the sanctioned mutations in the Jamabandi data.

Mutation Printing – This module is used for printing the mutation register village wise.
Revert Mutation - This module is used for reverting an incorporated mutation if there is some error in the Jamabandi data after incorporation. Access to this module is available to the administrator user only.

Web interface for Jamabandi Nakal and Monitoring – Web interface for nakal is also developed and hosted at http://jamabandi.nic.in . Data of a few villages uploaded to this site for testing purposes. The field staff also enters monthly feedback report on this site.

The Land Records Administration workflow after Bridging HARIS ## HALRIS is shown in figure-2.

Salient Features of HALRIS

- Integration of Registration and Mutations.
- Automated mutation workflow.
- Online Mutation Incorporation facility.
- Automatic Remarks Column updating of Jamabandies.
- Consignment of Jamabandies in E-Record Room
- Usage of Hindi, the language
- Role based Security.
- Client/Server technology,
- Web Enabled access to Jamabandies data
- Biometric authentication
- Provision for digital signatures in future

Benefits to Citizens

- HARIS improved the quality of service in Tehsils by reducing the total time taken by the Tehsil staff for registration. Now documents are returned same day to the public earlier sometimes it takes weeks/months to get a registered deed.

- HARIS uses the collector rates as reference rates for computing the stamp duty. So in any case it will not allow the registration of land under the DC rates. This feature of HARIS eliminated the requirements of pre-registration audit. So Govt. stopped the pre- registration audit of documents, which has saved the general public from the harassment at the hands of auditors.

- In HARIS photographs of witnesses are also taken along with the sellers and buyers. This has reduced the incidents of wrong witnesses, which was prevalent before the implementation of HARIS.

- Red Cross is using the service charges for running social welfare programs for the weaker sections of the society.

Benefits to Government

i. After the implementation of HARIS there is a straight away 40% increase in the stamp duty collection. This is possible due to the following reasons:

ii. HARIS has forced the collectors to make their collector rates uniform. Earlier there was a big difference in the collector rate and the open market rates of the property. In HARIS it is possible to fix a separate rate for different parts of the same locality by dividing it into number of segments. So this has reduced the practice of concealing the exact location of property for saving the stamp duty.

iii. In HARIS it is not possible to register a document below the collector rate. This has stopped the revenue leakage caused by the registration of under valued deeds.

iv. HARIS has also reduced the 47-A cases to a considerable extent. It was a common practice to register an under valued deed and then the parties would get it impounded by the Tehsildar. Later on people get the deed back by paying a bribe or small amount of fine.

v. HARIS project has been generating Rs. 5-6 Crore rupees per annum from registrations as service charges, which is enough for executing the other E-Governance projects related with Revenue Department.

vi. HALRIS implementation has started at all districts, one in each of five districts of Ambala Division and at Sirsa district.

vii. Much desired solution of online updating of Land Records is now available through HALRIS ## HARIS Model, which is a unique product in the Country.

Impact of HALRIS

- Availability of Updated Nakal of ROR (Record of Right) to public through Information Kiosks has added new dimensions to the delivery of services to the public in the state. Reduction in litigations due to on-line availability of updated record.
- Low manual intervention & data capturing at source leading to less errors.
- Web enabling to bring Land Records from Patwari's bag to the people and to bring transparency in making available access to the ROR on anytime, anywhere basis

Viability and Sustainability

For implementing HARIS & HALRIS, in Haryana, District Red Cross Society has been found handy, as the Dy. Commissioner is the chairman and controller of its functions. District Red Cross Society is taking service charges from each applicant as budgetary support for sustainability of the project. State government is generating Rs. 5-6 crores as service charges from HARIS project. District IT Society (DITS), again headed by Dy. Commissioner and DIO NIC-HSU as Member Secretary has been formed in each district. Functions of DITS are performed by District Red Cross society by keeping separate accounts both for income and expenditure. Income from HARIS service charges can only be utilized for legitimate purposes of Land Records maintenance

All funds for HARIS were raised from these societies. Now 40% of the income goes to Red Cross society, 50% goes to DITS for exclusive use for operations and maintenance of computers, and remaining 10% goes to FCR Office at SHQ for further IT initiatives in Revenue department.

DC is the chief controller. It gives him flexibility of using funds as and when required depending upon local conditions; totally decentralized. It gives much needed sustainability, both financial as well technical. It also gives much coveted advantage to government to fix responsibility of the officers at district level as now they can not say that funds were not available in time.

Lessons Learned and Documentations

The technical Issues involved in Bridging HARIS and HALRIS were:

Porting of Land Records data from legacy system to windows environment.

Use cases/features required in the new software to regularize the unstructured cases present in the legacy data.

Mutation incorporation module to generate new Jamabandi using the existing data.

NIC-HRSC has recommended number of procedural reforms in the existing land records procedures. Report has been submitted to the Revenue department Haryana for further necessary action.

Revenue Department should issue the guidelines to make the computerize copies as the primary record and to stop the manual issuing of nakal and mutations writing to make the Tehsil centers functional.

Nodal Officer

State Level- There must be one nodal officer identified at state Head quarter, who will be authorized to approve the changes/customization, process & administrative re-engineering, legal reforms, and taking other relevant decisions for the speedy and successful implementation of the project. Any customization in software should be incorporated only after the written approval of this nodal officer.

Tehsil Level – wherever, the project is started, one nodal officer from Revenue department (Patwari/Kanoongo) should be made responsible exclusively to work in Tehsil computer centre for all administrative matters and ensuring delivery of services to Citizens in a transparent and time bound manner.

Infrastructure

The existing hardware at Tehsil/Sub-Tehsil level is not sufficient. The requisite hardware (at least one server and 6-7 clients), system software with citizen services should be installed before starting HALRIS at Tehsil/Sub-Tehsil. For data interchange between Tehsil and Districts, dialup will not work, as data is huge. To keep the updated record at e-record room at district level, sufficient bandwidth connectivity between Tehsils-Districts-State headquarter would be required. Fund provision must be made for Annual maintenance contracts for the equipment.

Manpower & Training

Implementation of software and making changes after roll out is a continuous process therefore at least one professional at every district will be required, who will look into the day to day problems at Tehsils and manning the e-record room server activities at District Hq. At Tehsil level, at least one operator will be required so that hardware maintenance and backups and other implementation issues can be attended.

Extensive training of revenue staff would be required on the operation and implementation aspects of the new system. Initially, the project can be implemented through job work contractual operators; however, ultimately, the existing Revenue staff should take over the implementation.

Phasing of implementation

1. Huge amount of funds would be required for implementation of the project across the state.

2. The implementation should be planned in a phased manner on self-sustainable basis.

3. The project streamlines at a Tehsil/sub-tehsil, the manual issuing of copies of Jamabandi should be banned.

4. The DC should be empowered, locally, to issue such notifications, once the Tehsil goes on-line.

5. The rollout should be planned on self sustaining model.

Transferability / Replication

a. HARIS has been successfully replicated in Delhi, Himachal Pradesh, Orissa, Uttarakhand and has also been taken by J&K.

b. HALRIS has been provided to Punjab also.

c. The Haryana government has declared HALRIS as standard product for replication at all locations in Haryana for Land Records Administration.

d. The implementation through District Red Cross Societies & DITS has been found to be very successfully sustainable model in Haryana. The State government is replicating this model in other e-Governance projects also.

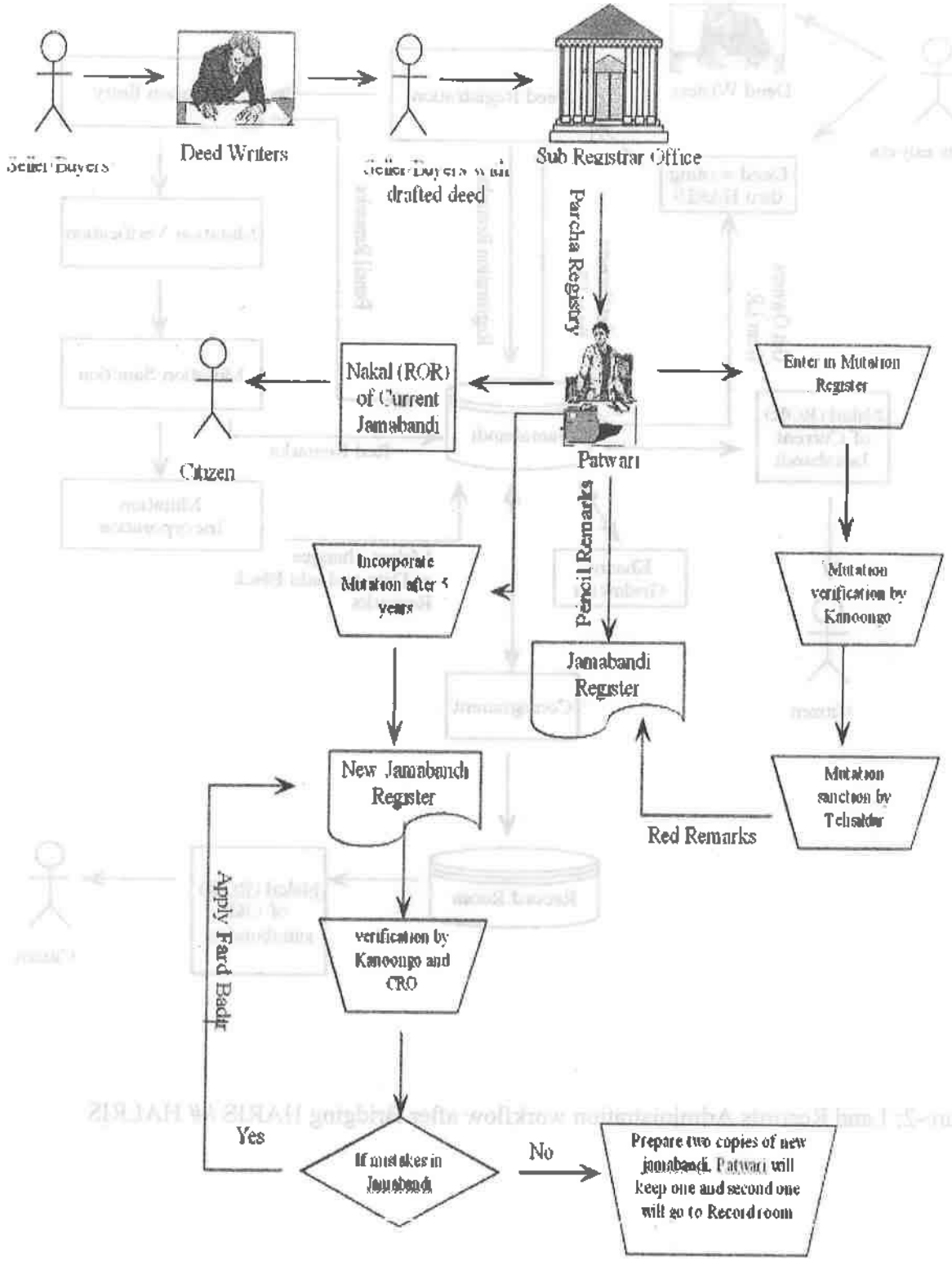


Figure 1: Land Administration workflow before the computerization

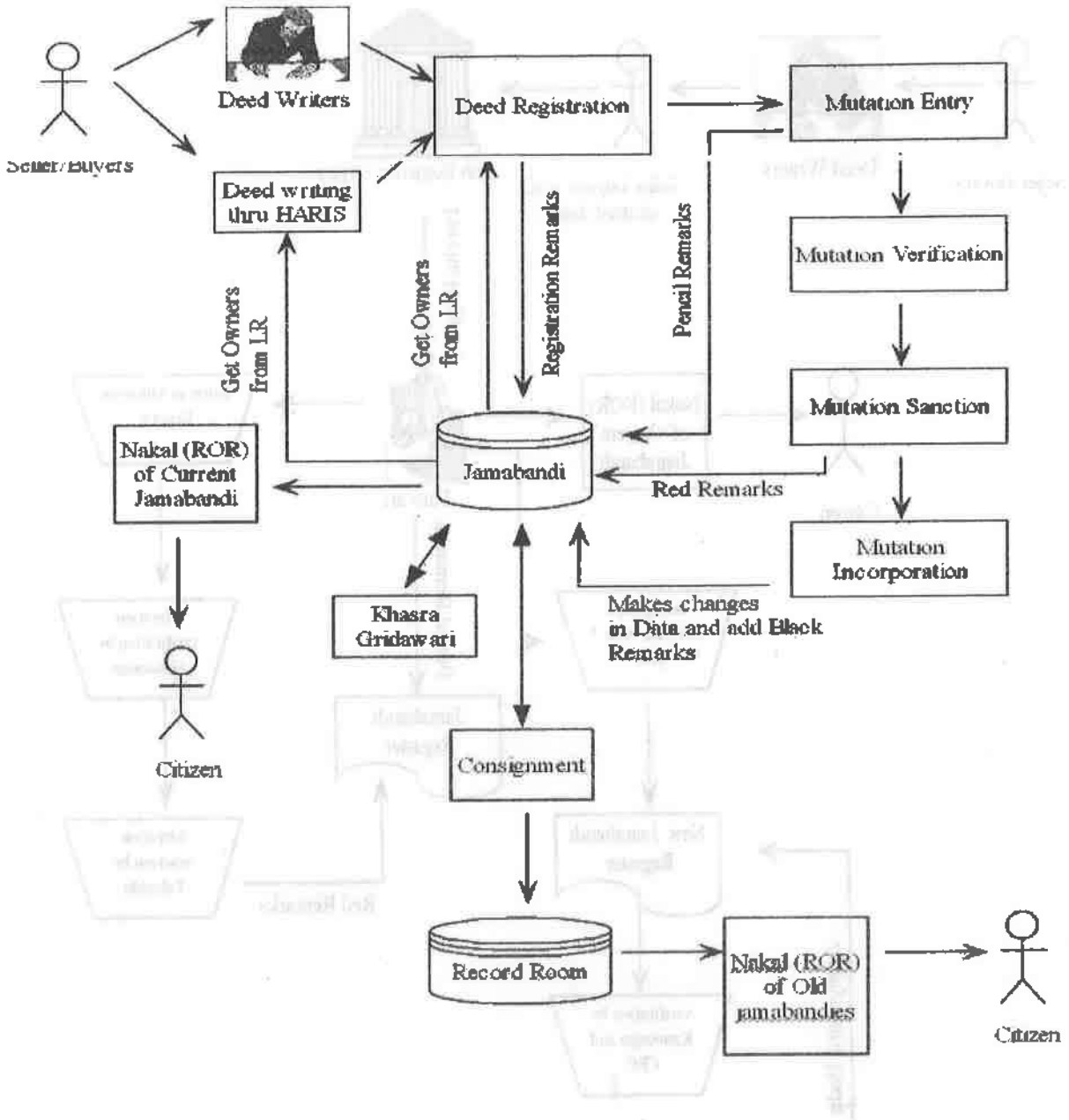


Figure-2: Land Records Administration workflow after Bridging HARIS ## HALRIS

Chapter-12

Computerisation of Land Records in Himachal Pradesh

Rakesh Kaushal
M.P.Sood
Vijay Kapoor

Need of Modernization of Land Records

It is increasingly being realized that in a democratic setup the people have a right to know of matters that affect their lives. Technology now makes it possible for people to have access to information. A prime example of this is Land Records. As long as the records are maintained manually, actual access by the public for various purposes and indeed by other Government Department for their own use was difficult in practice because the records were being maintained at dispersed locations and in a format specifically designed for the assessment and collection of land revenue. Computers have become easily available, inexpensive, reliable and easy to operate. It has enabled its access in a centralized way allowing answer to variety of queries to meet the requirements of individuals, planners and decision makers. Therefore, Modernization of Land Records Schemes is a very basic and urgent need of the day for the farmers.

History of Land Records Computerization in Himachal Pradesh

Computerization of Land Records in Himachal Pradesh initially was started in Kangra District on pilot basis when Govt. of India sanctioned a sum of Rs. 25 lakhs in the year 1989-90 and data entry of 1604 Jamabandis/Villages was made up to the year 1994-95. The software prepared did not take into account the process of regular updations through mutations. The software was then discontinued in 1996 and efforts were made to develop fresh software which would take into account mutations updation mechanism. The development of the software started afresh in Oracle 7.0 in Sept. 1996 after the final specifications were frozen in August 1996 and two modules namely Shajra Nasb and Jamabandi were completed and testing of the developed software started in Sept. 1997 in respect of above mentioned two modules. Simultaneously, the development and testing of remaining two modules namely Harvest Inspection and Mutations was in progress. The Mutation module was completed in Oct 1998 and was put to test run in District Shimla in Nov.1998. At the same time the software in respect of mutation were updated as the revenue staff during the implementation suggested some changes and testing was completed in April 1999. As for the entry related to Khasra Girdawari is concerned, it was decided to print only first 5-6 columns of the Girdawari from newly generated Jamabandi in the order of Khasra Number. This decision was taken for the reason that Girdawari involves huge amount of data entry, which will not be possible to enter after every six months that too in the beginning of the computerisation process. Hence, it was decided that Shajra Nasb, Jamabandi & Mutations modules should be undertaken in the first phase so as to spread computerisation and in the second phase the Girdawari entry should be undertaken. However, the program to print the Khasra Girdawari register with first 5-6 columns from the generated Jamabandi has been

prepared (a litle modified) and is in use. The Oracle based software was made available to all the districts for implementation as per the details given below:

Sr	Year of implementation	Name of District
	December, 1997	Shimla,
	December 1999	Hamirpur
	During the year 2000	Bilaspur, Kangra, Mandi and Una.
	During the year 2001	Chamba, Kinnaur & Sirmaur
	During the year 2002	Solan & Lahaul-Spiti

Note: Since the Kullu was under settlement, so no implementation was undertaken with Oracle Based software. However, in Year 2004 when the window based software was prepared, it was implemented in Kullu.

However, when the software was to be implemented in the Tehsil, it was found that Oracle 7.0 was discontinued and new version Oracle 8.0 was being marketed which was based upon the Client – Server Architecture along with hike in rates of Oracle products.

In view of the above it was decided that the whole software should be converted into Window platform which at that time was an economical proposition and the Window based software developed in Visual Basic 6.0 at front-end and MS SQL Server 2000 at back-end was put into the use.

Land Records Computerisation Model in Himachal Pradesh

The Land Records Computerization model in the State of Himachal Pradesh is the exact replica of the present manual land records system prevailing in the State, which provides variety of data /information required for Administration and Planning purposes; however simplification of existing formats shall be considered at the appropriate time. The following documents have been taken up for computerisation in Himachal Pradesh:

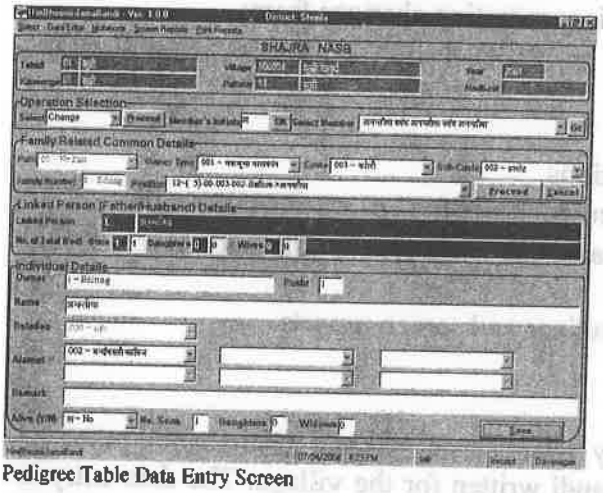
Type Document	Details Computerized
GRAM NIDESHIKA	Contains revenue locational parameters like Patwar circle, Kanungo circles, revenue village (estate) correlated with the census data.
SHAJRA NASB	Contains information about the various owners' parentage, caste / sub-caste, ownership accounts etc. Generation of unique code is ensured.
JAMABANDI	Contains records of ownership, tenancy, area, land revenue, land classification, customary & forestry rights, Irrigation and Watermills details.
MUTATION REGISTER	Contains details of changes in ownership to be incorporated into next Jamabandi after the sanction of revenue authority.
KHASRA GIRDAWARI	Contains records of six monthly crop inspection and changes in possession

Highlights

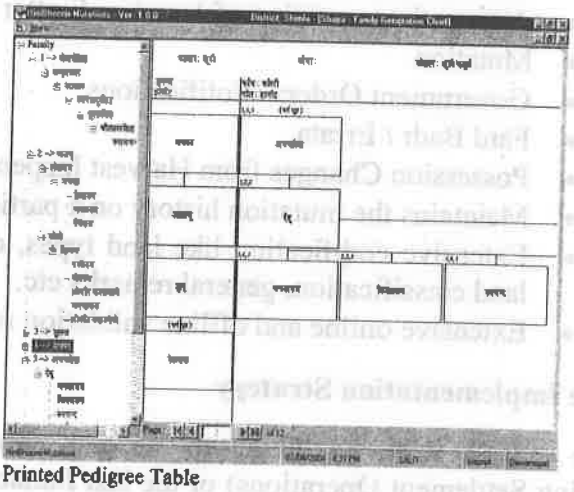
Major highlights of the HimBhoomi software are as follows:

- Exact replica of existing manual system with improvements & compatible to requirements thereby enabling its replication without any resistance from the revenue staff.

- Includes land reforms detail, a unique feature that has not been attempted in any similar software in the country.
- Assignment of Unique code to each individual appearing in any capacity in land records thereby enabling to know the extent of land possessed, which could be base for many e-governance applications.
- Includes customary rights & Forestry (TD) rights details that are often requisitioned by various Courts of Law.
- A complete MIS as it encompasses Minor Irrigation census, agriculture census details.
- Linkages with Census Codification enlarge the scope of data and information.
- Facilitate the online mutation entry and generation of Nakal and Jamabandi.
- Facilitates the computerisation of record in both rural and urban area.



Pedigree Table Data Entry Screen


Printed Pedigree Table

The HimBhoomi software developed for Land Records Computerization has following components/modules:

Sr	Component	Developed In	Used For
1.	Gram Nideshika	Oracle 7.0 & Visual Basic	Helps to uniquely codify all revenue based locations based upon standard census codification
2.	Master Entry Module	Oracle 7.0 & Visual Basic	Ensures the one time master entry of village wise records
3.	LaPort Module	Visual Basic	Facilitates the migration of master data fed in Oracle to SQL Server at Tehsil centre.
4.	Mutation Module	Visual Basic	Helps entry of mutations and final generation of Records of rights and associated reports.
5.	ROR Distribution	Visual Basic	Used to issue the various types of copies like Shajra Nasb, Mutation, Jamabandi, Customary rights and Forestry rights.
6.	Touch Screen Kiosk	Visual Basic	For viewing the details related to land records on touch screen set up in the Tehsil.

7.	Support	Visual Basic	This module deals with sending various softwares updates in executables in a user friendly manner.

HimBhoomi Software General Features

Various features of HimBhoomi software are:

- Ensures rationalisation and standardisation of various documents thereby minimizing errors.
- Very simple to execute.
- Data Entry in Local language that is Hindi.
- Automatic generation of Jamabandi after incorporating changes from:
- Mutation
- Government Orders /Notifications
- Fard Badr / Errata
- Possession Changes from Harvest Inspections.
- Maintains the mutation history on a particular account.
- Extensive codification like land types, caste/sub-caste types, cultivator types, 9-fold land classification, general remarks etc.
- Extensive online and offline validation routines and screen reports.

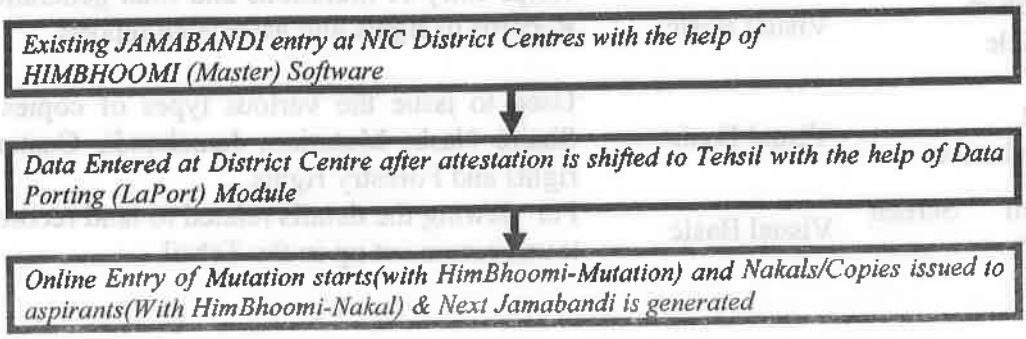
The Implementation Strategy

The process starts by taking-up the data entry from Misal-Hakiyat (Jamabandi prepared during Settlement Operations) or the last Jamabandi written for the village. The data entry is started by first entering the Shajra-Nasb. That is, each individual appearing in the Jamabandi is indexed and assigned a unique Code, and then the related Jamabandi details are entered against this Index.

After the initial data entry is completed, a printout of the existing Jamabandi, including its Shajra Nasb and other reports, is generated and given to the concerned Patwari for cross checking and reporting errors, if any. The Patwari and then the Kanungo concerned ensure that the existing Jamabandi is generated 100% correct, by getting the reported data entry errors corrected. They issue a certificate also to this effect and then the data will be ported to the Tehsil centre after all the villages are attested in this way by the Patwari and Kanungo.

Once the data is ported to the Tehsil centre computer centre, the mutations are entered at regular interval so as to keep the data up-to-date all the time besides the Nakals are issued from the Tehsil centre.

A pictorial representation of the implementation strategy is shown below:



Present Status:

At present Computerization of Land Records is in progress in all the Districts. The data entry process of 104 Tehsils/Sub Tehsils is in progress at respective District Computer Centers and the Jamabandies of more than 18660 Villages against 20706 villages have so far been computerized. 35 Tehsils have completed the computerization process and have started issuing the Computerized Copies of Land Records. Process of validation as well entry of Mutation work has simultaneously been taken up with the Master Data Entry work. At present data entry of around 90.98% villages is complete. The Tehsil centres in remaining Tehsils have been set-up and necessary hardware have been procured and installed.

In addition to above, services related to 14 kinds of certificates including Bonafide Himachali Certificate, Income Certificate, Caste Certificate, Legal Heir Certificate, Income Certificate , Agriculturist Certificate, Backward Area Certificate, Rural Area Certificate, etc. have also been added.

Further, we are also extending the scope of computerisation by implementing HimRis (Himachal Registration Information System) in all the Tehsils.

The Road Ahead

- Conversion of HimBhoomi application into three-tier architecture/ Web enablement of the land records.
- Introduction of encryption/decryption of data.
- Introduction of bar codes in the Nakal.
- Use of watermark stationery for printing various reports.
- Introduction of more robust methods to check the errors during the entry.
- Linkage with GIS system
- Making available mutation copy.
- Integration of *HimBhoomi* with *HimRis* (Himachal Registration Information System).

Impetuous to Land Records Computerization:

During the year 2003 Department of Information Technology was set-up in the State and Revenue Department in co-ordination with the I.T. Department as well as H.P. State NIC centre planned for early Computerization of Land Records. In order to boost the progress of Computerization, following actions have been taken and has started Computerization work in Mission Mode.

Sr. No.	Activity	Action taken
1.	Completion of data entry and its validation & backlog updation	In addition to available terminals at NIC Dist Head Quarter, some of the hardware procured for the Tehsil has been put to use for the completion of master data entry work. Private data entry agencies have been selected through open tender and have been deployed for data entry work, a specific target for the completion of data entry work up to December, 2005 has been given to be fixed by Honorable CM Himachal Pradesh. Daily working hour for data entry work has also been increased and work is being done in extended shift. Regular monitoring at all levels is being ensured. Political intervention and regular interaction of Department with CM and RM has also led to good progress.
2	Setting up of Computer Centre at Tehsil Head Quarters	The State Government has procured the hardware for all Tehsil Centres and necessary site development for setting up of Tehsil Computer Centres have been completed and these machines have been installed.
4.	Providing legal sanctity to computerized ROR	Legal sanctity to computerized ROR has already been provided by the State Govt., copy of such Notification is made available on http://himachal.nic.in/citizen/LRC_N.htm
5.	Stopping of parallel system of issuing of ROR & preparation of land records Documents.	Orders have been issued for the stopping of manual preparation of records in the Tehsils which have been computerized. But due to peculiar topography conditions prevailing in the State of Himachal Pradesh stopping of parallel system of issuing of ROR is not feasible.
6	Self-Sustainability of LRC Project	In a state like HP where paying capacity is very low, the revenue generation can not be the core point in the computerisation. The main objective is to make available RoR to the public at his/her doorstep and this is achieved. However, a nominal service charge of Rs 10/ per page along with Copying fee as prescribed by the Government of Himachal Pradesh for issuance of extracts of Patwari's record is being charged for supply of Nakals.
6.	Imparting training to Revenue Officials	The computer awareness training has also been imparted to 1041 Patwaris and Kanungos in all the 12 districts. The rest of the revenue officials are under training. In addition to it the System Administration Training has also been imparted to 60 revenue officials who are to be deployed in the 35 Tehsil centers. Few courses have been organized for Tehsildars and Naib-Tehsildars at Himachal Institute of Public Administration (HIPA) in which besides the General Computer Awareness training on land records computerization has been imparted.
	Preparation of Various Manuals	In order to make Land Records Project a success apart from various user manuals, Management Manual for revenue officers and Tehsil operation manual has been prepared besides guidelines which are issued regularly from the department.

Computerization of spatial data through Modern Technology

No attempt has been made to digitize the cadastral maps as the government is of the view that first the non-spatial aspect of the computerisation should be finished. However, very soon we will take up the computerisation of spatial data so that people need not visit Patwari for map nakal.

Integration of computerized land records data with registration department

H.P. State also agrees to the proposal of Integration of Registration process with Land Records Management System and necessary steps in this regard would be taken in due course of time.

Chapter-13

Computerisation of Land Records in Orissa: Updating of Cadastral Maps

Gadadhar Parida

Computerization of Land Records in Orissa has been completed in 154 Tehsils out of 171 Tehsils. A ROR database has been created in the process, and is being up-dated to enable on-line correction of the R.O.R. to give effect to the orders in mutation cases. However, at present, the Cadastral maps cannot be corrected to keep it at par with the ROR database. To enable on-line correction of the Cadastral maps, these need to be digitized. Digitization of cadastral maps has been taken up on a Pilot basis in 06(six) Tehsils of Orissa.

Cadastral maps have been prepared in the Traditional method. They contain some errors in spite of the process of distribution of error during plotting and permissible error during extraction of the area of the plots. By digitizing the existing cadastral maps, the said errors are being incorporated into the spatial database leading to discrepancy in the area of the plots relating to the ROR database and the spatial database.

A Study in Salipur Tehsil of Cuttack District

In Salipur Tehsil this came to our notice first and we made a spot visit to assess if the cadastral maps exactly reflect the field and the result was in favour of preparation of a error free cadastral map as the checking was done again in the traditional method.

The problem

Study of a few plots of Chamarigol Village of Salipur Tahasil of Cuttack District.

Sl. No	Plot No.	Area in acre as per final R.R.O.	Area in acre as per digitized map.	Area in acre as per field visit.	Remarks.
1	2	3	4	5	6
1.	39	Ac.0.013	Ac.0.023	___	This plot 'Rasta' has been amalgamated with Chaka No.15 and 16.
2.	51	Ac.0.031	Ac.0.049	Ac.0.049	Field measurement sheet appended.
3.	52	Ac.0.120	Ac.0.102	Ac.0.097	Field measurement sheet appended.
4.	125	Ac.0.026	Ac.0.035	Ac.0.038	Field measurement sheet appended.
5.	142	Ac.0.032	Ac.0.040	Ac.0.39	Field measurement sheet appended.
6.	144	Ac.0.040	Ac.0.030	Ac.0.038	Field measurement sheet appended.

7.	157	Ac.0.022	Ac.0.030	Ac.0.024	Field measurement sheet appended.
8.	171	Ac.0.014	Ac.0.024	Ac.0.018	Field measurement sheet appended.
9.	183	Ac.0.042	Ac.0.033	—	This plot has been amalgamated with plot No.182
10.	242	Ac.0.307	Ac.0.274	—	This plot has been amalgamated with Chaka NO.82, Chaka Plot No.241.
11.	264	Ac.0.478	Ac.0.432	Ac.0.483	Field measurement sheet appended.
12	294	Ac.0.156	Ac.0.140	Ac.0.140	Field measurement sheet appended.

Inference

It is seen from the field study that the map area comes to Ac.0.023 against the ROR area of Ac.0.013. Similarly, in plot No.51 the digitized map area comes to Ac.0.049, which agrees with the field but varies from the ROR area of Ac.0.031. Thus, the map seems to be matching with the field and the discrepancy in the ROR area is due to the defective methodology (Acre comb). Again in PlotNo.142 field area of Ac.0.39 more or less agrees with the digitized map area Ac.0.040 against the ROR area of Ac.0.032. But in case of plot No. 264 the field area comes to Ac.0. 483 against the digitized map area of Ac.0.432 where as the ROR area is shown as Ac.0.478.

Thus, from the field visit it is apparent that in some places the plotting in the map also not reflect the field properly which explains the discrepancy in the digitized map area with the field area.

The Solution

The problem can be solved by preparing error free cadastral maps with the help of Hi-Tech survey instruments. Since the ROR database has already been created, the best alternative available is to check the plotting of each individual plot in the field. The ownership detail, classification of land etc. will remain un-changed and only the area of the plot is to be changed as and when required in the process. To safeguard the interest of the landowner and in the interest of minimum permissible error, with in the shortest time frame, the choice is in favour of Global Positioning System in comparison to Photo Grammetry or Satellite Imagery.

The Procedure

The procedure suggested is to issue one-month prior notice to the respective villagers, and the respective Gram Panchayat. On the appointed date, the respective village is to be visited with the available cadastral map, and the GPS. Each landowner is to show his land parcel and move around his respective plot beginning from the north- west corner of the village (plot No. 1). As the instrument is user friendly and the people are interested in the preparation of error free cadastral maps which is likely to solve many litigations during the field visit itself by convincing the landowners about the

accuracy of the survey, almost one map sheet can be covered in a day or maximum in two days if the land parcels are small and too many.

Difficulties

The process can have only two difficulties in the field –

There may be subsequent sub-divisions in the field not reflected in the cadastral map in which case a special report in this regard is to be submitted to the respective Mutation Officer for his decision and subsequent compliance of the same. Claims and counter claims of the same land parcel by more than one person in which case claims and counter claims of each person is to be reported to the Mutation Officer for adjudication and subsequent modification of the cadastral map in due compliance with the order of the competent authority.

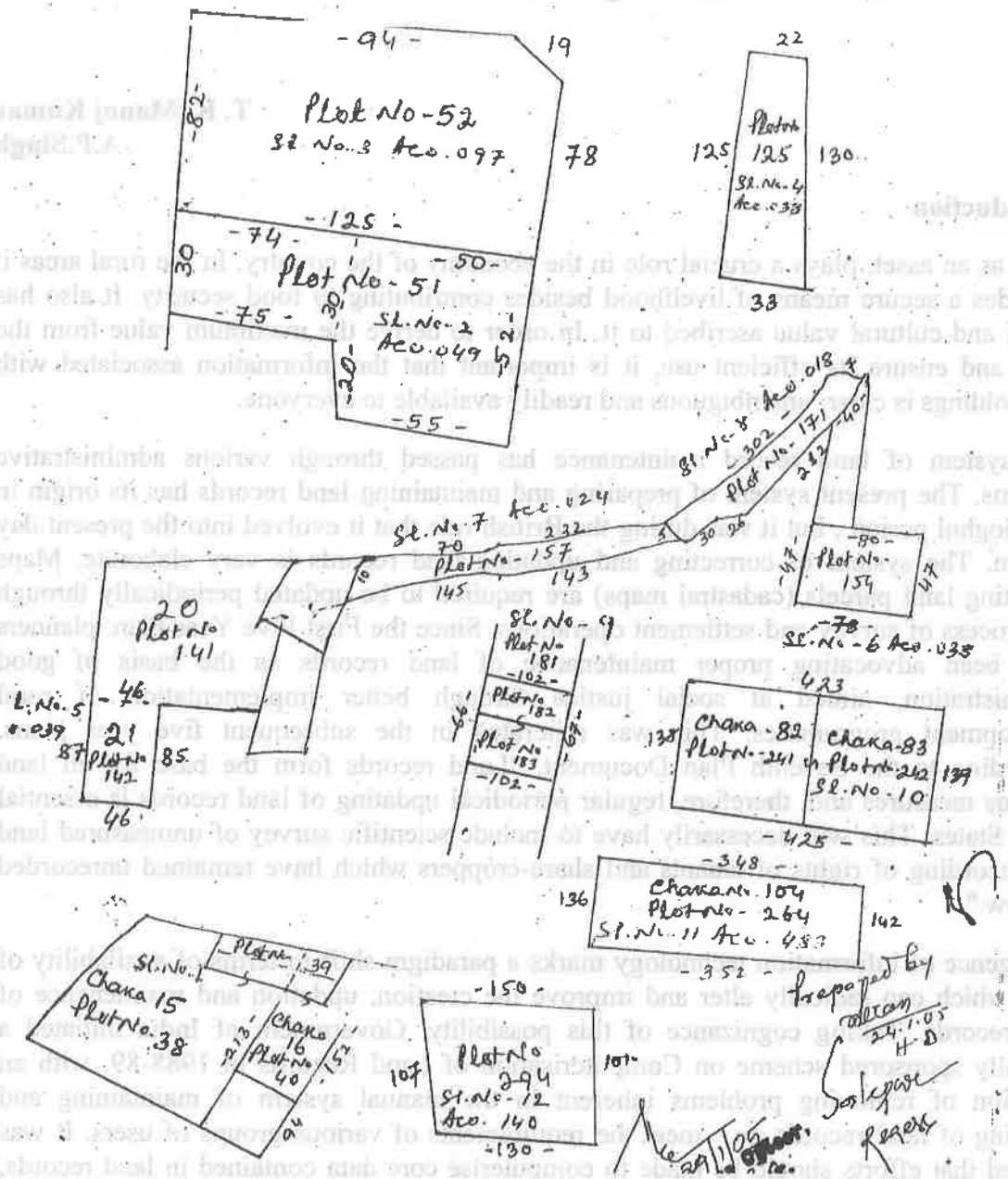
Once all the plots of a map sheet are covered fully, the digitized data is to be fed into the computer and the cadastral map generated with the help of the computer is to be numbered plot-wise following the existing cadastral map so that the description of the plot in the ROR data base is retained with minor modifications where ever necessary by super imposing the computer generated map on the existing cadastral map for the purpose.

In Orissa digitization of the Cadastral maps of 5(five) Tehsils has been completed and of the 6th (sixth) Tahasil is nearing completion. The result of the Pilot Project is encouraging. The preparation of error free Cadastral Maps with digitized spatial data and linkage with the ROR data base will enable the landowners to have correct and updated land record relating to their individual land parcels.

Annex - II

Village - Chamarigol, Thana - Salipur No. 130
Tahsil - Salipur, District - Cuttack

Field measurement



Chapter-14

Assessment of Computerisation of Land Records in Rajasthan: Serving to Some Extent

T. K. Manoj Kumar
A.P.Singh

Introduction

Land as an asset, plays a crucial role in the economy of the country. In the rural areas it provides a secure means of livelihood besides contributing to food security. It also has social and cultural value ascribed to it. In order to derive the maximum value from the land, and ensure its efficient use, it is important that the information associated with landholdings is clear, unambiguous and readily available to everyone.

The system of land record maintenance has passed through various administrative systems. The present system of preparing and maintaining land records has its origin in the Moghul period , but it was during the British rule that it evolved into the present day system. The system of correcting and updating land records is very elaborate. Maps depicting land parcels (cadastral maps) are required to be updated periodically through the process of survey and settlement operations. Since the First Five Year Plan, planners have been advocating proper maintenance of land records as the basis of good administration, aimed at social justice through better implementation of rural development programmes. This was reiterated in the subsequent five year plans. According to the Seventh Plan Document, "Land records form the base for all land reforms measures and, therefore, regular periodical updating of land records is essential in all States. This will necessarily have to include scientific survey of unmeasured land and recording of rights of tenants and share-croppers which have remained unrecorded till now."

Emergence of information technology marks a paradigm shift in terms of availability of tools which can radically alter and improve the creation, updation and maintenance of land records. Taking cognizance of this possibility, Government of India initiated a centrally sponsored scheme on Computerisation of Land Records in 1988-89, with an intention of removing problems inherent in the manual system of maintaining and updating of land records, to meet the requirements of various groups of users. It was decided that efforts should be made to computerise core data contained in land records, so as to assist development planning and to make records accessible to people/planners/administrators. The programme started in 1989 was for computerization of non-spatial data. The prime objective of this programme is to store all information regarding land in a systematic and logical way so that information is easily retrievable.

The detailed objectives of the programme are:

(a) To facilitate easy maintenance and updating of changes which occur in land database such as changes due to availability of irrigation/natural calamities/consolidation/ or on account of legal changes like transfer of ownership, partition, land acquisition, lease etc.

(b) To provide for comprehensive scrutiny to make land records tamper-proof, which may reduce the menace of litigation and social conflicts, associated with land disputes.

(c) To provide the required support for implementation of development programmes for which data about distribution of land holdings is vital.

(d) To facilitate detailed planning for infrastructure as well as environmental development.

(e) To facilitate preparation of an annual set of records in the mechanized process and thereby producing accurate documents for recording details such as collection of land revenue, cropping pattern etc.

(f) To facilitate a variety of standard and ad-hoc queries on land data.

(g) To provide a database for agricultural census.

Computerisation in Land Records in Rajasthan

Computerisation of Land Records in Rajasthan was started in 1994-95. Initially, it was started in 2 pilot districts i.e. Jaipur & Barmer. Later on computerization of Land Records was taken up in all 32 districts of the State in 1996-97. The project is being implemented with the complete technical assistance of NIC on turnkey basis which includes feasibility study, design, development, implementation of software and consistent technical support at state, district and field level in all respects.

In Rajasthan, there was no uniformity in writing and maintaining land record registers since there were several princely states before the formation of the State of Rajasthan. The fact may seem surprising, but there was a lot of diversity between districts and even among tehsils in the same district in the maintenance of land records. It was therefore imperative to find out a unified and common system of writing land records for the whole State, as per Land Revenue Rules and Acts, for preparation of software. Several conferences of collectors were organized at state level to document and understand the diversities in the existing system. A study was also made through interactions with grass root level and field officials. The first successful milestone was achieved in 2001 when common software was launched for all the 241 tehsils. The software was rolled out through out the State in Feb-Mar 2004.

Rajasthan has seven million land records (RoRs) and 34 millions plots in nearly 42,000 villages. A computerized printed copy of RoRs can be obtained from Apna Khata Centre

in 235 tehsils after paying Rs. 10 for upto 10 plots and Rs.5 per 10 plots thereupon. The State Government has provided a validity and legality for the computerized RoRs but there is still a need to abolish handwritten RoRs. The Chausala (four years) updation process can be accomplished through computer. Unavailability of regular power supply, lack of trained personnel in remote tehsils, the unfamiliarity of revenue officers with computer application etc. have been some major teething problems in the computerization process.

New computer centers have been constructed in 240 tehsils and they have been equipped with necessary hardware and software. About 1000 patwaris and other field functionaries have been trained to run them and already more than 2.5 lakh tenants have been provided with copies of land records in computerised print outs. Regular trainings program for revenue officials on computer awareness and software features have also resulted in significant gains for the project

Rajasthan's Land Records on Website

Rajasthan is one of the first States for hosting the entire state land records data on a web for public use. The details of land can be viewed on apnakhata.raj.nic.in web site. The certified copy of RoR can be obtained from the authorized centres. The Govt. of Rajasthan has authorized Kiosks holders to obtain the Land Records Copy from the Internet on payment basis as prescribed that is valid and legal for all purposes. At present the project has been successfully launched in all 32 districts of Rajasthan at the level of a tehsil. The data is available in Hindi. Any person can retrieve his/her land details by providing the tehsil's name, village, khata number. The data is being updated in a decentralised manner on regular basis.

Field Study in Selected Districts of Rajasthan

The Centre for Rural Studies with the help of Society for Integrated Developmental Activities, Research and Training (SIDART), Jaipur conducted field study in six districts of the State during the period of 25th May, 2004 to 20th June, 2004. One district from each division has been selected based on simple random sampling: Nagaur district from Ajmer division, Bikaner from Bikaner division, Jaipur from Jaipur division, Sirohi from Jodhpur division, Bundi from Kota division and Dungarpur from Udaipur division. Two tehsils from each district have been selected by simple random sampling, from amongst the tehsils where scheme of computerisation of land records has already been implemented. The selected tehsils are: Sanganair and Chomu from Jaipur district, Bundi and Hindoli from Bundi, Rewdar and Pindwara from Sirohi, Simalwara and Sagwara from Dungarpur, Deedwana and Ladnu from Nagaur and Nokha and Loon Karansar from Bikaner district. This paper is an extract from the report built on the basis of extensive field work in rural areas of Rajasthan. We considered the tehsil as a sample unit for the purpose of study. The total number of respondents is 1987.

The implementation of CoLR in Rajasthan is almost two- three years old at the time of our field study. The objectives of the study are as follows:

1. To examine the extent and impact of Computerization of Land Records on revenue administration and cultivators.
2. To examine the ease and speed with which the cultivators are able to obtain the land records and the procedure for the same.
3. To examine the human resource development, capacity building and awareness generation, taken up for the implementation of the programme, and the adequacy of the same.
4. To examine the procedure for making mutation and the time taken for the same.
5. To study broadly
   (a) the hardware and software utilized for the computerization of land records
   (b) the methods of maintenance of the same
   (c) the measures for security and preservation of the data stored in the computer;
6. To examine the changes necessary in the existing legal provisions in the revenue laws.
7. To examine the extent to which the data generated through the computerized Land Records system is helpful in planning and decision-making.
8. To find out the extent to which:

   a) CoLR has reduced and changed the workload of the revenue functionaries.
   b) It has minimized the possibilities of interpolation of land records and rent seeking behavior.
   c) A comprehensive database on various facets of land is available for helping in land reforms.

Analysis of Data

1) Awareness and Motivation

The awareness level of the farmers about computerization of land records is very low in Rajasthan. The level of awareness is only 57.1 per cent. The proportion of awareness is very high in district Jaipur i.e. 72.6 per cent while very low in Bikaner i.e. 32.7 per cent. All the surveyed tehsils of Rajasthan had operationalised the CoLR programme more than two years ago. Even after two years of implementation of the project, however, awareness level is less than 50 per cent in some of the tehsils. The low awareness stems from the fact that the use of manual RoR is still prevalent in the State and patwaris are

still providing manual RoR to the farmers. Thus use of computerized RoR's to a large extent, depends on the will of the revenue functionary. We found that the awareness level is not related strongly to the extent of the time of operationalisation, but depends on the will and the interest shown by the tehsildars and other revenue functionaries *According to Mangal Ram; a farmer, village Vatika, District Jaipur, awareness of computerized system should be spread like the awareness about Electronic Voting Machine amongst rural masses.* We would agree with him and suggest that a campaign needs to be launched to bring about universal awareness.

During our study we found that majority of the farmers got the information of computerisation of land records either from friends/ neighbours/ known persons or on their own after visiting the tehsil. An analysis shows that the source of awareness for 37 per cent of the respondents are friends/ neighbours/ known persons. 30 percent became aware after visiting tehsil, 16.30 per cent came to know through revenue personnel, and the remaining through government publication and newspapers. Thus the main source of awareness is through word of mouth and through a visit to the tehsil. This also highlights the limited role of the patwari/other revenue personnel and government publications in creation of awareness. In our opinion, while it is true that a majority of farmers may not be literate to read government publications, but the awareness spread through patwari and other revenue personnel should be much higher. We attribute the lack of awareness to two reasons: First, the continuation of manual RoRs and Second: the patwari and other revenue personnel are not doing enough to spread awareness amongst landholders. Several farmers strongly opined that revenue personnel should go from village to village, to spread awareness about the computerisation of land records. They feel that it should be community driven activity; word –of –mouth publicity and must be done with renewed vigor. Therefore it becomes necessary that State government should ban the use of manual RoR forthwith and revenue personnel should be involved in enhancing awareness through a structured programme, or alternatively, NGO's could be utilized for the awareness campaign.

2) Opinion of farmers about the benefits of computerisation of land records

Almost all landholders are in favour of a computerized system of land records. They state that it will be better to computerise all the land documents. Land holders also demanded the computerization of Khasra Girdawari (Records of Crops). According to them, the computerisation of RoRs will not be successful as ultimately they have to meet the patwari for the issue of Khasra Girdawari . According to them, if the government wants to improve service delivery of the revenue administration, there is a need for computerizing the Khasra Girdawari also. *According to Sualal Choudhary, a sarpanch, village Vatika, District Jaipur; the facility of computerization is very good but the discretion of the patwari should be reduced to the minimum.*

If we consider the result of the study, 62.1 per cent respondents' state that computerization of land records will be really beneficial when the computerisation of Khasra Girdawari is also completed. 36.8 per cent of the landholders feel that the present

system provides benefits to the landholders. Only a negligible 1.1 % were of the opinion that the system after computerization does not give any additional benefits.

According to the sarpanches; 93.94 per cent have a positive opinion about computerisation of land records. They stated that computerisation is benefiting the land holder . Only a small proportion (6.06 %) were not in favour of computerisation. According to them, computerisation of land records is not benefiting the landholder to any extent, because the landholders still have to visit tehsil for obtaining computerised RoRs. After the computerisation of RoRs , patwaris are still creating problems in issuing Khasra Girdawari and charging the same amount of money which they were charging for Khasra and Khatauni. *According to Smt. Patasi Devi, sarpanch of Gram Panchyat Daulatpur , tehsil Deedwana of District Nagaur, all work relating to the patwari should be computerised. It will ensure the lessening of harassment by the patwari in different ways.*

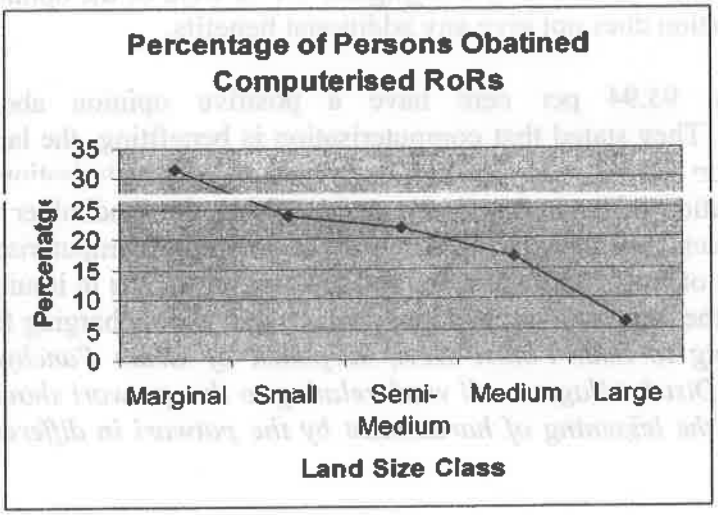
3) Usage of Services

It is seen that the level of awareness about the programme is low. It logically follows that the knowledge about the procedure of obtaining computerised is also low. As per the respondents, only 26.6 per cent persons have the knowledge regarding the procedure of obtaining computerised RoRs.

Amongst the people who are aware, less than half or 46.2 per cent know about the procedure for obtaining computerised RoRs. On the basis of the above, we feel there is a strong need to enhance awareness, not only in terms of knowledge of computerised systems established at tehsil headquarters but also in terms of procedure of obtaining computerised RoRs. Awareness in districts Dungarpur, Nagaur and Bikaner is especially low on both the aspects- general awareness and procedure of obtaining computerised RoRs. Knowledge about the procedure is higher than the average in Jaipur, Bundi and Sirohi districts. In the following paragraph we will discuss the number of persons who obtained computerised RoRs.

4) Persons obtained computerized RoR's

The proportion of the persons actually obtaining benefit from among the surveyed population is only 13.2 per cent of the total respondents. While amongst those who are aware of the programme, only 23.1 per cent of the persons obtained computerised RoRs. This proportion is very low in Sirohi, Dungarpur, Nagaur and Bikaner. Since manual RoRs are still continuing in the State, therefore landholders are taking manual RoRs. We feel that the number of beneficiaries of the computerised system will increase after the abolishment of the distribution of manual copies of RoRs. Another reason for not obtaining the computerized copy is the establishment of Apna Khata Centre only at tehsil headquarters. The landholder has to cover a long distance to reach the tehsil office. Experience of different states has demonstrated that once the manual RoR's are banned, automatically the people will opt for the computerized RoR's.



Adjoining graph shows that the % of persons obtaining computerized RoRs is decreasing as the land size is increasing. This result may seem surprising, but it clearly indicates that large and medium size farmers are not fully utilizing the service of new computerized system. Since in the state the distribution of manual RoRs is still valid, they are taking the service of patwari.

5) Banning of Manual Provision of the RoR's.

We also asked a question on the banning of manual RoR's from landholders. Responses from landholders also vary according to their awareness of computerisation of land records and if they have already obtained computerised RoRs. If we talk about all respondents, then slightly more than half of the respondents i.e.56.8 per cent are in favour of banning the manual RoRs. 69.7 per cent aware persons are in favour of banning manual RORs, while on the other hand about 85.5 per cent, who have already obtained computerised RoRs are in favour of banning manual records. In our opinion, the response from this category is important because they are aware of the present computerised system. Since they faced no problems in obtaining computerised RoRs from tehsil headquarters, they are recommending the ban on manual distribution of RoRs.

The sarpanches were also asked the same question, 54.55 per cent of the sarpanches are in favour of the banning of manual extraction, 27.27 per cent are against the banning of manual records and remaining (18.18%) are unable to voice an opinion on this.

The opinion about banning of manual RoRs is also dependent on the ease and convenience with which they are getting the computerized documents from the concerned tehsil staff. If they get it without any difficulty, they would give a positive reply in favour of banning manual RoR's. In most of the tehsils except Sagwara and Ladnun, a high percentage of respondents are in favour of banning manual RoR's. In these two tehsils the reason for this low proportion may be indifference of the staff involved to the computerisation of land records. The success of computerisation of land records depends directly on the abolishment of the manual records. Wherever this will continue, the revenue staff will force these on the farmers for their personal vested interests.

Opinion about Banning of Manual RoR according to Caste Category amongst Persons Who Obtained Computerized RoRs

Caste Category	Banning of manual RoRs (in %)		
	Yes	No	Can't Say
SC	94.3	3.8	1.9
ST	83.3	11.1	5.6
OBC	85.8	11.5	2.7
Others	79.5	16.7	3.8
Total	85.5	11.5	2.7

Significant at the .05 level (2- tailed)

Above table depicts that majority of the Scheduled Castes farmers are in favour of banning manual RoRs because in majority of the cases in India this category suffered a lot due to improper and poor land records management. This table reflects the opinion of the farmers who have already obtained computerized land records. It also indicates that these persons are not facing any problem in accessing computerized records from tehsil. We found that manual system was good to some extent for large and medium farmers as well as influential persons. In many cases we also found that patwari did not charge money against the issue of manual RoR from large and medium farmers. But in computerized system there is no possibility of issuing computerized RoRs without any charge. Thus we may say that computerization is bringing equity.

6) Information Flow

The first and the principal objective of the study has been to find out to what extent information flow has been enhanced by CoLR. The speed of Apna Khata Centre is rated as excellent in almost all the surveyed tehsils. About 92.7 per cent of the respondents got the RoR without any delay, the remaining found service not satisfactory in terms of consumption of time.

The reasons attributed for delay are power failure at tehsil headquarter and unavailability of tehsildar and computer operator. As the State government has trained only one person from every tehsil, his absence causes delay. However, these problems can be easily tackled and should be sorted out in the near future. About 65.3 per cent respondents stated that sometimes delay was caused due to problems in getting revenue stamps. Sometimes the revenue stamp vendors created problems or charged extra money to issue revenue stamps. Therefore, we feel that it is better idea to replace it by giving payment of fees directly at the counter. 92.4 per cent of the respondents from all over State are of the opinion that fees should be deposited at the counter itself.

7) Time Spent in Obtaining Computerised RoRs

After computerization, one expects a substantial reduction in terms of the time taken for getting RoR's. The table below indicates the % of people and the time taken in getting

the RoR's. About 15.6% got the RoR immediately, while 56.9% got it within one to two hours and nearly 95% of the respondents got it within one day. The following table shows the district wise details of the time spent by the farmers in obtaining computerised RoRs.

Time Required to Obtain Computerised RoR (In Percent)

Tehsil/District	Time							
	Imm	1-2 Hours	½ day	1 Day	2 Days	3 Days	Ten Days	Average Time (in Hours)
Sanganer	11.1	42.6	7.4	31.5	7.4	0.0	0.0	6 h
Chomu	8.6	61.4	4.3	21.4	1.4	1.4	1.4	7h & 45 m
Jaipur	**9.7**	**53.3**	**5.6**	**25.8**	**4.0**	**0.8**	**0.8**	**7**
Hindoli	15.2	45.4	3.0	33.3	3.0	0.0	0.0	4 h & 45 m
Bundi	23.6	41.1	0.0	35.3	0.0	0.0	0.0	3 h
Bundi	**19.4**	**43.3**	**1.5**	**34.3**	**1.5**	**0.0**	**0.0**	**4 h**
Rewdar	50.0	50.0	0.0	0.0	0.0	0.0	0.0	1 h
Pindwara	21.4	35.6	7.1	28.6	7.1	0.0	0.0	7 h
Sirohi	**25.0**	**27.6**	**6.3**	**25.0**	**6.3**	**0.0**	**0.0**	**6 h & 15 m**
Simalwara	20.0	8.0	0.0	68.0	4.0	0.0	0.0	7 h
Sagwara	20.0	20.0	0.0	60.0	0.0	0.0	0.0	4 h & 30m
Dungarpur	**20.**	**10.0**	**0.0**	**66.7**	**3.3**	**0.0**	**0.0**	**6 h & 30 m**
Didwana	12.5	25.0	0.0	50.0	0.0	0.0	12.5	34 h
Ladnun	66.7	0.0	0.0	33.3	0.0	0.0	0.0	3 h & 45 m
Nagaur	**35.7**	**14.2**	**0.0**	**42.9**	**0.0**	**0.0**	**7.1**	**21 hrs**
Nokha	0.0	16.7	0.0	83.3	0.0	0.0	0.0	6 h
L.Karan Sar	20.0	20.0	0.0	60.0	0.0	0.0	0.0	4 hrs &45m
Bikaner	**9.1**	**18.2**	**0.0**	**72.7**	**0.0**	**0.0**	**0.0**	**5 h & 30 m**
Total	**15.6**	**41.3**	**3.4**	**35.5**	**3.1**	**0.4**	**0.8**	**6 h & 45 m**

According to above table, 95.8 per cent get a copy of the computerised RoR on the same day and the remaining , less than 5%, get it in a period of anything between 2 to 10 days. In the latter case, the reasons are: unavailability of computer operator or tehsildar, problem in computer system and unavailability of revenue stamps at tehsil. The State government has trained only one person per tehsil for the computerised system, his absence for any reason may lead to delay for the farmers. On the other hand, the tehsildar has to shoulder a lot of responsibility which takes him away from his office; therefore, he is not the right person for the purpose of authentication. In our opinion, the computer operator himself should authenticate the computerised RoR as is done in the state of Karnataka. Unavailability and higher price for revenue stamps was noticed in some of the surveyed tehsils during our field visit. This can be tackled by stressing the deposition of fees directly at the counter. Another major problem is the breakdown of the computer system. Whenever any hardware or software related problem occurs, there is no expert available at tehsil headquarter. We found that there is no State level agency for providing service at tehsil level. Whenever a breakdown occurs one person has to go with computer peripherals to the district headquarter. This whole procedure is time consuming and causes unnecessary delay.

45 per cent of the total respondents were in favour of authentication of RoR by the computer operator while only 2.6 per cent were not in favour of this argument and the remaining were unable to say anything because they had never visited the Apna Khata Centre. On the other hand, if we consider the responses of the persons who had visited Apna Khata Centre, we found that about 83.6 per cent of the landholders favored the argument that computerised RoRs should be authenticated by the computer operator, 5 per cent were opposed to this and 11.5 per cent were unable to say anything about this.

To understand the improvement over the previous system, we need to find out the time taken for obtaining manual RoR's. According to many of the respondents, time taken for obtaining RoRs from patwari is also dependent on the money provided to him. In the following table we will discuss details of the time taken in obtaining manual RoR by the farmers.

Time Required for Obtaining Land Records prior to Computerisation (In Percent)

District	Same Day	1-3 Days	3-7 Days	1-2 weeks	2-4 Weeks	One month	More than one month	Average Time (Days)
Sanganer	0.60	25.80	20.70	17	18.20	10.70	7	23
Chomu	9.50	32	17.70	13	20.70	4.70	2.4	7
Jaipur	5.1	29	19.2	14.9	19.5	7.6	4.7	15
Hindoli	9.30	14.70	27.3	26.7	6	7.3	8.7	15
Bundi	9.30	11	25.6	33.70	11	4.10	5.3	12
Bundi	9.4	12.7	26.4	30.4	8.7	5.6	6.8	14
Rewdar	2.9	18.20	32.10	21.90	15.30	5.10	4.5	11
Pindwara	4.50	12.10	17.20	20.70	31.10	10.9	3.5	14
Sirohi	3.9	14.8	23.8	21.2	24.1	8.4	3.8	12
Simalwara	14.40	9.60	12.80	12.80	21.60	20.80	8	18
Sagwara	8.10	13.50	8.80	13.50	27	20.90	8.2	18
Dungarpur	11	11.7	10.6	13.2	24.5	20.9	8.1	18
Didwana	13.80	11.70	9.40	12.90	18.10	27.60	6.5	14
Ladnun	13.50	16.70	5.60	2.40	24.60	32.50	4.7	17
Nagaur	13.7	16.9	7.4	7.4	21.5	30.2	2.9	16
Nokha	13	14.80	12.20	7.8	18.20	31.30	2.7	16
L.Karan Sar	2	4.1	14.20	9.20	12.30	40.80	17.4	34
Bikaner	8	9.9	13.2	8.5	15.5	35.7	9.2	24
Total	8.3	16.3	17.6	16.9	18.9	16.3	5.7	**16**

Above table clearly indicates that only 42.2 per cent of the respondents were getting RoRs within one week and for the remaining it took more than a week. In one case of Bikaner district, we found that the patwari had not provided the RoR to the landholder till one year because the landholder was not interested in paying extra money to patwari. Basically, if we compare the time of manual RoR with computerised RoR, we find that in computerised system, 95.8 per cent of the landholders are getting the RoR on the same day ,while in manual system only 8.3 per cent of the landholders were able to get the RoR on the same day. Definitely, this is a sizeable improvement over the existing system in terms of time taken for the documents.

Reduction in Time after Computerisation in issuing RoR

Tehsil/District	Average Time prior to Computerisation (in Hrs.)	Average Time after Computerisation (in Hrs.)	Reduction in Time (in days)
Sanganer	552	06.00	23
Chomu	168	07.45	7
Jaipur	360	**07.00**	**15**
Hindoli	360	04. 45	15
Bundi	288	03.00	12
Bundi	336	**04.00**	**14**
Rewdar	264	01.00	11
Pindwara	336	07.00	14
Sirohi	288	**06. 15**	**12**
Simalwara	432	07 .00	18
Sagwara	432	04. 30	18
Dungarpur	432	**06. 30**	**18**
Didwana	336	34.00	13
Ladnun	408	03. 45	17
Nagaur	384	**21.00**	**15**
Nokha	384	06.00	16
L.Karan Sar	816	04.45	34
Bikaner	576	**05.30**	**24**
Total	384	**06. 45**	**16****

*** Significant at the .05 level(2- tailed)***

8) Accuracy of Computerised Land Records

From amongst the persons who had already obtained computerised documents, 96.2 per cent of the respondents were satisfied with the accuracy of the computerised system. Only 1.1 persons found that computerised system was not accurate and the remaining were not able to comment anything on the accuracy of the system. *According to Shri Lal Chand Bunkar of Hadota Village of Chomu tehsil, in his computerized Jamabandi, the name of his father was recorded wrong.* Most of the mistakes were related to wrong spelling of the names of landholders or their father's name. In our opinion, further work needs to be done in this area to ensure the accuracy of land records. Errors in the database may lead to complaints from the citizens and also give cause to vested interests to speak against the system.

9) Harassment and Manipulation in the Computerized System

As we already discussed above, after Computerisation, farmers can now get a copy of RoR for any parcel of land on the same day from Apna Khata Centre at the tehsil headquarters. In principle, these records had already been available directly from the patwari; but in practice it meant a lot of inconvenience, harassment and bribes. Patwaris

have travel duty and are generally not easily accessible. Now the Land records are in the public domain. Therefore, when we asked beneficiaries; do you think that the process of obtaining computerized RoRs is free from harassment of government officials or any other person?; only 21.40 per cent of the respondents who obtained computerized RoRs replied negatively.

Cross Tabulation between persons Obtained computerised RoRs and Computerised system is free from Harassment (In Percent)

Persons Obtained computerized RoRs	The computerised system is free from Harassment			
	Yes	No	Cant' Say	Total
Yes	76.30	21.40	2.30	13.20
No	51.40	5.50	43.10	86.80
Total	54.70	7.60	37.70	100

Above table indicates persons who obtained computerized records are in favour of computerized system. On the other hand, persons who have never visited apna khata center were unable to say anything about the harassment in computerized system. 21.40 per cent of the respondents who obtained computerized RoRs faced difficulty in obtaining computerized records. Respondents faced harassment due to problems in obtaining revenue stamps. In some of the tehsils computer operators and patwaris were also not extending the required co-operation to farmers in terms of informing them the procedure for obtaining computerised RoRs.

The manual system of land records maintenance has been described as highly opaque. Patwaris have been perceived as monopolizing the records, which were not open to public scrutiny. Several inaccuracies crept into old manual system due to improper manipulation by the patwari. In the computerized system, there should be no possibility of any type of manipulation by any revenue officials but presently in Rajasthan it does not seem true. The main reason is the lack of work flow automation in the State. For taking care of the possibility of manipulation, the software should have a built in workflow automation and the progress in work should be moved from one revenue personnel to another on the computer system. In Karnataka, there is no possibility of any type of manipulation by a village accountant or kiosk operator or any other person due to workflow automation in which the transaction moves from one revenue person to another revenue person on computer system.

According to the beneficiaries, 44.50 per cent of the respondents relied on the present system and were quite sure that no manipulation is possible by patwari or the computer operator. 42.3 per cent of the beneficiaries were unable to respond since they did not know the details and power of the officials in the new computerized system.

10) Cost Advantage

It is well established that information flow and rent seeking behaviour are negatively co-related. The increased information flow would lead to a decline in rent seeking behaviour. Computerisation of Land Records (CoLR) would bring forward a wider dissemination of information at a lesser cost. Hence, the cost related to information would stand reduced and thereby the rent being charged by the revenue officials and others who had real monopoly access to the information will also decline. The others will include the local elite and the influential persons who have had pre-existing access to land information. It had been the attempt in this study to find out whether this objective of CoLR has been met and if so to what extent. Therefore, in the following table we will discuss the rent paid by the farmers prior to the Computerisation of land records. According to table, three-fourth of the respondents were getting a copy of the manual RoR by paying more than Rs.50 and the remaining were getting it by paying less than Rs.50. During our study we found that actual rate of issuing of each document is put up at the Patwar Ghar. Still , we found that awareness regarding the prescribed charges for obtaining documents was lacking amongst the farmers. Only 10.1 per cent of the farmers were paying in the range of the prescribed fee or nothing. In fact it is the farmers who belong to the medium and large category who paid nothing. It clearly indicates that farmers of these categories either have influence on the patwaris or are aware and knowledgeable and in a position to complain to higher authorities and thus the patwari does not demand money from them. The following table also clearly indicates that corruption is widespread and prevalent amongst the revenue personnel. After computerization, we found that in most of the cases farmers were paying only prescribed fee. However the farmers are still bound to take Khasra Girdawari from the patwari, therefore now the patwari is charging more money from them for this record. The farmers need for records every kharif and rabi season to get crop loans. Therefore, the need of computerisation of Khasra Girdawari is required at the earliest for reducing corruption. 81.6 per cent of the beneficiaries obtained computerised RoRs by paying upto Rs 20 while in the manual system above 75% farmers obtained RoRs by paying more than Rs.50. It clearly indicates that farmers benefit in terms of reduced corruption and payment of bribes after computerisation. The prescribed fee for obtaining computerized RoRs is Rs. 10 for upto ten plots and Rs. 5 per 10 plots thereupon. The no. of plots varies from one plot to forty-five plots. *According to Jagdish Sharma , a villager of village Muhana, Jaipur, Computerisation of RoRs has facilitated us very much and we are very much happy with this work of government.*

Money required to obtain RoR prior to Computerisation (In Percent)

Tehsil/District	Money(in Rs.)								
	None	10-20	20-50	50-100	100-200	200-500	> 500	Average Cost (in Rs.)	Reduction in Cost (Rs.)*@
Sanganer	8.8	1.7	8.8	27.10	33.70	19.90		149	134
Chomu	5.7	7.4	29.7	28	16	10.30	2.90	126	111
Jaipur	**7.3**	**4.5**	**19.10**	**27.50**	**25.00**	**15.2**	**1.4**	**138**	123
Hindoli	1.3	10.20	33.10	14.60	36.30	4.50		91	76
Bundi	0.6	6.7	20.8	23.0	43.8	5.1		97	82
Bundi	**0.9**	**8.4**	**26.6**	**19.1**	**40.3**	**4.8**		**94**	79
Rewdar	2.8	1.4	7.7	32.4	50.7	4.9		112	97
Pindwara	2.3	10.9	10.9	30.9	32.6	12.6		117	102
Sirohi	**2.5**	**6.6**	**9.5**	**31.5**	**40.7**	**9.1**		**115**	100
Simalwara	4.6	5.4	2.3	40.0	33.1	14.6		123	108
Sagwara	9.2	7.4	6.1	35.0	35.0	7.4		101	86
Dungarpur	**7.2**	**6.5**	**4.4**	**37.2**	**34.1**	**10.6**		**111**	96
Didwana		6.0	13.7	22.2	50.4	7.7		117	102
Ladnun	1.6	10.9	15.5	27.1	41.9	3.1		93	78
Nagaur	**0.8**	**8.5**	**14.6**	**24.8**	**45.9**	**5.3**		**104**	89
Nokha		7.0	11.4	21.1	47.4	13.2		121	106
L.Karan Sar		3.0	1.0	5.0	68.0	23.0		195	180
Bikaner		**5.1**	**6.5**	**13.6**	**57.0**	**17.8**		**155**	140
Total	**12.1**	**15.7**	**26.6**	**23.3**	**14.2**	**7.3**	**0.8**	**119**	104

** After computerization farmers are paying Rs. 10 for upto ten plots and Rs. 5 per 10 plots thereupon. Therefore as per our analysis, average cost is Rs. 15.*

@ Significant at the .05 level(2- tailed)

11) Opinion about Computerisation of Khasra Girdawari

Farmers expressed a strong desire for computerisation of Khasra Girdawari , as is evident from the adjoining table. According to this, about 84 per cent of the farmers are in favour of the computerisation of Khasra. If we see the details of respective tehsils, more than 70 per cent of the respondents in every tehsil are in favour of computerisation . Hindoli tehsil has a maximum number of people against computerization which is 9.6 per cent. This can also be attributed to the fact that the computerisation process in this tehsil is not progressing well. Therefore, many respondents have bitter experiences of computerisation. In the following table we will see the proportion of the persons facing problem in obtaining manual Khasra Girdawari from the patwari. According to responses, 67.9 per cent of the respondents faced problems in obtaining Khasra, 28 per cent are satisfied with the service provided by the patwari and remaining 4.1 per cent were unable to comment on the matter. According to responses from sarpanches; 91.91 per cent are in strong favour of computerisation of Khasra Girdawari , 6.06 per cent are against the computerisation of Khasra and remaining (3.03) per cent are unable to say anything. *According to Shri Bhudesh Ji Baba, village Jeerawal, district Sirohi; computerization of khasra and maps will provide sufficient facility to the villagers.*

In every tehsil more than half of the persons are facing problems in getting Khasra from the patwari. Amongst the persons who have obtained computerised RoRs, 98 per cent desired the computerisation of Khasra Girdawari. But in our opinion, there is a need to simplify the fields of RoR and Khasra Girdawari prior to computerisation. We found that there are many columns common in RoR and Khasra Girdawari. Therefore we may merge both documents to provide a single document to the farmers in place of two documents. In Karnataka, the computerised system was popular because RTC contains both the ownership information as well as crop information. According to responses from sarpanches, 60.61 per cent stated that presently landholders are facing problems in obtaining manual Khasras, therefore computerisation of Khasra is necessary. 36.36 per cent are against the computerisation of Khasra, as according to them, Khasra requires the details of current crop , therefore it is very difficult to computerise this document. But in our opinion, Rajasthan should go forward for the computerisation of Khasra as has been done in Karnataka.

In the following table we will discuss the time taken by the patwari in providing Khasra to farmers.

Time Required to Obtain Khasra (In Percent)

District	Same Day	1-3 Days	3-7 Days	1-2 weeks	2-4 Weeks	One month	More than one month
Jaipur	7.7	8.1	11.3	31.5	15.8	8.6	17.2
Bundi	12.6	10.8	9.6	32.5	10.2	15.7	8.4
Sirohi	12.3	10.7	15.6	24.6	22.1	9.0	5.7
Dungarpur	16.8	7.4	6.5	14.9	28.2	23.3	3.0
Nagaur	11.1	15.2	14.7	23.4	21.3	10.2	4.0
Bikaner	0.7	4.3	13.6	20.7	32.8	22.1	5.7
Total	10.5	9.5	11.6	24.7	21.3	14.7	7.8

The above table shows that only 31.6 per cent of the respondents are getting the Khasra within one week, 46 per cent between one week to 4 weeks, 14.7 per cent in one month and 7.8 per cent in more than one month. It clearly reveals that service delivery mechanism is not working well in the case of distribution of Khasra. This needs to be studied with the money paid for obtaining this document.

Money Required to Obtain Khasra (In Percent)

Tehsil/District	Money(in Rs.)						
	None	10-20	20-50	50-100	100-200	200-500	> 500
Jaipur	1.8	20	23.6	21.8	19.1	12.3	1.4
Bundi	0.7	40.8	15.5	20.4	15.5	5.6	1.4
Sirohi	18.8	6.3	25.9	23.2	11.6	12.5	1.8
Dungarpur	26.1	4.9	27.1	24.1	11.3	6.4	0.0
Nagaur	23.1	18.5	32.9	13.9	9.8	1.2	0.6
Bikaner	0.0	2.3	34.6	40.0	16.9	11.1	0.0
Total	12.1	15.7	26.6	23.3	14.2	7.3	0.8

The above table indicates that the farmers are paying a higher amount than the prescribed fee. Only 27.80 percent of the farmers are receiving Khasra Girdawari by paying upto Rs.20. The prescribed fee for Obtaining Khasra is Rs.10 upto 10 plots and Rs. 5 per 10 plots thereupon.

12) Institutional Finance

Experience has been that the procedure for obtaining loans is so cumbersome that, many a time, loan applications are held up for want of ownership/possession certificates and the loanee has to make several visits to the tehsil and banks, for which he has to incur additional expenditure. Besides, the loan may not be available in time. There is an opportunity cost attached to the time of the loanee as well. All these factors add to the cost of the loan and make the loan more costly to the loanee as compared to what is available in the market. An important objective of the CoLR was that it should be able to cut across procedural tangles and facilitate availability of rural credit.

Bank loans are given on the basis of RoR's. Therefore, landowners need copies of such RoRs for applying for loans. It was observed that there has been some positive impact on the flow of institutional finance because farmers are now getting very good printable computerized copy, and in less time, as compared to manual illegible hand written copy. According to farmers, due to legible computerized copy financial institutions are convinced easily. We asked a very simple question from respondents about the availability of finance after computerisation. About 47 per cent of the respondents found that it becomes easy to obtain a loan after computerisation. Only a very low percentage (4 %) found, there was no change. 49 per cent could not say anything because they had never applied for a bank loan. One can conclude that computerization of land records has slightly facilitated availability of loans from banks for the farmers.

13) Reduction in Disputes

It has been well accepted that a majority of the disputes and conflicts in rural areas are related to land. These land disputes have been analysed and it has been found that many of them stemmed from lack of perfect knowledge. Many of the disputes originate from a faulty record system. These disputes or conflicts in the rural society act as a burden on the rural economy because it results in financial outgo in the form of litigation. Opaqueness of records also leads to adverse selection , litigation and high transaction costs. For this indicator, we asked the respondents about land-related disputes. About 40.8 per cent of the respondents are sure that computerisation has reduced the land-related conflicts. 5.4 per cent respondents opined that computerisation is not helping in the reduction of disputes. Remaining respondents (53.9%) are unable to say anything about the reduction in disputes due to computerisation. It is too early to draw conclusion on this matter, but it is expected that with better and transparent records , availability of information to different parties will increase before they make a transaction and hence related disputes may decline. On the other hand computerization may increase knowledge about matters which were previously not known and this may lead to an increase in litigation , at least initially.

14) Land Reforms

It has been admitted that implementation of Land Reforms has suffered on account of poor records base. However, It was assumed at the beginning of this programme that CoLR will provide a firm basis to the programme of Land Reforms. A landholder may own land in several villages, tehsils and districts, and in the names of relatives. Under a computerised system of record keeping such data can be collected, collated and retrieved easily. Therefore, CoLR has been rightly considered as a major support to Land Reforms. But we found that the present manner of computerization of land records is not sufficient for further implementation of computerization of land records. Basically, in every Indian States, the computerization of land records is designed to promote delivery service of documents in terms of money and time not in terms of detecting case of ceiling surplus. With this background; it appears that present form of CoLR may not contribute to the promotion of further implementation of Land Reforms legislations. This may be due to fact that implementation of CoLR is at a tehsil level and the records are not integrated .Once the database is integrated at the district level or State level, there might be emergence of new cases.

15) Mutation

In 1957, the Government of Rajasthan decided that the powers under Section 135 of Rajasthan Land Revenue Act should be exercised by the Panchyat concerned instead of tehsildars. The process of mutation is as follows:

The applicant may report for mutation directly to patwari or through tehsildar. The patwari writes the report in Mutation register as per para 121 of the Rajasthan Land Revenue (Land Records) Rules, 1957. After that Inspector, Land Records verifies the mutation and puts forward to sarpanch for necessary orders instead of tehsildar. The Panchayat shall decide mutations in accordance with the provisions of section 135 of the Rajasthan Land Revenue Act, 1956 and Rajasthan Land Revenue (Land Records) Rules, 1957.

In case the Panchayat fails to give any decision on the mutation cases as per the rules the matter may be reported to tehsildar. He may order within 30 days for the disposal of mutation.

The tehsildar has no power to review the orders of the Panchayat. The Panchayat has also the power to sanction the mutation under section 19 of the Rajasthan Tenancy Act. The tehsildar cannot exercise these powers. An appeal against the orders of the Panchayat would lie to the Collector.

After the computerisation of land records the same process is continuing. After completion of mutation, as per above mentioned procedure, the mutation entry is entered in the computer. The mutation does not work like an online module to carry out mutation on the database for dynamic updating of database. Another flaw of present mutation system is that it does not have a built in workflow automation system which moves transactions from one personnel to another on the system with specific roles and

responsibility of the revenue personnel. According to the Revenue personnel, the online mutation as has been done in Karnataka may not be possible in Rajasthan due to the involvement of Gram Panchayat in this mutation procedure. Therefore, either an amendment should be made in this regard for the success of Computerisation of Land records programme or the activities being carried out at the Panchayat level have to be incorporated into the work flow system either in an online manner or if this is not feasible in an offline manner. The latter would involve batch updation of data on a periodic basis.

Therefore we asked similar question with the respondents about the facilitation of Panachyat in muatation process, it is evident from the following table that the respondents found that the involvement of the Panchayat in the process of mutation facilitates the process of mutation.

(i) Facilitation of Panchayat

Opinion about the facilitation of Panchayat in mutation (In Percent)

Tehsil/District	Yes	No	Can't Say
Sanganer	70.2	26.5	3.3
Chomu	87.6	11.9	0.6
Jaipur	**78.8**	**19.3**	**2.0**
Hindoli	72.6	23.6	3.8
Bundi	89.9	9.6	0.6
Bundi	**81.8**	**16.1**	**2.1**
Rewdar	43.0	57.0	0.0
Pindwara	80.6	18.3	1.1
Sirohi	**63.7**	**35.6**	**0.6**
Simalwara	96.9	2.3	0.8
Sagwara	96.3	1.8	1.8
Dungarpur	**96.6**	**2.0**	**1.4**
Didwana	97.1	1.1	1.7
Ladnun	98.3	1.1	0.6
Nagaur	**97.7**	**1.1**	**1.1**
Nokha	97.1	1.7	1.2
L.Karan Sar	98.8	0.6	0.6
Bikaner	**97.9**	**1.2**	**0.9**
Total	**86.1**	**12.6**	**1.4**

According to our study, 86.1 per cent of the respondents stated that the role of Panchayat in revenue matter is helpful and therefore this practice should be continued without any major modification. Only 12.6 per cent of the respondents are against the above statement.

(ii) Opinion about the change of Role in of Panchayat in Mutation Process

Only 9 per cent of the respondents are in favour of changing the role of Panchayat in revenue matters. The others are happy with the role of the *panchayat* in revenue matters. The proportion of persons in Rewdar (54.9 %) shows some resistance against the Panchayat. In this tehsil, we found that majority of the farmers were not happy with the functioning of Panchayat. Some farmers complained about the corruption in Gram Panchyats. It seems that the decentralization of powers to the panchayat has worked for the benefit of farmers. There were some complaints against the panchayats in terms of corruption and discrimination on the basis of caste etc, but overall more than 85% of the

respondents wanted the involvement of the Panchayat in the mutation process and the remaining were not in position to say anything .

(iii) Opinion about Computerisation of Mutation Process

We also asked about the computerisation of mutation process from the respondents. According to them, 82.6 per cent were in favour of computerisation of mutation process. 4.5 per cent of the respondents were against the computerised system and remaining could not say anything because they don't know about the computerised system. *According to many respondents; " computer se paise and time ki bachat hoti hai".(Computerisation saves money and time).* It clearly indicates that they hope that computer will curb corruption. The main reason of the success of Bhoomi Project in Karnataka was online mutation process which ensures that database is current and valid. Without the assurance of a correct and updated database, computerization does not have any meaning as the computerized RoR will not have reliability or validity and one will have to check the records against manual RoR's. Therefore it is desirable that on-line mutation should be launched in the State to ensure that the system is fully computerized and the benefits of information technology accrue to the programme.

According to responses from the sarpanch, 84.85 per cent are in favour of computerisation and on-line mutation. The sarpanches also do not feel any burden due to extra work of mutation. According to them , 81.82 per cent stated that there is no extra burden due to mutation workload on the Panchayats, the remaining (18.18 per cent) felt that the workload had increased due to the mutation work.

16) Infrastructure and Electricity

We found sufficient infrastructure at every tehsil of the State except in tehsils of Dungarpur District. In every tehsil of Dungarpur, the facility of ACs was not established till date even after two years. Similarly, we also found the problem of computer furniture at many places. The problem of irregular electric supply is prevalent at every tehsils except some tehsils of Jaipur district, but we found that the work of distribution of computerised RoRs was not affected due to lack of electricity. In some of the tehsils, UPS is not working for the required period and therefore there is a need to replace UPS with generator. Every tehsils contain only one computer system and printer, breakdown in the computer affected the work of distribution of computerised RoRs. Therefore it is recommended that one extra computer with printer could be provided at every tehsil. In addition, One 5 KV generator may also be set up at tehsils.

17) Points of View of Farmers

(a) The facility of computerisation of land records is extremely beneficial and there is a need to enhance awareness amongst the farmers. It will be better if revenue department organized camps at village level to explain the procedure of obtaining computerised RoRs. The government may also take help from Panchayat members for the publicity of computerised system.

(b) Availibility of RoR's should be extended to the Panchayat level.

(c) The computerisation of RoRs will not curb the corruption existing in the revenue department. There is also a need to computerise all documents issued by patwari or other revenue personnel like Khasra Girdawari, birth and death certificates etc.

(d) The State government has established Gram Doot in some of the selected districts at village level, and therefore there is a need to extend this service in all the villages of State.

(e) We have acute problem of electricity, therefore good battery back should be provided to face the problem of power.

(f) In some of the places, computer operator is not available all the time during working hours and is engaged in some other unofficial works. Therefore it is necessary that computer operator should be available all the time to facilitate in time saving to farmers.

(g) There should be a photograph of the main landholder at the top of the RoR.

(ii) Points of View of revenue personnel

(a) Tehsildar

i) There is a need to provide separate computer system for the registration work. Presently we are doing registration as well as land record's work on the same computer, causing delay in the issue of land records to the landholders.

ii) There should be two resource persons at tehsil headquarter in place of one, because whenever a resource person goes on leave for any reason, problem is caused for the beneficiaries.

iii) The fee for the computerised RoRs should be deposited in cash in place of revenue stamps, because sometimes there is a shortage of revenue stamps. This also causes problem to farmers.

iv) The password security system should be replaced by the thumb impression of the selected revenue personnel.

v) Presently, the service proved by the AMC contractor is not satisfactory; therefore there is a need to the revise present system of AMC.

(b) Patwari (Resource Person)

(i) The training provided by the State government to the patwaris(designated as resource person after completion of computer training) is not adequate for the handling of Apna Khata Centre. Therefore, thorough training should be provided to at least two three persons from every tehsil.

(ii) Most of the tehsils are facing the shortage of computer stationery and problem of UPS(Uninterrupted Power Supply).

(iii) Since only one patwari is trained in every tehsil, therefore they have a heavy work load. As per the discussion with resource person, we found that they feel that their appointment is a punishment because their colleagues (patwaris) are earning extra money by issuing other documents.

(iv) The work of land records is generally affected due to the engagement of the computer for work other than land records. This can lead to security problems and should be avoided.

(v) The software contains some glitches, therefore modification in software should be considered necessary. The following are the main glitches in software:

a) Mutation updation module is not updating the name in the original Jamabandi module automatically.
b) The codes for different types of land should be separate like in the manual records.
c) Khatedar and Gair-khatedar should be separate in computer programme to facilitate in detecting separately.
d) The software designed for Nahari area is not working properly, therefore there is a need to modify existing software.
e) The software does not show the area according to Khasra.

(vi) There should be one standby printer in case of failure of first printer.

(vii) At least two computers should be provided to every tehsil , one for issuing RoRs and the other for updation of Jamabandi.

(viii) Every tehsil has an acute problem of electricity, therefore mini generator should be provided for smooth functioning of Apna Khata Centre.

(xii) The computerisation of all remaining documents is also essential.

(xiii) The merging of Khatauni Jamabandi and Khasra Girdwari becomes essential in computerised system.

(xiv) A scanner is also required some times in cases of mutation.

Benefits of Computerisation of Land Records

(i) From the point of View of Government

(a) The load of records room has declined after the computerisation and there will be no need for extra space for putting records in near future.

(b) The computerisation is saving time of the revenue personnel, now they may concentrate more on other work.

(c) The revenue has increased against the issue of RoRs.The total revenue collected from September 2002 to till onwards is 121 lacs. In the current financial year till Janurary 06 Rs. 60 lacs have been collected.

(ii) From the Point of View of Land holders

(a) The general public can get a copy of RoR at tehsil headquarter without any delay or harassment during office hours. In the manual system, there was difficulty in accessing the patwari.

(b) Previously there were many cases reported about errors in the RoR due to human arbitration, but after the computerization process the possibility of errors in the documents has decreased.

(iii) **Suggestions for Improvement**

(a) There is a need to modify software from the point of view of future prospects and there is a need to computerise the khasra girdawari also.

(b) Mutation should be on-line and there is a need to integrate khasra and khatuni prior to implementation of on-line mutation.

(c) The updation of chausala should be on a yearly basis in place of four years.

(d) There is a need to amend the mutation process after the computerisation of land records.

(e) There should be a tie up with an agency at the district to provide software and hardware support to the computer systems at the tehsil level.

(f) There is a need to amend Rajasthan Land Records Rules-155 and 156 for the preparation of yearly Jamabandi.

(g) There is a need to amend rule 154 & 160 of Rajasthan Land Revenue Act.

Opinion about On-line Mutation

About three-fourth of the tehsildars are of the opinion that on-line mutation will help in quick disposal of mutation. About 16.67 per cent of the tehsildars do not agree with the statement, and the remaining i.e. 8.33 percent are unable to say anything about it.

Opinion about accuracy

About 91.67 per cent of the tehsildars agreed with the statement that computerised RoRs are accurate and updated. The same is the opinion amongst the patwaris also, 82.35 per cent of the patwari stated that computerised land records are accurate, 14.70 per cent did not agree with the statement and only 2.95 per cent of the patwaris are of the view that it was too early to say anything about accuracy of the system. In addition, 79.41 per cent of the patwaris accepted that computerised RoRs are more accurate than manual RoRs. According to them, whenever we wrote a copy of RoR from Jamabandi register, there were chances of human mistakes at the time of writing RoR and in computerised system there is no chance of any inaccuracies after the correct feeding of raw data. Remaining 20.59 per cent of the patwaris did not agree with the statement.

Reduction in Corruption

We also found during our study that CoLR reduced corruption to a large extent. The majority of the tehsildars are also of the same view. According to our responses, 91.67 per cent of the tehsildars are in the view that computerised system of distributing RoRs reduced corruption of revenue department. One tehsildar argued that at this stage, it will be premature to comment on the reduction in corruption, which is an age old practice.

Rise in Revenue Collection

According to 51.52 per cent of the patwaris, computerisation of land records has resulted in the increase of revenue collection. According to remaining patwaris since the cost of obtaining computerised RoRs is the same therefore it is very difficult to say that computerisation enhanced the government revenue. According to sarpanchs of the gram Panchayat, 84.85 per cent are also saying that computerisation enhanced the revenue of state government while remaining (15.15) opposes the statement.

Workload of Revenue Department

The spirit behind the computerisation of land records is to reduce the workload of over burdened revenue personnel and provide easy access to the farmers to documents without any bribe or harassment. Prior to computerisation, there were various tasks related to land records involving many personnel at different stages. In Rajasthan, the farmers are in need of mainly two documents related to land, namely : Jamabandi Khatauni and Khasra Girdawari. The state government has computerised only the Jamabandi Khatauni and computerisation of Khasra Girdawari is still awaited. In addition , the mutation process is still continuing in the same way as was in the manual system. The computerisation of RoRs reduced the workload of patwaris only to some extent. 75 per cent of the tehsildars accepted that computerisation reduced the workload of revenue personnel marginally. To ensure the success of the programme, it should reduce the workload of the revenue personnel substantially.

Reduced Interpolation

In manual documents there were many complaints of tampering and interpolation by the patwari since patwari was the sole person in charge of the manual records. After the computerisation the power of updation was not vested with patwari and other revenue personnel. Therefore, any type of interpolation and tampering after computerisation decreased. 75 per cent of the tehsildars agreed with this and stated that computerisation helps in diminishing interpolation by the revenue personnel as they do not have any power of modification in raw data .

Rise of Public Faith in Revenue Administration

The basic and grass root work pertaining to land records is done by the patwari. Due to the opaque nature of revenue record keeping, and also due to his monopoly ,the patwari could tamper with the records. But after computerisation , since there is a reduced role of patwari in updation or modification of land records, there is a lesser possibility of tampering of records or delaying matters. According to tehsildars and sarpanches of gram Panchayats, there has been growth of public trust in the revenue administration after computerization.. About 85.29 per cent of the patwaris stated that after the computerisation of land records the faith of public in revenue administration has increased.

Conclusion

The findings of field study indicated that CoLR in Rajasthan has not been fully successful as the distribution of manual RoR is continuing. Awareness of the programme is also low as compared to other states of India. The system of providing manual RoRs needs to be stopped, but prior to that the computerized system should be foolproof and reliable. The data needs to be real time and the mutation process should be online. Once the mutation is approved at the computer the land records database should simultaneously get updated. Presently, the state government is providing printing of land records and updation of the database in offline model makes it out of sync with current status of land records and therefore is not very useful. Working of both the manual and the computerized system concurrently will lead to the computerized system being sidelined and it will not be successful. The State Govt should ensure that the database is clean and without errors, the online mutation procedure is working , look into the security aspects as well as maintenance, switch over to the computerized mode fully and ban the manual system

Even in the present state the CoLR is dealing with some of deficiencies of manual land records. Farmers may access their records any time at tehsil without the help of a patwari Therefore, land records are more transparent and open for public scrutiny.

During our study, we found that farmers are getting computerised RoRs without any delay and harassment. The farmer first submits an application with revenue stamps to tehsil office and majority of the farmers obtain the computerised RoRs within one day.

However, the farmers have to visit the tehsil for obtaining computerised RoRs, thus causing some inconvenience to them.

The application of Apna Khata software is user friendly and GUI based. It operates in windows 2000 operating systems. The front end was used VB 6.0 and database is managed in SQL server 2000. The architecture of application is server as a client, therefore it is not possible in Rajasthan to extend this system to other clients. It is true that International Organization of Standardization has certified the existing software; however this software still contains many glitches. The computerized mutation does not reflect the real benefits of computerisation, as it does not ensure automatic updation of land records. It needs online mutation, which can work only in a workflow automation system. The security in Apna Khata software is provided by the traditional password system, which is prone to hacking. Presently, the Rajasthan Government has computerized only the RoR (Khatauni). The Khasra (Crop details document) still remains to be computerised. The people of Rajasthan will be able to get full benefits of Computerisation of Land Records only after the computerisation of Khasra and implementation of online mutation.

Presently, the State government in association with NIC has provided training only to one patwari from each tehsil. Whenever the trained patwari is on leave, RoRs seekers have to wait up to the end of his leave. Therefore, more revenue officials should be trained for the computerized system in phases. It may also be a good idea to recruit fresh entrants at that level from amongst people who have some knowledge of computers.

In Rajasthan, We found that most of the farmers are getting RoRs in the prescribed rate while in manual, most of the farmers were getting RoRs for Rs.50 or more.

Finally we may say that in Rajasthan, the service delivery system is excellent in most of the tehsils and farmers are not facing any type of harassment in obtaining computerised RoRs. But there is a need to ban manual extraction and enhancement of awareness amongst farmers through various sources to provide real benefits to farmers of the State. The shifting of architecture from server as client to server-clients will provide the real benefits of online mutation to farmers. The amendment in the relevant act of mutation is also desirable.

Recommendations

- Presently, the state government is providing printing of land records and updation of the database in offline model makes it out of sync with current status of land records and therefore is not very useful. Therefore it is necessary to ensure online mutation and workflow automation in the present software for a dynamic and current database.
- Streamlining the system and banning of manual extraction will provide the full benefits of computerisation of land records to the farmers. Therefore, relevant acts would have to be amended to render hand written land records illegal. This is

necessary because existence of both hand written and computerized records makes the CoLR programme redundant.

- Security through password is prone to hacking. Therefore, it is necessary to provide security through bio- metric identification technology in-place of traditional password. It was seen that the computer containing land records data is also being used for other purposes. This may endanger security of land records data and create possibility of infection through virus in computer system.

- Farmers have to purchase revenue stamp from the vendor (middleman) for obtaining a computerized RoR, resulting in inconvenience and loss of time. Therefore, the state government should accept cash against the fee of computerized RoR. The revenue officials may deposit money in Revenue Department of every tehsils at the end of the day.

- The architecture of application of computerized system is server as a client; therefore it is not possible in Rajasthan to extend this system in other clients. The shifting of architecture from server as a client to server-client will provide the real benefits of computerization to landholders.

- Whenever any software or hardware related problems occurred in the computer system, no expert was available at tehsil level. Therefore, either an expert had to arrive from district headquarter or a resource person had to depart to tehsil office with computer system to remove the computer problem. The time taken was anywhere between 3 days to one week. Due to this, users faced inconvenience. Therefore a trained person should be available at tehsil office to sort out these problems or the State should tie up with computer agencies to provide maintenance at the tehsil level.

- Farmers have to visit tehsil office for obtaining computerized RoRs which causes delays and greater cost to them. Therefore, it will be better, if the Apna Khata centres at sub tehsil level are extended to the sub panchayat level, subsequently.

- One mini generator, one extra printer, one scanner and one stand by computer should be provided to every tehsil for smooth functioning of Apna Khata Centre. In most of the tehsils we found acute shortage of stationery and problems in UPS, These problems, though minor need to be attended to.

- At present, one patwari has been trained from every tehsil for dealing with the work of computerization of land records . His absence from the tehsil for any reason may lead to delay for the farmers. Therefore, other revenue officials also should be trained for the use of the computerized system.

- Touch screen kiosks should be installed in all tehisls to empower the farmers and provide them access to information.

- At present the computerization of land records in Rajasthan is restricted only to Records of rights. The benefits of computerization will be reflected fully after the computerization of Khasra i.e. records of crops. Therefore, the computerization of Khasra is also necessary.

- Computerization of land records will not be complete without the digitization of cadastral maps. Therefore it is necessary that in the next phase digitization of maps should be taken up.

- There is a need to integrate Registration Department with the land records data to facilitate simultaneous initiation of mutation cases and updation of land records.

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Chapter-15

Computerization of Land Records in Uttar Pradesh: An Example of e-governance

V.N.Garg
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With the change in Land Records Manual, giving legal sanctity to the computerized documents of land records, UP Government decided to switch over to fully computerized system of maintaining and delivering the basic land records to facilitate the processes of rural masses. The Department of Revenue has computerized records of land ownership of 2.5 crores farmers. The service had been started in 305 tehsils. The farmers can take a computerized copy of records pertaining to land title from tehsil counter after paying a fee of Rs. 15. In the computerized system, manipulation either in area or mutation orders can be traced without any difficulty. Moreover, the harassment of the farmers in getting the copies of land records is also minimized. Internet access of these records has been provided to make the system transparent.

Application Context

So far the maintenance of basic land records was being done manually by 27000 lekhpals and the lower level revenue functionaries in 70 districts and 305 tehsils. It was observed that in some of the tehsils maintaining only one copy of land records was in practice. It was difficult to check the manipulations in the records by lekhpals. Records of government land were often manipulated and based on these; illegal pattas were given to the interested person/parties. The farmers were facing many problems in approaching the concerned lekhpals to get certified copies of their ownership documents for obtaining bank loans, for filling in courts and for claiming subsidy under government schemes and other such purposes. State Government initiated computerization in 16 districts under the Government of India's scheme of 1993. Later this was replicated in all the districts. In the last two years, the scheme was extended up to the tehsil level. The pace of feeding data was very slow in the beginning and it was not being updated regularly due to various problems.

Implementation approach

Chairman, Board of Revenue, U.P. prepared a strategy to update the computerized records to operationlize the scheme village wise in mission mode idea to start services to the farmers immediately. This was possible only when the field officers operationalized the scheme village wise. The strategy was explained to the field officers at the very start of the actual work in the form of one-day workshop. The announcement of operationlized villages at tehsil level popularised the programme in rural masses. The farmers became

aware of the computerizaton plan as they came to the tehsil centres to obtain their extracts. The members of bar association felt comfortable when they received a computerized copy from tehsil instead of approaching the lekhpal. The manually written documents were sometimes, illegible and at times, gave rise to many interpretations. The computerized records are more legible and easier to understand. Moreover, all the records are available at one place and there is less hardship to the farers. Manipulation in the records of Government land can also be prevented by Computerization of Land Records.

Directions have been given to all the Collectors to put this record on Internet server of NIC to enable the viewing of the land records through internet kiosk. This will create a transparency in maintaining the land records. This will realize the dream of e-governance in the true sense. In this system the farmers whose mutation orders were kept pending for a long time can, after viewing the records through internet, apply for fresh mutation in the tehsil office or lodge a complaint in case of any discrepancy.

Implementation Challenges

Many constraints came to the notice during data updation programme. Irregular power supply at tehsil level was the major one. The hardware problems were also encountered during time bound programme. Lekhpals were not interested in data updation programme.

Besides, awareness training programme conducted centrally. The Collectors were instructed to select dynamic revenue officials at tehsil level and put at least two of them to operate the system. The intensive training at NIC district centre was given to these selected officials. So far, 2308 revenue officials have been trained under awareness programme and around 710 out of them are working with the tehsil computerised system.

National Informatics Centre in Uttar Pradesh developed a software program "BHULEKH" to maintain the records in the tehsil centre. The Software contains many modules like data entry, mutation updation process, report generation, query and features such as log recording facility. The data has backup arrangements to fight against possibility of corruption of data. NIC took one year to develop the version 1.1 of Bhu-Lekh in SQL server and VB environment. This replaced the old technology based software of Unix and Foxbase. The upgradation of software is being done continuously on receiving the feedback from the field.

Benefits and Costs

Every tehsil is equipped with two computers on client server architecture, two printers, one dot matrix and another laser printer, UPS and Genset. Procurement of windows 2003 and SQL server 2000 has been done for each tehsil. Total expenditure so far on hardware assets is 7.62 crores and on data entry it is 7 crores.

Till July '05 delivering 1478171 copes of extract of computerized RORs has resulted the deposit of Rs. 2 Crores as user charges in all the tehsils. The provision has been made to

spend amount collected as user charges for the maintenance of the tehsil computer centre so that uninterrupted services can be rendered to the farmers. Demand of extracts of record of rights is expected around 48,00,000 per year on an average which will create a corpus of Rs. 7.2 Crores in the state every year. Computerization of land records has been found financially and technically feasible.

Development Authorities, Sugar Mills, Irrigation Department and other developmental departments are in need of computerized records tehsil wise. Nominal amount will be charged from these institutions and computerised land records on CDs will be provided to them.

Courts and banks can verify the records of the farmers with the help of internet.

Future Plans

- The mutation orders kept unentered in the record of rights (Khatouni) due to sale or purchase and succession should be entered in 35 days time automatically. Tracking of mutations through software program will help to achieve this purpose. The software designed for the specific purpose developed by National Informatics Centre will monitor the pending mutations.
- Trainers are being appointed for one year to facilitate computerization of land records at tehsils. These trainers will be placed at district HQ and will go to tehsils in rotation for regular training and support the tehsil officials.
- There is a plan to put touch screen kiosk at all the tehsil centres so that farmers can check their records immediately before taking extract from counter.
- Installation of biometrics device is being planned to secure the system and to avoid unauthorised access.
- The conversion of revenue record room into digital record room will be done on pilot basis in Lucknow, Ghaziabad and Gautambudhnagar.
- The crop detail statement (Khasra) is being taken up for computerization in the state this year under the GOI's scheme.
- Computerization of village map (Sajra) is being taken up for all the villages of state.
- Data warehouse will be established to keep a backup of the data and to generate various types of analysis-based reports at state level. Based on that decisions could also be taken in making changes in policies related to land reforms.

Ultimate Goal

Ultimate goal is to provide a web enabled Land Information System for the accelerated development of the state of Uttar Pradesh.

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The Centre for Rural Studies (formerly Land Reforms Unit) of the Lal Bahadur Shastri National Academy of Administration was set up in the year 1989 by the Ministry of Rural Development, Government of India, with a multifaceted agenda that included among others, the concurrent evaluation of the ever-unfolding ground realities pertaining to the implementation of the Land Reforms and Poverty Alleviation Programmes in India. Sensitizing the officer trainees of the Indian Administrative Service in the process of evaluating of land reforms and poverty alleviation programmes by exposing them to the ground realities; setting up a forum for regular exchange of views on land reforms and poverty alleviation between academicians, administrators, activists and concerned citizens and creating awareness amongst the public about the various programmes initiated by the government of India through non-governmental organisations are also important objectives of the Centre for Rural Studies. A large number of books, reports related to land reforms, poverty alleviation programmes, rural socio-economic problems etc. published both externally and internally bear testimony to the excellent research quality of the Centre.

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