# Bhoomi*: Online Delivery of Record of Rights, Tenancy and Crops to farmers in Karnataka, India

**Rajeev Chawla**
Secretary, e-Governance, Government of Karnataka

## Abstract

The *Bhoomi* (meaning land) project of online delivery of land records in Karnataka (one of the 26 states of India) demonstrates the benefits of making government records more open so that citizens are empowered to challenge arbitrary action. It also illustrates how automation can be used to take discretion away from civil servants at operating levels.

The Department of Revenue in Karnataka has computerised 20 million records of land ownership of 6.7 million farmers in the state. In the past, under the manual system, land records were maintained by 9,000 village accountants, each serving a cluster of 3–4 villages. Farmers had to seek out the village accountant to get a copy of the Record of Rights, Tenancy and Crops (RTC) – a document needed for many tasks such as obtaining bank loans. Nearly 2,500 bank branches in Karnataka loan approximately Rs. 40 billion to farmers as working capital every year.

Village accountants are not easily accessible, as their duties entail travelling. The time taken by village accountants to provide RTCs range from 3 to 30 days. There was also a problem of bribery – bribes ranging from Rs.100 ($1 $\cong$ Rs. 46) to Rs. 2,000 had to be paid. If some details were to be deliberately written in an ambiguous fashion, the bribe could go up to Rs. 10,000. Land records in the custody of village accountants were not open to public scrutiny. In the Bhoomi project, a printed copy of the RTC can be obtained online by providing the name of the owner or plot number at computerised land record kiosks in 177 *taluk* offices, for a fee of Rs.15. A second computer screen faces the clients to enable them to see the transaction being performed. In the next phase of the project, all the *taluk* data bases will be uploaded to a web-enabled central data base. RTCs are available online at internet kiosks in rural areas, which will connect to the central data base.

Earlier, mutation requests to alter land records (upon sale or inheritance of a land parcel) had to be filed with the village accountant. The village accountant was required to issue notices to the interested parties and also paste the notice at the village office. Often neither of these actions was carried out, nor any record of the notices maintained. Although theoretically, an update of land records could be carried out after a 30-day period by a revenue inspector, in practice, it could take 1–2 years for the records to be updated. Bhoomi has reduced the discretion of public officials by introducing provisions for

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recording a mutation request online. Farmers can now access the data base and are empowered to follow up. A farmer can check the status of a mutation application on a touch-screen provided on a pilot basis in 20 computerisd kiosks. If the revenue inspector does not complete the mutation within 50 days, a farmer can now approach another officer at the *taluk* level to authorise the mutation. The requests are to be handled strictly on a first-come-first-served basis. These measures limit opportunities for collecting bribes. After computerisation, there was a 85% jump in the number of mutation requests This change seems to indicate a level of acceptance of the new system by the population.

The system of collecting crop data printed at the back of the RTC is also being computerised on an experimental basis. Greater accuracy in crop data would lead to a more equitable distribution of crop insurance claims. Every year nearly one million farmers (15% of the farming community) insure their crops. Earlier, farmers could obtain falsified crop records from village accountants to boost their claims. With the implementation of Bhoomi, crop data on the RTC is the only document that can be used to back a claim.

Bhoomi will facilitate a quicker disposal of land disputes in courts by enabling faster retrieval of documents required by courts, such as notices issued for mutation to affected parties. More than 70% of the disputes in courts are land based. Open access to data and the transparent and traceable mutation process will also reduce the number of disputes.

Bhoomi has demonstrated a sustainable way of computerising land records. By the end of December 2006, the total user fee collected through issuance of RTCs was Rs.45 crore. This amount not only covered the investments made in computerisation but left enough surplus for further development.

By enhancing transparency and providing greater access to information, Bhoomi has empowered poorer farmers and increased accountability of the revenue department. Operators of the computerised system are made accountable for their decisions and actions by using a bio-login system that authenticates every login through a thumbprint. A log is maintained of all transactions in a session. By and large, Bhoomi has been portrayed positively by the media and has won several awards. Independent evaluation studies have shown that Bhoomi has significantly reduced corruption and improved service delivery. The Government of India is making special efforts to replicate Bhoomi in other states of India.

## Application Context

### Importance of Land Records in India

The collection of land revenue and the existence of the institutions of the state have been co-terminus. A historical analysis of ancient Indian policy suggests that tax on land played a pivotal part in the evolution and maintenance of the systems of governance.

In ancient times, land revenue was possibly the only source from which the entire income of the government was derived. Further, it was levied 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. Broadly speaking, it was a share of the produce paid in kind or cash. The mode of assessment and collection underwent a change when the British took over the administration. Lands were measured roughly and village records of lands were gradually built up. Thus, closely linked to the collection of land revenue was the creation of an array of land records wherein collection of revenue could be systematised and recorded.

India's independence ushered in the era of the welfare state and accordingly 'land revenue' or the tax on agricultural land also witnessed a reduction. Further, other sources of taxation became the primary sources of income for the Government. In spite the decline in the importance of land revenue, the importance of land records cannot be undermined. The entire structure of land records management that was associated with revenue collection now had to sustain its relevance *suo moto*. The plan document of the Seventh Five-Year Plan rightly opined:

> Land records form the base for all land reforms and therefore regular periodic updating of land records is essential in all states.

Thus, the concept of collection of revenue necessitated the maintenance of land records, in a rudimentary form in ancient times and a more systematic form during the British administration. Maintenance of land records has now become more vital for administrators and creation of a land information system is one of the key issues facing governance today.

Land records itself is a generic expression and could include, in Karnataka State, records like the Register of Lands of Khetwar Patrika, Records of Rights, Tenancy and Crop Inspection Register (RTC) Form 16, Khata Register (Form 24), Khirdi (Form 25), Mutation Register (Form 12), Disputed Cases Register (Form 8), etc.

However, certain types of information relating to land play a more important role. These may include primary information about land presented in terms of its geological information like the shape, size, land forms, soils; economic information related to land use irrigation and crops; and the information pertaining to legal rights, registration and taxation. No improvement in land can be made without acquiring rights to the land. These rights cannot be acquired until ownership is established.

The rationale for maintenance of land records originates from the following issues:

1.  Land records form the basis for assignment and settlement of land titles. These records must stand the test of legal scrutiny.
2.  Land is a very precious source and the land records system must safeguard the rights of the legal owner of the land.
3.  Issues of land rights not only raise legal complexities but also have socio-economic dimensions. 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 maintaining and updating these records. Manual maintenance of land records hinders effective collation and analysis of the data contained in them.

In Karnataka State, the land records were earlier maintained through a manual system, involving 9,000 village accountants, each serving a cluster of 3–4 villages. Eight registers were maintained to record the following types of information:

1. Information on current ownership of each parcel of land, its area and cropping pattern, disputes, mutations and
2. Village maps that reflect the boundaries of each parcel.

Requests to alter land records (upon sale or inheritance of a land parcel) had to be filed with the village accountant. However, for various reasons (cases of disputes or to extract bribes) the village accountant could afford to ignore these 'mutation' requests. Upon receiving a request, the village accountant is required to issue notices to the interested parties and also paste the notice at the village office. Often, neither of these actions was carried out, and no record of the notices was maintained. Notices were rarely sent through post. Theoretically, if no objections were received within a 30-day period, the land records were updated by a revenue inspector. In practice, however, it could take 1–2 years for the records to be updated.

Landowners found it difficult to access the village accountant, as his duties entail travelling. The time taken by village accountants to provide RTCs ranged from 3 to 30 days, depending upon the importance of the record for the farmer and the size of the bribe. A typical bribe for a certificate could range from Rs.100 to Rs.2000. If some details were to be written in an ambiguous fashion, out of selfish motives, the bribe could go up to Rs.10, 000. Land records in the custody of the village accountant were not open for public scrutiny.

Over a period, several inaccuracies crept into the old system through improper manipulation by the village accountant, particularly with respect to government land. Even where accountants were law-abiding, village maps could not remain accurate as the land was parcelled into very small lots over generations. The system of physical verification of records by deputy tahsildars (supervisors of village accountants) became weak as the number of records multiplied and these functionaries were burdened with a host of other regulatory and developmental work.

## Implementation Process

The central and state governments have long been aware of the need to reform the land record system. The beginning of computerisation of land records in Karnataka goes back to 1991 when the first pilot system was

initiated under the Ministry of Rural Development's Computerisation of Land Records (CLR) project, fully funded by the Government of India. By 1996, projects for computerisation of land records were sanctioned for all districts in the state of Karnataka. However, no provision was made to install computers at the taluk level where the manual records were actually updated.

The breakthrough came when the state government mandated that 'Bhoomi – Computerisation of Land Records' would have to be undertaken and finished in all sub-districts by March 2002. It was also decided to fully support development of a citizen-centric land records system even if it meant substantial investment by the state government for those components of the project, which were not being funded by federal government. This political mandate was backed by full administration efforts at all levels. The major objectives to be fulfilled by the Bhoomi project were:

- Facilitating easy maintenance and prompt updating of land records.
- Making land records tamper-proof.
- Allowing farmers easy access to their records.
- Collating the information to construct a data base regarding land revenue, cropping pattern, land use, etc.
- Utilising the data for planning and for formulating development programmes.
- Enabling usage of this data base by courts, banks, private organisations and companies, ISPs.

The Karnataka Government's Department of Revenue planned to set up computerised land record kiosks (Bhoomi centres) across 177 taluk offices. These kiosks were to provide farmers with the Record of Rights, Tenancy and Cultivation (RTC) – a document needed for obtaining bank loans, giving proof of ownership, etc. The Bhoomi project was expected to speed up delivery of RTCs, without harassment or bribery.

## Digitisation of Legacy Data

The first and most important step to kick-start the Bhoomi system was to capture legacy data records, numbering about 20 million, which the village accountants were in possession of. For this purpose, a comprehensive data entry software, Bhoomi, was designed after extensive discussions at various workshops at division, district and state levels. The feedback from these workshops helped the department in designing this data entry software.

The manual records were withdrawn in a phased manner from the entire state. A print out of the computerised records was individually signed by village accountants (100%), revenue inspectors (30%), shirasthedars (5%), tahsildars (3%), assistant commissioners (2%), and deputy commissioners (1%) after comparing the record with the manual registers to authenticate the data. They also put their seal with the name and designation along with

date of verification. The manual and computerised sets of records on the starting day now serve as original records and are kept in safe custody of the taluk office. As and when the process of comparison and certification is over in a taluk, a notification is issued by the Deputy Commissioner prescribing use of only computerised RTCs for all legal and other purposes.

## Issue of Copies to Farmers

Land records kiosks have been made operational in all 177 taluks and 26 special taluks. Village accountants can no more issue copies of the manual records, as only computerised records are valid. In every taluk, one village accountant has been designated as the kiosk village accountant. The farmers get the copy of their record on payment of user charges of Rs.15. Records are generated using the Bhoomi software running on kiosk computers and a back end server holding the data base. The records are signed by the village accountant at the kiosk and are provided to the farmers. In case of any small errors on the computerised records, the farmers can lodge a request with the taluk office along with the copy of the record available with him. Correction is made in the computerised Bhoomi data base if the error is found to be genuine, and the corrected copy is then provided to the farmer free of cost.

## Mutation Process in the Field

When a change of ownership takes place through sale or inheritance, farmers can file an application for a mutation of the land record at the Bhoomi centre at a separate operator-assisted counter that handles mutations. Data from the application is entered into the terminal at the counter and a checklist is generated for manual verification of data and documents by a supervisor. Each request is assigned a number. The number can be used by the applicant to check the status of the application on a touch-screen provided on a pilot basis in some of the computerised kiosks. Once the manual verification is complete, an entry is made in the back end server which automatically generates notices that has to be served to the affected parties. Notices are collected by the village accountants on their visit to the taluk office as per a fixed schedule.

The village accountant serves these notices to interested parties and gets their acknowledgement on one of the notice copies. If every thing is in order, the revenue inspector passes the appropriate mutation order in the mutation registers after a prescribed period of 30 days from the date the notice is issued to the party. The mutation order is then brought to the Bhoomi centre. Notices with the acknowledgement of interested parties and the mutation order passed in the field are then scanned on to the

system. The revenue inspector who has passed these orders in the field authenticates the data entry. The deputy tahsildar verifies that everything typed and scanned is as per physical mutation records. The system then automatically updates the particular land record. Physical records are filed in the record room.

## Crop Updation

Crop updation is a batch process done three times a year. Bhoomi data of concerned crop fields are supposed to be provided to a private data entry agency for the updation process. Checklists are to be generated after crop updation and should be validated and signed by village accountants before updated data is merged with the Bhoomi main data base.

## Legal Framework

The unamended Karnataka Land Revenue Act did not provide for a computerised system. The Act has now been amended and provides for the storage of data on storage devices and use of Bhoomi software as provided by the government from time to time.

## Overcoming Implementation Challenges

Maintenance of equipment at 177 centres, many of which are located in far flung rural areas; dealing with isolated incidences of fraudulent certificates being presented at banks; mitigating problems of farmers who have to travel long distances to reach a Bhoomi kiosk; lack of currency and poor quality of crop survey data; and problems faced by illiterate farmers in filing mutation forms are some of the challenges that the project team has grappled with.

Many actions have been taken to improve the uptime of computers at Bhoomi kiosks. Apart from the 1000 officials who were trained at the district level, 108 village accountants (VAs) were trained comprehensively in a two-month residential training course on hardware and networking in Bangalore. Four of these trained VAs are being placed in each district to serve as resource persons for primary diagnostic and repair if necessary. Facility managers with service-level contracts carrying stiff penalties have been assigned to each kiosk. The processing of payments to the facility managers has been decentralised so that the facility managers become more responsive to the needs in the field. All these measures have improved the uptime to its current level of 98%.

The printing process is being made more secure so as to deal with the problem of fraudulent certificates. But officers continue to enjoy a large amount of discretion in the process of mutation, even as some measures have been put in place to curb corruption. Illiterate farmers still face difficulties in filling out mutation applications. A key challenge is to create

awareness amongst rural population of all the changes that have taken place in processing RTCs and mutation, so that unscrupulous elements are not able to take advantage of their ignorance. Many of the future plans of Bhoomi are designed to deal with some of the key implementation challenges mentioned above.

## Recent Innovations and Improvements Carried out in Bhoomi

The Bhoomi project started in the year 2002 with 177 taluks being operationalised. 'Operationalisation' means that there were servers in every taluk office with the local data bases residing on those servers. There was no connectivity with the state, connecting these taluks to any central location, making disaster recovery difficult.

The Bhoomi application was written in Visual Basic with Microsoft SQL Server 7.0 as the back end.

During the year 2005–06, an exclusive wide area network (WAN) for the Bhoomi application using a dedicated V-SAT based network was set up. All the taluk offices are connected through this network and Bhoomi data centralised to the State Data Centre (which was created by the e-Governance Department). The data, in a batch mode, 4–5 times a day, gets replicated in Bangalore. The data base server at state level is SQL 2000. The taluk data bases are now being migrated from SQL 7.0 to SQL 2000.

All the future enhancement to the Bhoomi application running at the taluk server is now being written in .net 2.0.

All the old 177 Bhoomi servers have been replaced by new servers from HP which are fully remote-controlled through scripts. This is the first time in the country that scripts are run and servers controlled as against browser-based controls of remote servers which is the normal practice in industry.

The 177 old Bhoomi UPSs were also replaced and the new SNMP and online-enabled UPS, which have been put in place, are fully script-controlled. So much is the extent of the automation that an application running at the data centre switches on the UPS and the HP servers for taking data back-ups during the night after which the servers and the UPS are switched off. Such automated operations are required keeping in mind that the UPS and the server cannot be kept on in the night because of acute power problem in rural areas apart from spikes in the power supply.

The state data centre is also used for pushing patches, running scripts and remotely controlling the 177 Bhoomi sites. The remote sites are also diagnosed by the e-governance department from the state data centre by logging on to the servers and computers there.

All 177 servers are in a single-window domain with bio-metric authentication. Adding of new users in the 177 taluks are controlled centrally. Biometric information is also in the window domain directory on the central data base, although such information also exists on the secondary domain controllers at the taluk level for faster authentication.

The state data centre is also used for electronic data interchange with the 'Kaveri' programme (the computerised registration process in Karnataka). The Kaveri application using the web services at the state data centre sends daily registration data to the data centre from its 220 locations. The data so obtained in XML format from various Kaveri locations is then forwarded to Bhoomi locations through the WAN intranet. The taluk Bhoomi machines are not connected to the internet for security purposes and therefore, the data centre acts as a router for Kaveri data coming in from various sub-registrar offices.

Handheld devices have been deployed in the last year for crop updation from the villages. Using the telephone lines in the villages, the simputer's inbuilt modem is used to transfer the data to the state data centre from where it is routed to the concerned taluk. The data centre with its large centralised controls and efficiency, has therefore, made lots of qualitative change in the way Bhoomi works.

The Bhoomi and Kaveri programmes have been fully integrated. All across the country, the registration data from survey offices comes in manually in the form of 'J-slips' to the taluk offices. Previously, the J-slips were generally received late and then processed with further delay in the manual system. Even after the computerised Bhoomi was started, the J-slips were received manually and hardly accounted. In a recent Bhoomi–Kaveri integration (about 8-months-old state-wide implementation), the Kaveri system sends daily transaction data from their sub-registrar offices to the state data centre from where it is routed to respective taluks. On a first-in-first-out basis, these transactions are then handled by Bhoomi. This has lead to huge qualitative change as citizens are now very confident that their transactions in the sub-registrar office will definitely result in their land record getting updated automatically without having to run from post to pillar.

The first-in-first-out principle adopted in Bhoomi in the last year (version 4.5) has lead to a situation where the mutations are done on seniority basis. There is no way a tahsildar can by-pass a senior pending case and favour others.

## New Developments in Bhoomi

### Launching of Rural Telecentres to Distribute Bhoomi Records

In the existing Bhoomi implementation, citizens had to go to taluk offices to get their land records. Under the Nemmadi programme (rural digital services; *Nemmadi* means peace of mind), the government has finalised setting up of 800 telecentres. The vendor has been chosen and about 100 telecentres are already operational. In the next three months, 800 telecentres at all the sub-taluks will be operational, taking Bhoomi all the way to the villages. Needless to say the data made available to these telecentres will be

from the state data centre where all the 200 lakh land records are stored and get replicated and updated daily.

## Integrated Mutation in Bhoomi

In the conventional land records system, the spatial data in land records was updated after a mutation was done in the taluk office. This process was called *phodi*. This led to a situation where while non-spatial data was updated, the spatial data in the form of phodi used to sometimes take years together. Bhoomi now uses integrated mutation process where the non-spatial and spatial data gets updated simultaneously. It is a matter of pride that for at least years to come, Karnataka will be the only state in the country where integrated mutation would take place. Other parts of the country may require a couple of years to reach this advanced state of management of land records.

## Interaction With the Outside world

Bhoomi is a G2C project. It is primarily meant for citizens although its data can also be used by the government for various MIS, but that is only secondary. Every year, approximately 1.6 to 1.8 crore people are served through the Bhoomi project. In fact, it may be one of the biggest citizen-centric projects in the world, where a rural population of this size is served. By paying as little a sum as Rs.15, citizens contribute approximately Rs.25–30 crore every year as revenue to the Bhoomi project.

More than 10–15 lakh mutations are handled every year by the Bhoomi system, making Karnataka's land records the most updated in this part of the country. It may be noted that in the manual system only about 5 lakhs mutations used to happen every year.

Bhoomi is one project that has been embraced by all political parties in Karnataka. All parties in power are proud to encourage this project further. This shows the huge political acceptance of the project and the political sustainability thereof.

## Technology

As explained in an earlier section, while Bhoomi started with local servers placed at 177 taluks with SQL 7.0 and Visual Basic, it may be noted that it was the only application in the country at that time (2000–01) which used bio-metric authentication. Recently, the application has been updated to SQL 2000 with new components of Bhoomi being written on .net 2.0. New remotely-controlled servers with fully script-enabled features are put in place. The state data centre now has the complete data of 200 lakh records.

It can serve 1000 telecentres simultaneously and serve each of the telecentre in less than 5 minutes. The state data centre scalability has been tested by a third party, viz., Ernst & Young to show the robustness of its infrastructure.

## Impact Analysis

Improving the land record delivery system has a significant social and economic impact in rural areas. Nearly 2500 bank branches in Karnataka loan approximately Rs. 40 billion to farmers as working capital every year. A copy of the RTC is absolutely essential for the farmer to procure the loan. Effective land record management can help banks in recovery of such loans. In the long run, Bhoomi will help improve the investment climate of Karnataka by maintaining clean records of land ownership in urban and rural areas. A McKenzie report noted that India loses 1.3% of potential investments because of its poor land record system.

More than 70% of the disputes in courts are land-based. Adjudication of disputes can be faster if access to land records is made efficient. Many mutations in land records are challenged in courts. Such challenges are often upheld on technical grounds when the defenders fail to produce copies of notice that were served to the affected parties. As a million notices are served in a year, a manual storage and retrieval system makes it difficult to retrieve old notices for submission to courts. In the Bhoomi system every notice that is issued is scanned and a copy is easily retrievable from the Bhoomi kiosks. This facility in itself will create a huge impact on the resolution time of disputes. It will also reduce petty corruption for facilitating or hindering the process of retrieval of manual notices. The open access to data and the transparent and traceable mutation process will reduce the number of disputes.

Crop insurance has been made compulsory for those who take farm loans in Karnataka. Every year nearly one million farmers (15% of the farming community) insure their crops (paying Rs. 420 million as premium and collecting Rs.2960 million in damages). There has been a substantial increase in the number of insurers amongst farmers who have not taken a loan. Earlier, farmers could obtain falsified crop records from village accountants. As droughts usually destroy the entire crop, there was no way of verifying such records. Often, village accountants offered such favours to rich farmers who could afford to pay bribes. As insurance is a zero-sum game, the poor would suffer in future as premiums go up. With the implementation of Bhoomi, crop data on the back of the RTC is the only document that can be used to back a claim. As efforts are on to make the crop data more current (and accurate) and the VA more accountable for the data, corruption in the pay-out of insurance claims is likely to be reduced. At a later stage, insurance companies will be able to seek cropping data from a central computerised data base. This will make the insurance pay-out more equitable.

Bhoomi as a transparent land record system is a vast improvement over the manual system that it has replaced. The system is likely to facilitate the land sale and rental markets in Karnataka by reducing a part of the transaction costs. Many researchers have noted that any re-allocation of land in favour of landless and small farmers will increase their income and the overall agricultural productivity.

There is lack of data to isolate and assess the direct impact of the Bhoomi system on reduction in poverty levels. Total annual savings for farmers on the costs of obtaining an RTC are discussed later as a part of the cost and benefit analysis. These savings are particularly important for small and marginal farmers.

For a fee of Rs.15, a printed copy of the RTC can be obtained online in 5–30 minutes at computerised Bhoomi kiosks in 177 taluk offices. The land records are in the public domain. Copies of RTC can be obtained for any land parcel in the taluk by providing the name of the owner or the plot (survey) number and any record can be viewed through a touch-screen at a few kiosks.

Farmers can apply for mutation and expedite the process by reviewing the status of their request online, presenting documentary evidence to supervisors in the event that their request is not processed within the stipulated time period. With the computerised system, administrators can quickly determine the number of approved and overdue mutation orders. After computerisation, there was a 85% jump in the number of mutation requests. In the last year Bhoomi has carried out nearly one million mutations whereas in the previous two years, the average number of mutations carried out in the manual system were only at the rate of 0.55 million per year. This change would seem to indicate a level of approval of the new system by the population, and willingness to update changes in land ownership that were previously left undocumented.

## Report Card of the Public Affairs Council

Bhoomi is one of the few e-government applications that have been evaluated by an independent agency using a systematic methodology. An evaluation conducted by the Public Affairs Council, Bangalore in July 2002, showed significant impact on efficiency in delivery and corruption.

1.  **Ease in use of the Bhoomi kiosks:** Many users (66%) were able to utilise the Bhoomi kiosks with no assistance, in contrast to 25%, in the case of the manual system. Most users of the Bhoomi system (78%) found the system to be very simple. Many Bhoomi users (68%) had also made use of the manual system in the past; a majority of them (78%) found the Bhoomi system simpler.

2.  **Complexity of procedures:** Most users (79%) of the Bhoomi kiosks did so without having to meet any official except the counter staff, in con-

trast to 19% who had to meet at least one official, in the case of the manual system. The extent of complexity is reflected in the fact that 61% of the users of the manual system had to meet two to four officials for their work. Legacies of the manual system have not completely faded away. About 18% of Bhoomi users reported that their document was not signed by the appointed village accountant operating the kiosk and 6% reported that they filled out an application form (printed form) for issue of an RTC.

3. **Errors in documents received:** Users indicated that the Bhoomi kiosks provided error-free documents to more users (74%), in contrast with 63%, in the case of the manual system. Among those reporting errors, wrongly spelt names were the most frequent error (81% in case of manual system, and 53% in the Bhoomi system). However, major errors in land details were noticed by 31% of those who reported errors in the manual system, in contrast with 4% in case of Bhoomi users.

4. **Rectification of errors:** Given that errors are not unusual at this stage of development of the Bhoomi system, the efficiency of the response systems were analysed. Almost all users of the Bhoomi system had the confidence to complain and seek rectification (93%) as compared to less than half (49%) in the manual system. Half the complainants (58%) got timely response in case of Bhoomi, while such response was reported by only 4% of those using the manual system.

5. **Cost of service:** All users of the Bhoomi facility who wish to receive a hard copy of the RTC have to pay a fee of Rs. 15/- each and receive a receipt for the same. A large segment of users (66%) reported that they did not get a receipt for the payment they made.

6. **Hidden costs:** Citizens also incur hidden costs of time and effort to secure these certificates. Most Bhoomi users (79%) reported a minimal waiting time in the queue of 10 minutes or less, in contrast to 27% in the manual system who could meet the concerned official in such short time. The bigger issue is the number of times a citizen had to visit these offices to get the certificate. While most users got the RTC (72%) with one visit to the Bhoomi kiosk, only 5% got it that fast in the manual system.

7. **Reduced corruption:** The most serious issue is that of corruption and bribery. Two-thirds of the users of the manual system paid a bribe – 66% of them reported having to do so very often. In contrast, only 3% of the users of the Bhoomi system reported paying bribes.

8. **Staff behaviour:** While the technical capacity of the system plays an important role in its success, the approach of people who handle the task is of critical significance too. Most Bhoomi users (85%) rated staff behaviour at the Bhoomi kiosks as 'good'; none of the users of the manual system rated staff behaviour as 'good'.

Armed with genuine certificates, farmers can raise loans for a variety of

purposes and need not be easily harassed by bank staff. Mutations used to be an instrument for rural corruption, exploitation and oppression. Land-owners simply bribed the

VA to change the titles of poor farmer's lands to their own names. Small farmers, mostly illiterate, could do little to change this state of affairs, either because they did not know of it or because they could not afford the VA's bribes. Media reports (Fig. 1) quoting farmers makes it evident that after initiation of the Bhoomi system, such practices have become difficult. 'In one district in north Karnataka where feudalism still prevails, 32 farmers' lands had been recorded in the VA's name prior to computerisation,' Naga-raj says. 'The man immediately sold the lot before Bhoomi began. I know of hundreds of such cases'. Many reports in the print media have portrayed Bhoomi very favourably.

> "I have no complaints [about Bhoomi]", says farmer Basavenappa Angadi, president of about 40 farmer self-help groups in the cotton-growing Dharwad district of Karnataka, 440 kilometres from Bangalore. In Kengeri, a satellite town near Bangalore, farmer Byregowda too likes his new RTC: "This is now pukka [genuine]. The Village Accountant cannot change names anymore."

**Fig. 1** *Kudos for Bhoomi*

However, some early reports (based on small-sample interviews and an-ecdotal evidence) also pointed to problems and other limitations (Fig. 2). For example, Hanstand and Lokesh interviewed 23 users of the Bhoomi system in January 2001 in one centre and reported that 20 of the 23 farmers favoured the old system. Teething problems (the kiosk had been working for 6 months) like power outage for 5–6 hours at the kiosk seemed to be the main reason for the dissatisfaction with the new system. Many of these teething problems were overcome subsequently. One interesting aspect of Bhoomi is the constant improvements that have been made in the applica-tion, in response to the feedback received from various stakeholders. For example, the project has already decided to re-define the role of tahsildars and the deputy tahsildar in the process of mutation because the feedback suggests that their intervention causes delay (a problem mentioned by Han-stand and Lokesh). Some of the reports indicate that there could be a lack of awareness about how the Bhoomi system works. For example, even though there are no forms to be filled in the Bhoomi system to get an RTC, some reports in the media quote complaints in this regard.

> Ironically, while Bhoomi aims to help the poor, in regions like Bijapur in Kar-nataka, which has the highest demand for RTCs, it is the poor who appear to be struggling most with the new system. "We spend Rs 10 ($0.2) as bus fare to reach the town from our villages and pay Rs 15 ($0.3) for an RTC. Sometimes it takes two days because the queue is so long. The VA was better," complains Mehboob Modi Patel. Another farmer, Amsidda Irrappa Karnal, says, "I am il-literate. Who will help me fill up the application form [for the RTC] here?"
>
>     The project should help address gender inequality. Land ownership has long been a male bastion in India – in Karnataka women own just 12% of the

land – and this is reflected in Bhoomi. Women in Dharwad district do not know of the new system. Those from Kalakawatagi village in northern Karnataka say that they have not seen their computerised RTC, issued free by the revenue department in 2001 for personal verification. In Kolar Dsitrict, about 100 km from Bangalore, 42-year-old Pappamma, a feisty leader of some 200 women's groups, says she has visited the local e-kiosk several times to help women obtain RTCs. "But taluk officials themselves know little of the system and are in no position to even begin helping the women. They need training." she comments.

[Based on 'Flaws in Bhoomi: India's model e-governance project' by Keya Acharya. Received via e-mail]

**Fig. 2** *Impediments at the grass-roots*

## Elements of Empowerment

### Access to Information

- Bhoomi empowers the small rural farmer in many ways. Their relationship with the lower rungs of civil servants can be on a more equal footing. In the manual system, land records were maintained in registers to which citizens had no access. The records of land ownership in Bhoomi can be collected by anyone. Similarly, the status of mutation requests can be tracked online. The process has become transparent to such an extent that the clients can observe the stored image of their land records through a second monitor facing them. Farmers have access to complete documentation of notices and mutation orders in case of a legal dispute.
- Bhoomi will eventually make it possible for a 1000 rural telecentres to be established and be economically viable in Karnataka. These telecentres will help empower large segments of rural populations by enhancing access to information and services that will be delivered through the telecentres.

### Social Accountability

- There are many elements in the system that enhance accountability. The bio-login procedure, the use of encryption and public–private key ensures that the issue of RTCs and changes in data records can be traced back to the operators who were on duty and supervisors that gave the go-ahead. By specifying a first-come-first-serve basis for processing mutations and allowing the deputy tahsildar to pass mutation orders in case the RI does not pass the orders in 50 days, the power to harass has been taken away. If an application is pushed down in the priority order, reasons need to be assigned for keeping it in abeyance.

## Inclusion and Participation

- In the earlier system, a number of people, particularly the poor, illiterate and women may have found it difficult to obtain land records due to corruption, inefficiency, and cumbersome procedures. The Bhoomi system does not require an application to be filed in. Data is available to indicate that more people have started to collect RTCs and have also come forward to get data corrected when errors are found.
- Often, farmers go to bank branches in groups to process crop loans in the hope that corrupt officers will find it harder to demand bribes in the presence of other people. The convenience with which RTCs can be collected, facilitates this group approach.

## Costs and Benefits

The expenditure on data entry operations for about 2 million RTCs in 27 districts was Rs.80 million. The unit cost of providing hardware, and construction of computer rooms and kiosks was of the order of Rs. 0.64 million for each taluk. Thus, the total out-of-pocket expenditure on the project was Rs.185 million. This does not include the cost of software development (months of effort by nearly 100 individuals) done gratis by the National Informatics Centre. The cost of processing an RTC has been roughly estimated at Rs.13, assuming a life of 5 years for the hardware and an activity level of 2 million RTCs issued from all the kiosks (10% of all holdings). This cost includes an assumed operational expenditure of Rs. 2 for stationery, cartridges and electricity. The current user fee of Rs.15 seems sufficient to cover these costs.

The benefit in terms of man-days saved is approximately 1.32 million man-days per annum, leading to savings of Rs. 66 million per annum in wages. The weighted average value of bribe paid in the manual system was Rs. 152.46 per person, while that in Bhoomi was Rs. 3.09. Even if we reduce the saving by the fee that they have to pay, of Rs. 15, the net saving is Rs. 134.37, and translates to a saving of over Rs. 806 million annually.

## Potential Future Benefits

The system generates various types of reports on land ownership by size, type of soil, crops, owner's sex, etc, which would be useful for planning poverty alleviation programs, and supplying agricultural inputs.

Many other benefits will flow from centralisation of the data base. The application has been PKI-enabled so that computer-generated records can be digitally signed. In the future, banks will be persuaded to access land record data of farmers to whom loans are to be issued, directly from the

central data bases. As authenticated data would be available, there would be no need for farmers to actually collect the RTC and carry it physically to the bank. This would require that banks change their business process for providing crop loans to farmers. This will also help banks to plan in advance the quantum of lending required. Similarly, high court, district and taluk courts could access the data base for resolving legal disputes regarding land.

The system could also lead to better administration of the Land Reforms Act, such as enforcing a ceiling on land holdings. Bhoomi makes it possible to identify and aggregate all land of different types belonging to an individual in a given village. This identification is based on a *khata* number that links all such records. The Bhoomi project is making efforts to clean up the data on *khatas.* A citizen ID will be needed to link records across taluks and districts. An analysis of ownership by gender has indicated a large divide. Such analysis can be made public and lead to reforms that will correct the situation.

## Driving Factors

Computerisation of land records in India has had a checkered history. In 1985, a Conference of Revenue Ministers of States resolved to computerise land records on a pilot basis. In 1988–89, a centrally sponsored scheme on Computerisation of Land Records (CLR) funded pilot projects in eight districts. The projects were to computerise core data contained in land records, so as to assist development planning and to make records accessible to people/planners/ administrators. By 1991–92, the scheme had been extended to 24 districts in different states. However, a review in 1993–94 indicated that states were finding it difficult to sustain the project due to the non-availability of skilled manpower, hardware maintenance, etc.

In 1998, a comprehensive evaluation study conducted in eight districts of different states found that progress had not accomplished much. Some of the bottlenecks were:
- Delay in transfer of funds to implementing authority by the state governments,
- Delay in construction of telecentres and installation of computers and other equipment,
- Delay in development of appropriate software as per the requirement of the state government,
- Delay in supply and installation of the hardware by the National Informatics Centre
- Lack of adequate training to revenue officials to handle the computers, and
- Absence of good vendors for taking up the job of data entry work

By 1998 it was realised that a district was not the appropriate adminis-

trative level to computerise land records. In 1997–98, a decision was taken to operationalise the scheme at the taluk level for delivery of computerised land records to the public at large. Under this programme, the central government earmarked Rs. 0.4 million for the purchase of hardware, software and other peripherals for each taluk. Nearly 2500 taluks out of a total of 6000 were to be covered. During the Ninth Five-Year Plan (1997–2002), the central government released a sum of Rs. 1545 million. By the end of 2002, the scheme was under implementation in 569 out of 599 districts in India. Since inception of CLR, the central government has released Rs. 21894 million (up to 31 December 2001) out of which the states/union territories have utilised around 53% of the amount.

In spite of such a large expenditure, there are only a few scattered taluks where computerised land records are being issued. Karnataka is the sole exception where the system is working in the entire state.

Given the variability of the land record systems across India, a single system or software was unlikely to be usable at all places. The federal government did not have a clear vision of the strategy to be adopted for implementation of the scheme. Nor did they insist on a detailed system design and implementation plan from the states before funding. This was one project where a thousand flowers should not have been allowed to bloom. Each state should have had a well-coordinated strategy as in the case of Karnataka.

In most projects, there was lack of involvement of the Revenue Department officers and district administration in the project. At most places the quality of manual records was poor and therefore data entry systems had to be designed with great care. Data entry was done offline by private agencies but due to poor work culture, the process was very slow and error-prone. Lack of training of field functionaries on data entry process led to wrong and defective data base. The printed records were distributed to the farmers without proper validation. The pilots in Dungarpur district took 14 years to complete its first stage. There was confusion about roles among the staff, and a lack of institutionalisation of the project by the state government. It largely remained a district-level initiative. In a period of rapidly changing technology, the pilot could not emerge as a standard to be followed across other districts.

Some of the reasons why the CLR scheme has succeeded in Karnataka and not in a large number of states are discussed herewith:

### Commitment and Political Economy for Change

Unlike the neighbouring Andhra Pradesh where e-governance is seen to be driven by the chief minister, in Karnataka e-government implementation has largely been bottom-up through departmental initiatives and primarily driven by civil servants. Yet it is to the credit of the drivers of Bhoomi that they were able to harness a significant level of political support. The political executive was completely involved in the computerisation project.

The state chief minister and revenue minister highlighted the importance of the project in many public forums. The chief minister wrote regularly to all district deputy commissioners, exhorting them to get fully involved in the computerization. He also inaugurated a large number of land record kiosks. Meanwhile, the revenue minister regularly reviewed the computerisation process and also inaugurated a large number of kiosks. A committee of members of the legislative assembly (MLAs) visited the kiosks and witnessed its functioning. All this helped demonstrate that there was a strong political will for computerisation of land records. Perhaps a desire to project the Government's pro-poor image led the politicians to lend full support to the project.

### Institutional Innovation

Resistance from field staff was anticipated and conscious steps were taken to lessen it. To allay the fears of field officials that their job descriptions will change in a major way, 12 state-level information seminars were organised for 1,200 senior and mid-level officers. And four division-level workshops were organised to train 800 officials. These seminars emphasised that maintenance of land records was only one of their many functions and that computerisation will remove the drudgery of maintaining these records manually. Revenue officials would continue to be responsible for field enquiry. Reducing corruption was not a key message at these gatherings.

Selected field-level personnel were invited to participate in the software development process for various Bhoomi modules through a formal state-level Bhoomi committee. Meetings were held with participation from various levels in the department to elicit suggestions for improvement. Decisions taken at these meetings were incorporated into the software design. Nearly 125 man-months were spent on software development (Bhoomi has already been migrated to Version 3 and all taluks are now using the latest version).

Field supervision is critical in the rollout of any new system. The project leader in-charge preferred to appoint four independent consultants who could tour sites randomly in each division and report problems and progress of Bhoomi. Appointing consultants needed special effort, as the central government project did not permit such an expenditure. The expected cost was Rs.1.5 million.

The village accountants who would be in charge of the new kiosks were chosen very carefully. Young persons fresh out of college were recruited and trained at the headquarters. These officials had not experienced the power that a village accountant could exercise over rural farmers. The project leader (additional secretary of the department) personally participated in the training given to every batch of accountants to ensure that they felt complete ownership and a sense of importance in being assigned to this new initiative. Accountants were encouraged to talk to the project leader either at his home or at his office. Nearly 900 officials, including all deputy

tahsildars, were trained in the state headquarters, and more than 1,000 officials were trained by the Bhoomi consultants at the district level.

Partnerships were forged with many different agencies. Agencies like the NIC and private data entry agencies played a pivotal role during various phases of implementation. Since the departmental staff was reluctant to enter data, private data entry agencies were used. An elaborate mechanism was designed for validating the data to make sure that it mirrored the manual records that had legal sanctity. Every district was provided with a consultant to act as a bridge between the data entry agency and the district administration. After the system was operational, the consultant trained the taluk staff and helped the district administration in the daily work at the Bhoomi kiosk.

Moreover, private operators were provided for one year to handle online data entry at the Bhoomi kiosks to enable the village accountants to get completely trained. Village accountants took over the work from these operators after a year. A comprehensive training module was designed jointly by the department and NIC to train the accountants. Training lasted 7 days, 11 hours each day, followed by a paperless test on the last day.

*Learning and Experimentation*

Rollout of the application to 177 locations has been a challenge because of the poor quality of manual records and the enormity of the data entry task. In the first phase, the project was implemented on a pilot basis in a controlled environment at four taluks. After gaining experience in data entry operations and implementation of the software, the scheme was extended to one pilot taluk in each of the 27 districts. In the third phase, the project was rolled out simultaneously to all the remaining 146 taluks.

Based on early feedback on unacceptable levels of downtime at certain kiosks, a facility manager with stiff service-level contracts was appointed to maintain the computer system. This has resulted in the centres' satisfactory working. The minimum expected configuration (server, kiosk machines and power supply) in every centre is expected to be up and functional all the time.

National Informatics Centre (NIC), Bangalore, had created the data entry software for the earlier phase starting in 1992. Even though considerable effort was involved, the software was unable to handle all the variations in land titles. Further, the data entry by a private agency had several errors due to lack of data validation.

In 1998, workshops were organised at both the division and the state level to understand and correct software problems. At the division level, workshops lasted 4 days and involved about 800 people. At the state level, workshops lasted 12 days and involved about 1,200 mid-level and senior officials. These workshops resulted in the setting up of guidelines and requirements for the new Bhoomi system.

Following the workshops, the state government worked closely with NIC to fix the data entry software and to develop the back end Bhoomi software. NIC set up a team of four people to work full-time on Bhoomi. The technical director also devoted about 10–15% of his time towards the management of the team. The end product was a system that has now become a model to be replicated in all states.

Incidence of a forged RTC in one of the taluks prompted experimentation in making the printing process secure so that forging a document would become difficult. Various options such as the use of holograms and bar codes were evaluated. More sophisticated solutions that encode and print the key contents of the land title as an image (like bar codes) on the RTC are being tried. Decoders supplied to key users will be able to decode the image to authenticate the RTC.

The system has been responsive to feedback from the clients. The system of charging a mutation fee for every survey number in a farmer's total holding was seen to be detrimental to farmers with very fragmented small holdings. A new algorithm is now used to calculate the fee on the basis of total holding and number of parcels.

## External Catalysts

The state government would not have generally taken up a project of this magnitude involving an upfront investment of Rs. 200 million. The central government's funding was the key catalyst that enabled the project champion to sell the idea within the state. Healthy competition with the neighbouring state of Andhra Pradesh, which seemed to have moved much faster with reforms and electronic governance, was another reason that spurred the state of Karnataka into action.

External recognition in the form of awards and positive feedback has also been a major motivator for the Bhoomi team.

## Lessons Learned

The success of Bhoomi goes against the traditional wisdom of improving service delivery to the poor which emphasises more investments to create a greater reach of delivery points. Bhoomi has reduced service delivery points from 9000 to 177 and is now in the process of providing 800 points, but consumer satisfaction has increased. Often, a large number of delivery points cannot be monitored centrally. Unless there are ways in which monitoring can be done by the community (presuming that an equal voice can be created for all groups), such large systems become inefficient.

Implementation of land record computerisation has been difficult in India. Bhoomi succeeded with the efforts of the project champion (the de-

partmental head) who worked a 15-hour day for over 12 months, devoting 80% of his time to the project. The fact that the project champion has had a tenure exceeding 6 years (still continuing) has been a very important factor in stabilising the system. Minimising resistance from staff by harnessing political support was an important contributory factor. Extensive training coupled with a participatory style of management has also helped to diminish resistance.

Project managers need to balance the potential benefits of the system against the risk of implementation failure in deciding how much reform (re-engineering) to tackle at any one time. In Bhoomi, significant benefits are delivered in issuing RTCs, but much of the old mutation process remains unaltered. There is no change in the role of the revenue inspector in passing the mutation order. Some other changes in the process may impact corruption in the mutation process. Bhoomi has reduced the discretion of public officials by introducing provisions for recording a mutation request online. Requests are processed on a first-come-first-serve basis. Another officer can pass a mutation order if the revenue inspector delays it beyond a limit. Farmers can now access the data base and are empowered to follow up. They can also detect fraudulent mutations. Reports on overdue mutations can point to errant behaviour. Still, supervisors must examine the reports and take appropriate action. In remote areas, operators may turn away citizens by telling that the system offering online services is down. Strict field supervision is needed (through empowered citizens committees and NGOs) to curb such behaviour. Ultimately, the only recourse that a citizen has against such practices is to lodge a complaint. The process for lodging a complaint should be facilitated through the web. The back end has to be geared to handle complaints received electronically.

As an implementation strategy, manually written RTCs were declared illegal from the day on which the computerised system became operational in a taluk. The notification was issued on a taluk-by-taluk basis as and when the scheme became operational there. This forced the department and the farmers to completely rely on the new system. The strategy worked because the application design was robust and did not falter.

There was some concern in Karnataka about raising the user fee from Rs.2 in the manual system to Rs.15. Often these fears about user fees are exaggerated, particularly if services have genuinely been improved. The response of the farmers at taluk-level has been overwhelming.

Soon after the initial success, elected representatives, district officials and farmers made demands that Bhoomi be extended to the sub-taluk level. Presumably, the project was considered an unqualified success. However, this expansion would have increased the costs without necessarily increasing the number of RTCs that would have been issued. The department did well to resist the temptation to expand as it would not have been able to monitor and support a geographically spread out operation. In any case, systems should be allowed to stabilise and prove their sustainability over a 2-year period before attempting any replication. In the 1980s, a DRDA

computerisation project called CRISP was replicated in 500 districts in a hurried manner. The expansion turned out to be a failure.

The department did well to explore other possibilities, short of direct expansion, that could make RTCs available at the sub-taluk level. Plans to allow private rural kiosks to issue copies signed through the territorial village accountants may never have come about if a hurried expansion of the Bhoomi system had been made. If such copies can be accepted by banks and verified by accessing the departmental data base, the need for signed copies will be reduced. A solution may emerge through wider consultations with the ultimate consumers of these documents.

Bhoomi succeeded because its design is robust, it targetted a critical need for farmers and delivered significant benefits by re-engineering land record processes.

Projects that are intended to benefit rural populations need to recognise the high level of effort that is needed to make rural population aware of the reforms that have been instituted. There is some feedback that in spite of the considerable publicity given to Bhoomi, farmers may still not understand the implication of all the reforms that have been carried out. Farmers need to be made aware that there is no need to pay bribes because the functionaries would no more be able to misuse their authority to benefit or wrongly penalise anyone.

## Replication of Bhoomi in India and Other Countries

The potential of information and communication technologies in impacting the lives of rural poor has been recognised but harnessing it has been a challenge. By its ability to serve as a *killer application* that can make a large number of privately owned rural internet kiosks economically viable, Bhoomi has shown the way to bridge the digital divide in poorer countries.

Although, the direct impact of Bhoomi on rural poverty can not be easily measured, there are many ways in which Bhoomi helps the poor farmers, as was discussed earlier. Recognising the importance of accurate land records, the Ministry of Rural Development, Government of India, funded many projects including Bhoomi to computerise land records in different states in India. After the success of Bhoomi, the Ministry of Communication and Information Technology (MIT) has taken up the replication of Bhoomi in other states under a special programme titled "Roll out of successful e-government initiatives." Under this program Bhoomi is one of the three e-government initiatives identified for a country-wide roll out. MIT is providing funds for pilot implementation of Bhoomi in one district of each of the 13 states that have volunteered to implement Bhoomi. Leading management consulting companies have been chosen to support the roll out effort. MIT is providing the funding for these consulting agencies.

The consultants are expected to capture knowledge and experience from successful projects and transfer such knowledge to the agencies involved in

pilot implementations. The project recognises that the replication need not necessarily involve the use of the same software as was implemented in the successful application. It is more important to capture the processes that lead to successful implementation such as digitisation of manual data, re-engineering of processes, involvement of all stakeholders and management of change. The consultants will prepare a report outlining the implementation plan, which defines the scope, outcomes, and the technology and business model for the proposed pilot implementation.

One of the key problems in replicating the Bhoomi system is the fact that the documentation of procedures that govern the mutation of land is poor across all states. In addition to legal provisions that are documented, there are several procedures developed on the basis of conventions that have evolved over many years. It requires significant effort to understand and document such procedures for designing a computerised mutation process. The computerised system needs to have the ability to handle different ways in which a mutation can arise. It took almost seven years for the Bhoomi project to understand and document these procedures. In most other states, the tenure of project managers is too short to allow them to undertake such an exercise.

In considering Bhoomi for replication it should be noted that Bhoomi does not lead to security of land tenancy for farmers who till the land of other owners. During the land reforms in 1970s and 1980s in India, the tenancy system was scrapped and land was granted to the tiller. However, in terms of ground reality, there could be a large number of tenants still tilling the land of other farmers without having any legal rights. The reforms needed to establish tenancy rights are more fundamental in nature. Clearly Bhoomi has little impact on securing such rights.

It must also be emphasised that Bhoomi does not provide a title. The RTC issued by Bhoomi has only a presumptive value. In a titling system, the accuracy of the data base maintained by Bhoomi will be guaranteed by the state. In case an owner loses the ownership of a land because of legal process or otherwise, the state would be required to compensate such owners. A land titling system can only be built upon records that are clean and maintained in a manner so that they cannot be tampered with. Given the poor quality of land records in many states of India there is no state (in fact, there are few countries) which has moved to a title system. Encouraged by the fact that Bhoomi will further clean up the data because of constant usage and openness of the land records, Karnataka has now embarked on a journey to move to a land titling system in the next few years.