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APPLICATION OF PHOTOGRAMMETRY AND REMOTE SENSING-LAND REFORMS IN INDIA

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ABSTRACT : The paper discusses the application of photogrammeting and remote sensing in aid of land reforms in India.

INTRODUCTION

The vital importance of Land Reforms and their effective implementation, especially to India, whose economy is predominantly agrarian, cannot be over-emphasised. Here, it would be pertinent to reproduce a few extracts from the Proceedings of the Conference of Revenue Ministers on Land Reforms etc., held on 18th May, 1985, in New Delhi.

" During the Seventh Five Year Plan, food production is proposed to be increased to the level of 180 million MTs. a year, against 150 million MTs. at the end of the Sixth Plan. No amount of food production could be of any help unless we develop purchasing power by providing work to the poor. We have to generate employment for the poor with the long term objective of brigning down the percentage below the poverty line from 40 per cent to 10 per cent by 1995. Land Reforms are important in achieving food production and providing work situation in agriculture " (3.1 page 4 of Ref. 1).

" For free flow of agricultural credit, uptodate land records are a necessity. The revenue machinery, the oldest department of the State Governments has to be revitalised and geared up for uptodate maintenance of land records which are now required for diverse purposes like planning agricultural credit, crop insurance, food procurement etc. Pass Books with legal status should be issued to all cultivators whether they are owners or tenants. Non land record States must take action to introduce land records as a time bound programme. The revenue machinery at the village level and the immediate higher supervisory level needs to be strengthened in the weaker States with trained functionaries. Uniform format of land and crop based statistics for the entire country should be attempted which will make the agricultural census, also easier. Computerisation of these statistics could be tried on pilot basis. A Generally Sponsored Scheme in this regard is also proposed during the Seventh Five Year Plan ". (Extract from the speech of Sardar Buta Singh, Minister of Agriculture and Rural Development (page 30 of Ref. 1).

After the attainment of Independence in 1947, several measures have been taken by the Government to bring in the much needed Land Reforms to improve the lot of the agricultural peasantry, some of which are mentioned below :

(i) Abolition of Zamindari and intermediary tenures.
(ii) Abolition of bonded labour.
(iii) Legal and social protection to the tenants.
(iv) Ceiling on Land Holdings and distribution of ceiling surplus land to the landless.
(v) Financial assistance to assignees of ceiling surplus land.
(vi) Consolidation of Holdings.
(vii) Conferment of homestead rights and provision of house sites to the homeless.

(viii) Identification and allotment of waste-lands for social forestry.
(ix) Protection of interests of tribals.

PHOTOGRAMMETRY AND REMOTE SENSING IN AID OF LAND REFORMS

It will be readily appreciated that the success of the above schemes launched with a view to bring about economic social emancipation of the masses, depends largely on their effective implementation, which in turn, is dependent on the availability of thoroughly reliable and comprehensive land/socio-economic data in the desired format, with the Planners/Administrators. Whereas with the traditional method of collecting the entire spectrum of socio-economic and land data needed for decision making for development planning and land management depended almost wholly on the lowest revenue functionary (and it could not always be ensured that completely realiable and comprehensive data was readily available in the desired format), the latest technology of Remote Sensing and Photogrammetry (combined with a minimum of ground work) provides a ready answer. The Satellite imagery and other data obtained from the Satellites orbiting in space, enable a synoptic and repetitive view of a large area (185 km $\times$ 185 Km. in one scene) which provides the Govt. and other agencies, with the general information required for regional planning, such as, vegetation cover, waste lands, cultivated areas, terrain characteristics, flood plains, rivers and water bodies, damages due to natural calamities, etc. And, the detailed information required for the purpose of land management and development schemes can be obtained with economy, speed and accuracy, from the aerial photographs (on different scales)–remotely sensed data obtained from sensors installed on aerial platforms. These can be used for collection of information/data, essentially required, for effective implementation of land reforms, some of which are mentioned below :

(i) Cadastral Surveying and Town Surveying, on scales large enough, for the purpose in view.
(ii) Topographic mapping on different scales, required for preparation of base maps.
(iii) Soil classification/land use mapping.
(iv) Density, type and quality of vegetation/forests.
(v) The identification of crop, its quality and density for estimation of crop yield for agricultural census/revenue taxation etc.
(vi) Classification of land, whether irrigated or not, and if so, from canals, tubewells or tanks etc.
(vii) Identification of waste lands and formulation of schemes for their reclamation.
(viii) Location of infrastructural facilities, such as Banks, Agricultural repair and service Centres, Educational Centres, Post and Telegraphs services, Markets etc.
(ix) Development of water resources, mineral resources, etc.
(x) Anti-erosion measures/preservation and improvement of environment.
(xi) Location of Dam sites, study of schemes for irrigation/Hydro-electric power generation. Sites for power houses, colonies etc.
(xii) Human settlements-slum clearance, planned development of existing towns/new towns.

For collection of a variety of information, aerial photographs of differenf specifications can be obtained and used. The details are not repeated here, and may be had from the departmental Pamphlet "Aerial Photography–An indispensable tool for developmental planning and surveys, and Indenting Procedures for aerial Photographs", avai-

lable with the Director, Survey (Air), Survey of India, R. K. Puram, West Block No. 4, Wing No. 4, New Delhi. The scales of photography for different uses are mentioned at the end of the Pamphlet.

It is important that the latest technology of Photogrammetry and Remote Sensing should be integrated with any schemes for land reforms and development. The experiment carried out in 1979–81 for preparation of cadastral survey maps by using rectified aerial photographs in Mandsaur District of Madhya Pradesh, has proved beyond doubt that the technique not only provides maps of the desired accuracy (otheriwise obtained by ground methods), but is also much cheaper.

It is further important that computer techniques are urgently introduced for maintenance of land records, their updating, retrieval, and supply of information in the desired format for various purposes of land management–fiscal, legal and economic. The continuing pressure on land due to population explosion, escalation in the cost of land, and the dynamic changes taking place in the land use pattern, etc. have made this a matter of urgent necessity. I would, therefore, repeat the suggestion made by me at the recent Cadasral Survey Seminar held at Dehra Dun, in September, 1985.

" Complete technique for capture of data, its structured storage, processing, updating, retrieval etc. have to be thought of and planned for the future, if the changing requirements have to be effectively met by use of evolving computer-assisted techniques. It would, therefore, be in the fitness of things that the State Govt. consider setting-up of high powered Committees (under the Chairmanship of Revenue Minister) with concerned Secretaries to Govt. and the Regional Director of the Survey of India as members, for an in-depth study of the perspective needs (say for next 15 years) of the Cadastral Survey Departments, and to plan the organisational growth, keeping in view the latest developments of this technology in India and abroad ".

In fact, there is an urgent need to set up a land information system so that we are fully geared for effectively coping with the multi-disciplinary and multi-dimensional present and acticipated future problems, connected with Land Reforms and their implementation. In this connection, attention is invited to the Keynote Address of Major General G. C. Agarwal, Surveyor General of India and Vice-President, International Cartographic Association, delivered at the " Workshop on Land Information System–Inputs to Planning " in October, 1985 (Ref. 3), for extremely valuable information and suggestions.

TRAINING NEEDS AND ORGANISATIONAL GROWTH

The success of any measures/schemes depends largely upon the effectiveness of the agency responsible for their implementation. It is, therefore, necessary that the revenue officials engaged in this work of vital importance are trained/re-oriented in the use of the latest techniques. The inertia to change from any prevailing methods/practices to newer ones, however better they may be, is quite natural and should be expected. We have, therefore. to make concerted efforts to overcome it and to introduce the latest technology, so that the benefits of land reforms do reach the common man. The suggestions made by me at the last Cadastral Survey Seminar held at Dehra Dun in September 1985, are still relevant, and are repeated below :

" What is really needed, is, not just one Survey Training Institute, at Hyderabad (which may not even be quite convenient for all the States to send their trainees and survey professionals to, especially for long duration courses), but about 5 to 6 Regional

Centres well distributed in the country. The location of the proposed centres and the details of the various courses to be run will have to be worked out, to adequately meet the needs of the conerned States. It is also essential that for uniformity, the various courses are standardised, and competent, well qualified and experienced instructors are appointed, for the purpose. It is desirable that all the instructors in the Regional Training Institutes should, themselves, have received training at the Survey Training Institute, Hyderabad. Also, senior level courses could continue to be carried out at Hyderabad, centrally ".

" It is important that the personnel who are recruited for carrying out cadastral surveys in a State should, apart from posessing a good measure of social sensitivity, have adequate educational background, so that they can absorb the latest technology which is being evolved for the purpose of survey, data collection, its processing, updating, and retrieval, etc. In this connection attention is also invited to the Resolution No. 6, for introduction of Aerial Survey Techniques. Amendments to existing Acts for accepting measurements from rectified Aerial Photographs of laid down specifications etc. may be required, and action as appropriate, should be initiated. If future Cadastral Surveys are to be carried out by using aerial photography, the scale of photography, its periodicity, ease of its availability for use, technology transfer, and all other relevant matters have to be considered, and decisions taken thereon. In fact, we could also consider whether the owner of a piece of land could be provided also with a copy of the rectified photo/orthophoto map of his property and surroundings, duly authenticated, for his record and reference. This is something he can easily co-relate/ translate on the ground, and would greatly value in addition to his legal deed of Registration ".

RECOMMENDATIONS

The area of the entire country should be got covered by aerial photography on scale 1 : 10,000. The cost involved being less than Rs. 2/- per hectare is nominal, when compared with the enormous benefits that will accrue, from this most valuable record, to the Survey and Land Records Departments, Town and Country Planning Organisations, Forest Departments, Irrigation and other Project authorities, Scientific bodies, Socio-economic Institutions, Administrators, Planners, Educationists, and a host of other potential users.

Facilities should be available with Town Planning Authorities to acquire small format (35 mm) Photography (by use of micro-light) of the fast developing urban areas, for effective control and monitoring of their development plans.

Restriction policy on aerial photographs should be liberalised, so that the photographs (atleast of the unrestricted areas) are easily accessible to the numerous users. for their free and open use.

Regional Training Centres (5 to 6 in the entire country) should be set up for teaching photogrammetry and photo-interpretation to land Surveyors and Professionals engaged in different disciplines.

Elementary Map reading and interpretation alongwith elementary Photo-interpretation and Remote Sensing should be taught at the high school level, so that the students are made aware of the need and importance of this knowledge.

There should be effective monitoring of the implementation of the 15 Resolutions adopted at the last (VIII) All India Cadastral Surveys Conference, so that full benefits are taken from the deicisions.

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