PARTICIPATORY GIS FOR JUDICIOUS WATER RESOURCE MANAGEMENT IN CANAL COMMANDS OF EASTERN INDIA

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Abstract:
Participatory GIS is a spontaneous fusion of participatory forms of developmental planning with modem information technologies. Concerted effort was made for mapping natural resources through participatory approach in sixteen villages of RP Channel 5 distributary command area and 22,000 plots were mapped through a combination of DGPS and LASER range finder technologies with the help of Pocket GIS software in Huskey and Pocket PC under DFID-NRSP supported project at ICAR-RCAR, Patna. Direct observation data were recorded on the Palm IIIXE hand held computer. Data in the Palm were integrated with the maps in Arc View GIS to produce basic large-scale maps. Direct observation (DO) data regarding date of sowing of crops, tillage practices, source of irrigation and methods of irrigation, location of outlets, outlet commands, tube wells and presence / association of different self-help groups in the villages were recorded against each plot by member of self help groups (SHG). Integrating maps with DO, different thematic maps were prepared. Farmers’ responses regarding the maps were collected and they found the maps useful in many respects. Information extracted from the thematic maps revealed that 55 outlets existed in the study area covering 1276 ha command area. There are 325 wells in the command area, out of which 257 are shallow tube wells, 24 are deep tube wells and 44 are open wells. Tube well water was used for nursery raising in 36 ha, ..for conjunctive use in 134 ha. and for crisis management in 374 ha command area. During Kharif season, 1117 ha area was covered under paddy. Timely (before 50” July) transplanting was done in 40.6% of the area, while it was late in 38.6% and very late in 20.8% of the area. Offline linkage between maps and water balance model (developed under the same project) of hydrologists has been established to develop a Decision Support tool for generating water availability scenario under each outlet command in controlled and uncontrolled outlet situation for facilitating water management related interventions by outlet management group. Distribution of 150 self-help groups and their income generating activities were spatially and temporally monitored and compared with the help of the map. Dialogues have been initiated with SHGs for promotion of agriculture-based activities by the groups in the villages and taking participatory resource management decisions as evidenced from personal discussion with representative of groups. Dialogue among project team members and State Irrigation department stakeholders using DSS for problems and solution has been initiated for future uptake.

About the Author:
Dr Biplab Saha, Ph. D (Agri Physics), Principal Scientist (Soil Physics) of Indian Council of Agricultural Research has 24 years of research experience in the field of Participatory Water Management, Participatory Watershed Management, Soil and water conservation, Application of Geo-Informatics in Natural Resources Monitoring and Management, People’s Participatory GIS (PPGIS), Climate Change and Life Cycle Analysis of Jute. He has 150 research publications in different journals, book chapters and abstracts of seminars and symposiums. He has handled various national and international projects and attended several national and international symposiums in India and abroad.
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**Introduction**

**Methodology:**

Differential Global Positioning System, LASER range finder, Huskey, Pocket PC, Solar panel and Palm IIIxe hand held computers were used for plot to plot mapping and recording direct observation data. Demarcation of village boundaries and ownership of plots were confirmed by key informants. Plot maps were started with pocket GIS software in Windows CE operating system and direct observation data were recorded in the Palm using Satellite Form Software. Plot maps and direct observation data from palm were integrated in a GIS environment to develop thematic maps using Arc View 3.3 software. Thematic maps of infrastructure, villages, plots, outlets and their boundaries, land types, land use, soil types, crops, date of sowing, source of irrigations, methods of irrigation and drainage directions were developed. Location of Self Help Groups and their economic status were also developed. Initiation of dialogues with stakeholders regarding use of thematic maps and future management strategies in respect of soil, water and crops towards increased productivity and improvement of livelihood was initiated.

**Results:**

(i) **Use of GIS & Maps:**
- Scientists discuss cropping patterns and land use possibilities
- SHG discuss potential cropping patterns and livelihood alternatives
- Irrigation engineers identify wasteful spillage of water from upstream outlets and design improved outlet management
- Location and design of outlet structures
- Operation of outlet structures
- Scientists link GIS to spreadsheet water balance model
- Assess alternative water rationing regimens
- GIS used interactively to dialogue with WUA and SHGs on water management

**Decision Support System (DSS) tools through linkage of PGIS maps and model**

(ii) Thematic maps generated through linkages of Water balance tool and GIS mapping used in Water Balance tool which estimates that with the uncontrolled outlets, water loss through surplus flow is 32.19 % and water applied to field only 35.38% (Fig.1) and predicts that if all the outlets have controlled flow, 25.99% of water loss due to
Conclusion:

- Participatory GIS is a convenient tool for natural resource survey
- Thematic maps developed are useful to villagers as it reduces land related conflicts, enhances land consolidation, helps in water management and gives qualitative information about their plots
- Selp Help Group members found opportunity to generate income through spatial and temporal monitoring of resources and to choose income generating activities for improving their livelihoods
- Decision Support System for local water management institutions and irrigation planners can be developed through integration of participatory GIS maps and water balance model