

SRI/JGK: March 20, 1995

PROPOSAL for PILOT PROJECT

# Electronics in the Service of Rural Development

By  
J. G. Krishnayya

Systems Research Institute  
17-A Gultekdi, Pune-411037

[Geoconcept@vsnl.com](mailto:Geoconcept@vsnl.com)

March 20, 1995

(Full text available for free download) (9 PP)

## A. FM Radio at District-level to accelerate development Communications.

In June 1976, the **IPAG Journal** of the Department of Electronics carried an article proposing the use of district-level "**Community**" **FM radio** stations to boost communications about development programs and activities, keep local agro-based Commerce fully informed (e.g. by broadcasting daily the prices at various *mandis*); to provide an integrating mechanism for school education upgrading efforts (through Panel discussions, Question and Answer Panels, Inter-School Contests, Special Lectures, Telephone book-ups to schools for feedback etc.); and to socially knit together the district through better sharing of local history, geography and cultural festivals, as well as music and theatre.

Today this can be implemented in its true spirit at very low cost because the most expensive single item - the antenna - already has been built for the local **TV Relay Centre**. Only a low cost **3KW transmitter**. and minimal studio facilities are needed. (*It is understood that Times FM in Bombay operates in a total space - offices and studio - of 800sft, and uses equipment costing less than Rs. 5 lakhs.*)

Today Battery-powered (pocket sized or portable) FM receivers cost Rs. 300, and are therefore affordable in rural areas. They can be carried on a plough if need be, or a tractor. Their use is not at all restricted to the evening hours as TV is.

It should be noted that this type of broadcast medium which is received easily by the target Group, is an essential part of any programme to make known, or to popularise, or to commercially introduce any other new technology - specially electronic - which may be developed for or in rural areas, such as:

Dowsing Instruments  
Flow Meters  
Flow Recorders  
Soil-moisture recorders  
Drip Irrigation monitors, etc.

It is therefore of the utmost importance to the Doe that such a medium come into being as early as possible.

It is suggested that each station should be manned by 2 full-time and 2 part-time persons from **All India Radio staff**, with guidance on relevant matters provided by a **District Broadcasting** consortium drawn from

The Health Department  
The Education Department  
The Zilla Agriculture Department  
The Local University/Colleges  
The nearest Agriculture University.

The station would draw up a six-monthly plan of operation which it would put up to the Consortium for

Approval. The approved plan (signed by all members) would be executed by the station with the help of trainees from the local **College** or **University**, thereby keeping operating costs down.

The tape-recorders CDs and other equipment used in the station would be procured keeping in mind that there is no intention of having a super-high-fidelity station. At the same time, some quality standard for such stations ought to be set on a nationwide basis for procurement.

>>>**Staffing:** It is suggested that each station have only 2 full-time staff (one engineer and one programme-side person) while the main work for the station is done by the existing AIR station staff on a part-time basis, and volunteer and trainee help from outside. Obviously one of the part-time staffers would have to function as the coordinator for the volunteers and for the other part-timers. The station can only be economically run if it is visualised as a Low Cost, Participative, Responsive System, and not a Bureacracy.

The cooperation of the nearby University and of the Distance-Learning Centers and of the extension departments of the nearby colleges and Universities will go a long way to making a success of the Pilot Project.

A successful pilot project will have the following results:

1. More rapid absorption of the latest agricultural and processing technology.
2. The creation of a stronger sense of community among the residents of the District, and of sharing in such things as Emergencies, Fire, Crime,. Medical emergencies, Blood Donations, Work for the handicapped, etc.
3. Quicker dissemination of information about Agricultural Market Prices, and about Input prices and availability; leading to higher real incomes among among the farmers
4. Much more lively Educational programmes intra-district and inter-district; involvement of the students in the Environment and in Conservation issues; direct participation by students in classes held by experts, etc. (Using telephone hook-ups to the studio).
5. A stronger voluntary sector and cultural life because of the mass medium made available through the FM channel. This will have many fallouts, all of them positive.

>>> **No. of Projects and COST:** We suggest that DoE could take up one or two pilot projects in Bihar, West Bengal or Orissa, at a budgetted total cost EACH of Rs. 20 lakhs: Rs. 5 Lakhs (capital) and Rs. 15 lakhs (to cover 3 years recurring budget deficit due to running costs and the cost of 2 full time & other part time staff; extension activities; coordination, etc.).

If DoE prefers, the recurring costs could be transferred to AIR & other departments, while DoE financed electronic aids for remote linkages, including such things as many (**50 - 100** (?) cassette tape reorders distributed around the district; FM radios for all the middle schools and two-five sets for each High School in the District; a studio-on-a-jeep for field interviews, and other latest electronic devices as they become available.

## **B. Add-ons to THEMAPS/DIGITIZ Mapping Software to meet the need of NGOs Doing Micro-Watershed Planning at Village level**

- i) Coming out of the experience of the **Society for Rural Industrialization**, Ranchi in Village-level participative Land-use planning, is the need for computer Support of the Spatial data about villages & watersheds (i.e. data represented by and on Maps).
- ii) Coming out of the experience of the **B.A.I.F.** during their current project on use of GIS for micro-watershed analysis and planning, primarily of water structures, is the desirability of doing this work CLOSE TO the **site of work** and the fact that even with 3 skilled and experienced GIS technicians using the expensive, imported PC-Arc-Info system with plotter and digitising tables (total investment of ca Rs. 14 lakhs) their capacity is just 5 GIS Projects per year (and one thematic mapping-on-state-maps project

involving 4 state maps. All their watershed projects are in districts adjacent to Pune. The output-to-capital ratio, apart from overheads of BAIF offices, etc, comes to nearly 1 project per Rs. **3 lakhs of equipment**.

>>> What follows from this is that the cost of depending upon imported software is too high for countrywide adoption of the practise. AS MANY AS POSSIBLE NGOs should '**be empowered**' to do their own micro-watershed planning using less expensive technology. Being closer to the local scene, with better access to the field and to the raw maps, and with only one watershed to work on at the start, each NGO is likely to be able to function without requiring trained and experienced GIS technicians. There should be hopefully, one NGO in each region of the country - later one in each District - which can analyse its own Watersheds and also extend help to other NGOs in the region.

[This less-expensive technology options also opens up local hardware production possibilities: It might well include a low-cost (light-duty) A-2 size digitizer (say a Roll-up **type device**), costing \$400-700, imported in bulk, inserted into a supporting frame for a longer life, and equipped with a suitable-for-India power supply unit, and resold to the NGOs). See the section on Instrumentation where this technological adaptation could be undertaken and performed in a rural area.]

>>> A very important part of this less-expensive, relevant technology must be the indigenous software package, which

- Performs the needed tasks,
  - Requires a minimum of hardware,
- and, in any case, nothing beyond the typical PC configuration as available in an operational NGO.
- Whose specifications are responsible to the felt needs of NGOs
  - For which training is available locally at a very reasonable cost
  - And, most importantly, for which an NGO user by himself or herself, in a faraway place can feel Confident that guidance and help are available to help them get started effectively.

## Computer Sophistication among Village-level N.G.O.s :

During February 1995, the **IST, Ahmedabad**, held a Workshop for NGOs working at field level in different locations. A questionnaire was distributed among these N.G.O.s as well as to 60 others whose addresses had been obtained. Thirty replied. They already had among them 50 computers. Only *10 reported no computer use*. They are using them for a variety of applications, but not yet for mapping. All thirty expressed a keen interest in this application, especially if the cost of the software was reasonable (in Indian terms).

However, it must be understood that these are all operating \_rganizations, with targets to meet, and with little time or patience to understand the "constraints" of software and hardware. In short, the software must be made **EXTREMELY EASY TO LEARN, VERY FORGIVING OF THE USER, and NOT REQUIRING A GIS SPECIALIST** to use. None of these qualities characterize existing GIS software. The **THEMAPS desktop mapping** package, however, has had it as one of its objectives from the start to be **END-USER-ORIENTED**. In this it has succeeded.

## Resulting Solution Mechanism:

We are therefore suggesting that

1. the **THEMAPS** and **DIGITIZ** software system be augmented and modified to meet the needs of village-level micro-watershed planners, and that
2. a special system of training and support for the NGOs be created and placed on the ground in the first instance (a 3-year project is proposed); along with
3. improved versions of the software after obtaining User Feedback.

## Critical Requirements

The critical requirements of micro-watershed...level mapping software, and of

the project to introduce its use, are:

1. The ability to digitize Village maps separately and to **stitch** them together later.
2. The ability to create contour information from a variety of basic sources in the field.
3. The ability to do a variety of specific analyses required for better land-and-water management, including *dam* and lake profiles and storage volume; Poligon intersections, etc.

rn

## Other Requirements :

4. Various other requirements will be projected by users as they get used to the system and as the villagers begin to be beneficiaries of the system. These will need to be added in various Updated versions over time.
5. Comprehensive User documentation and explanatory material, written and edited and revised from the User's point of view. Teaching materials and small Case Studies that can be taken up in class.
6. **Training** Courses at two levels presented at different places in the country.  
(After a 4 month period the first round trainees should return for a 4-day refresher Course.)
7. A cadre of support persons who will visit the users for a period extending to a week or me after a course to give them confidence and to get them effectively started on independent work.

>>> **TOTAL COST: (Three Years 18 man-years).. Rs. 36 lakhs** (includes development of V 1.0, 1.5 and 2.0 of the system)

### Manpower summary:

<b>Project Leader:</b> 3/4 Man-year @ Rs. 150,000	112,500
<b>System Software:</b> 5 Man-years @ Rs. 75,000/yr	375,000
<b>Application Experts:</b> 8 Man-years @ Rs. 60,000	480,000
<b>Applications Support:</b> 4 Man-years @ Rs. 45,000	180,000
<b>Other Support Staff:</b> 1 1/2 Man-years @ Rs. 40,000	<u>60,000</u>
<b>TOTAL:</b>	<b>12,07,500</b>

### Equipment Summary:

Hardware (3 PCs; Inkjet Printers; map input equipment; Dot-matrix printer; UPS)	4,50,000
Software (2 x Windows tools; 2 x Visual C++; 2 x other software tools)	<u>2,50,000</u>
<b>TOTAL:</b>	<b>7,00,000</b>

### Other Project Costs:

Training Courses related expenditure (10 Course)	3,50,000
Documentation, Literature & Maps procurement	1,00,000
Travel	<u>1,00,000</u>
<b>TOTAL:</b>	<b>5,50,000</b>

### Overhead Costs:

At 30% of Total	7,35,000
-----------------	----------

### Miscellaneous:

Adjustment for Increments & Inflation	<u>4,00,000</u>
<b>GRANT TOTAL:</b>	<b>35,92,000</b>

Rounded off to : Rupees THIRTY Six Lakhs.

**C. DECISION SUPPORT SYSTEM**  
*for Government functionaries at District-level*

The recent survey undertaken by Dr. Kulkarni of Pune, with TIDCO (Madras) in 7 states of the **Felt Needs of Villagers**, has brought out that they want:

- **ROADS** giving better connections to Taluka and District Headquarters - Drinking Water (Adequate and drinkable)
- Primary Education (Teachers; Teachers-with-training; adequate classrooms for Classes I-IV)
- Health Facilities (Access to Subcentre/PHC; adequate service available).

If even some of these needs are to be met, we must make intelligent use of technology (including advanced - and intermediate-technology), and must make wise spatial allocations of investment and operational budgets, and of existing personnel. In fact it is generally conceded that overall funds are generally adequate to provide as much as 25% better coverage quantitatively and as much as 50% better coverage qualitatively, in most areas, provided the best planning was used.

Wise spatial allocations can be assisted by a Thematic Mapping System backed up with a Expert Systems capability, and digital Maps of the respective districts, representing:

**Roads, Rivers, Bridges, Railways, Stations, Hamlets, Villages and Towns, Schools, Health Facilities and some topographic information.**

With this as a base, and with data on the villages from the Census and from other government sources, one has most of the information needed for arriving at allocative decisions.

It should be noted that (a) We are not at all speaking here of Natural-resource or of detailed crop planning that requires remotely sensed data or very powerful raster-GIS; (b) That the flexibility of the Database in use is important, so that the capability to refer to several tables for each map is a critical property; and (c) That having a readymade thematic mapping system as a basis is a major advantage, since it provides a robust and reliable software and support base for the system being proposed.

**What is required in addition is:**

A User-friendly user-Interface which is specialised for the particular problem, so that the user need only select from a simple menu of (3-7) choices at any stage of his analysis. This in turn will require that a simple-to-use programming language be provided for the thematic mapping system so that such user-interfaces can be readily created

**for Education Planner** (which villages need Primary schools, which schools to expand; where to post teachers; where to add Middle Schools; which schools to *select* teachers for training?)

**for Health Planners** allocating scarce funds between different heads and different locations; deciding between Sub-centres or visiting clinics, etc.

**for Roads Planners**, considering the *overall effect* (or benefit) of adding a piece of connecting road, of upgrading another piece, of re-routing a new Highway, *relative to cost*,

**for Drinking Water Planners**, who must choose a route for a pipeline, or sites for wells,

**for Transportation Managers** looking at improving the efficiencies of bus service while meeting the people's travel needs,

**for Communications;** planners seeking economical maintainable routes for new Cables, or  
**for Economic Planners** and Bankers identifying potential new growth poles and service centres.

We propose that this **Decision Support System** be based on the proven THEMAPS system. Which was originally developed with a DoE grant following its invention during a Planning Commission project on *Block Level Planning*. While the programmability feature may require substantial changes in the THEMAPS code, which was not originally designed with this in mind, it would be of great value and would ensure meeting the needs of Rural Development.

#### **Expert System capability:**

The amount of data involved in - for example - Education planning for 2000 villages is enormous. Take the problem of increasing the enrolment of *girls* in Primary school (with the ultimate goal of increasing the Female Literacy rate). There are 4 types of schools in inter-village distance matrix, the female adult literacy in each village, the school attendance enrolment data class-wise, and year-wise, the availability of extra class-rooms or school buildings in the village; the size of the manpower and construction budget each year, the number of trainees to be selected for refresher courses, etc., etc..

It is virtually impossible to plough through this manually to arrive at a good, fair decision. What is clearly needed is an **Expert System** (or **Fuzzy System**) module which can be "**programmed**" in a simple way *by a layman*., with some logic to do some of the analysis and to reduce the number of locations to be considered

For instance, if fifty teachers are to be sent for training, the system could be given some criteria and asked to find the 75 villages which come closest (or furthest away) to meeting those criteria. They could then be highlighted on the map and the decision-maker could select so as to ensure they are not too geographically concentrated.

The NCST in Bombay has had a good experience in building an **Expert System Shell**, and IIT-Kanpur has done a lot of work in **Fuzzy Systems** as well as **Artificial Intelligence**. We expect to take advantage of the work done at both these organisations.

>> Three Case Studies: Three detailed Case Studies (**District Maps; Expert System, User-Interface**, and all) will be done before the project is over. (We have already had discussion with the Maharashtra PWD and with the Health Department in Maharashtra, and in several other states, as also with the Education Department in Rajasthan and Maharashtra.) These Case Studies will test out the methodology and also suggest ways in which the Programmeability of the User-Interface and the Logic for the Expert System could be made more easy for the decision-maker to use. Basically we would be concentrating on the areas of concern identified by TIDCO & Prof. Kulkarni.

>> National Seminars: it is expected that two National Seminars would also be held during the last year to make known the results of the Case Studies, and to make the resulting software generally available.

>> Time: Because of the fact the problem involves subject-area expertise as well as expertise as well as Knowledge-Engineering expertise, as well as Software-engineering expertise and Cartographic software expertise, this project is expected to take a period of time to bring about the required results. It is scheduled for 3 years.

=====^v^=====

