

# Participatory Geographic Information Systems and Participatory Rural Appraisal Tools for Irrigation Water Management at the Periyar Main Canal Command Area – A Case Study on the Kottampatti Village, Madurai District

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**Abstract:** This study is an attempt to provide a solution for a Real-world Problem. Making the farmers to participate in the problem-solving process, which is a participatory approach and PRA Tools are used for it. PGIS tool is easy to use and to interpret the results and to get the output for the given input by the farmers themselves. Geographical Information System (GIS) has been established as a powerful tool for planning and decision-making process. The participation of local farmers at different stages of data input in GIS enables the researcher or a planner to produce a holistic and efficient output in the process of participatory planning and to build an archive of local knowledge that leads to understand the local community fabric and facilitates the project objectives. Participatory GIS is a spontaneous fusion of participatory forms of developmental planning with modern information technologies. Concerted effort was made for mapping natural resources through participatory approach and Participatory GIS (PGIS) aims to use the spatial knowledge of people at local level. The spatial representation of local knowledge facilitates participatory decision-making processes. The use of local knowledge and perception of farmers can help in creating an outline for developmental plans. It can contribute to the empowerment of farmers in solving developmental problems. The Periyar Main Canal Command Area (PMCCA), under the administration of Dindigul, Madurai and Sivagangai districts, is selected for the present study to understand the problem of the farmers. The aim of the study is to understand the irrigation facilities and to analyze the problems in Irrigation Water Management (IWM) using PGIS in Kottampatti village. Participatory maps are prepared by the farmers and are used as input in GIS. Further various methods of Participatory Rural Appraisal (PRA) like Transect Walk, Focus Group Discussion, Participatory Mapping and Ranking Methods shall be used in the study. The problems existing in the study area includes shortage of water for irrigation, inadequate price for agricultural produce, inadequate labor and ineffective water user's association. Finally, the study aims to conclude with suggestive measures that could be taken for the improvement of irrigation facilities for better cultivation in the study area. This methodology can be applied for any study area for better irrigation water management. PGIS and PRA analysis has good performance towards irrigation

Management.

**Keywords:** Participatory Geographical Information System, Participatory Rural Appraisal Tools, Periyar Main Canal Command Area, Irrigation Water Management, Statistical Package for Social Sciences

## 1. Introduction

PRA is a way of learning from and with community members to investigate, analyze and evaluate constraints and opportunities, and make informed that timely decision regarding development projects. Participatory GIS (PGIS) is a participatory approach to generate spatial information for spatial planning. PGIS combines Participatory Learning and Action (PLA) methods with geographic information systems (GIS). The sources of irrigation in study area at Periyar Main Canal Command (PMCC) area and considers the local knowledge in irrigation management to improve the irrigation facilities by applying the techniques of PGIS. Finally, All the data's collected via PRA tool are given as input in GIS which makes as PGIS tool and the data collected are analyzed using SPSS tool.

Participatory GIS (PGIS) is a participatory approach to generate spatial information for spatial planning. PGIS combines Participatory Learning and Action (PLA) methods with geographic information systems (GIS) [Chambers, R. (1992), JoAbbot et.al., (1998), Giacomo Rambaldi (2010)]. PGIS combines a range of geo-spatial data management tools and techniques such as sketch maps, participatory 3D modeling (P3DM), aerial photography, satellite imagery and Global Positioning System (GPS) data to represent peoples' spatial knowledge in the form of two or three dimensional maps. They are used for spatial learning, discussion, information exchange, analysis and decision making. PGIS implies making geographic technologies available to the disadvantaged groups of the society in order to enhance their capacity in generating,

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managing, analyzing and disseminating spatial information. The PRA studies have been conducted by scholars like Paul Gosselink *et al.*, (1997), John Campbell (2002), Mehretab Tesfai *et al.* (2000), Anwar Alam *et al.* (2012), and Kannan Narayanan (2014). Whereas the scholars like Saha *et al.*, (2012), Soman (2014) and K.Musungu (2015), have used GIS for participatory appraisal. The recognition of local participation has contributed to evolve a set of techniques designed to increase local participation and knowledge in planning process. The participation of local villagers at different forms of data International Journal of Scientific Research in Science and Technology ([www.ijrsst.com](http://www.ijrsst.com)) collection and using them as input in GIS enables the researcher to produce a comprehensive output for planning. GIS is necessary to ensure local knowledge and participation in a variety of planning projects. This research paper examines the sources of irrigation in Kottampatti village in Periyar Main Canal Command (PMCC) area and considers the local knowledge in irrigation management to improve the irrigation facilities by applying the techniques of PGIS.

## 2. Study Area

This chapter describes the location of the study area, sources of data and Methodologies used to achieve the objectives of the present study. The details of data set required, methods adopted for data analysis and the processes involved in the Participatory GIS and PRA tools used for identifying the Irrigation related problems in the selected study area. Study Area is Periyar Main Canal Command Area consist of many branches and sub branch canals and data has to be collected of which branch or sub branch canal is a source of irrigation for the kottampatti village. Data should be collected either by the satellite imageries or map and field data. Data collected for the Head, Middle, Tail and where the command area receives the water for the irrigation.

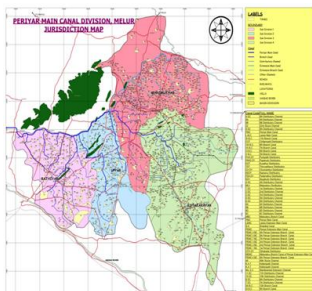


Fig. 1. Canal division

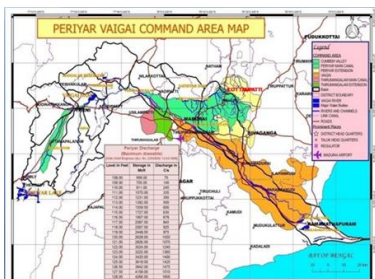


Fig. 2. Command area Map

## 3. Aim of the Present Study

The aim of this study is to analyses the irrigation facilities and its management by applying the PGIS methods in Kottampatti village of PMCC area. The aim is achieved by framing the following objectives.

## 4. Objective

1. To understand the perception of farmers about irrigation related issues by using PRA tools in the selected study area.
2. To apply PGIS tool for finding out problems for irrigation water management in the study area.
3. To suggest measures for improving irrigation water management.

## 5. Methodology

The extensive literature review is carried out in the wide variety of components of the project. The PGIS and PRA tools are the major components where the weightage will be given to these 2 tools and all others will be also studied with less weightage. More than 25 literatures has been carried out and studied in considering the various factors. The data were collected both the online and offline modes. The data collected through the online mode were segregated into many components and those data that were not available online are being collected offline by directly going to the village. The methodological frame work adopted for the study can be explained in a few steps. Initially, the Survey of India toposheets comprising the number 58J/8 at 1:50,000 scale is georeferenced. Subsequently, the cadastral map of Kottampatti village was imported and rectified with reference to SOI toposheet in ArcGIS platform. The georeferenced cadastral maps were then digitized and are assigned with the revenue numbers.

The various methods of PRA adopted in the study were transect walk, focus group discussion, participatory mapping and ranking methods, which brought out the problems of farmers in irrigation management. Initially, transect walk was undertaken, involving the local farmers for monitoring the field and identifying the problems. Transect walk method mainly deals with direct observation and incorporates the views of farmers. Informal meetings were held with the local farmers and workers and group discussions were made to bring out the problems related to irrigation and farming activities. Participatory mapping helped in preparing thematic maps on major crops, irrigation sources, facilities and its problems in the study village during 2017. Ranking methods is designed for the factors related to irrigation management. The ranking method was used to extract the preferences and opinions of farmers with regard to irrigation management. The local farmers shared their knowledge and opinions and were appropriately used in the study. They ranked the irrigation management strategies, on the basis of the criteria they have chosen.

The matrix ranking (first, second, third, etc.) gives an indication of relative preferences scoring (placing on a scale of 1–5) which were also used in the present study to improve the

irrigation facilities and planning through farmers’ participation. All the farmers were allowed to discuss elaborately and freely to express their opinion to rank the issues individually. Finally, a matrix was prepared immediately on the chart paper and displayed to the participants. Farmers felt more comfortable to change their minds from their original point of view Plot maps and direct observation data were integrated in GIS environment. Thematic maps of revenue plots within Kottampatti village, land use, crop types, sources of irrigation, methods of irrigation and canal flow were mapped. The results are discussed here under.

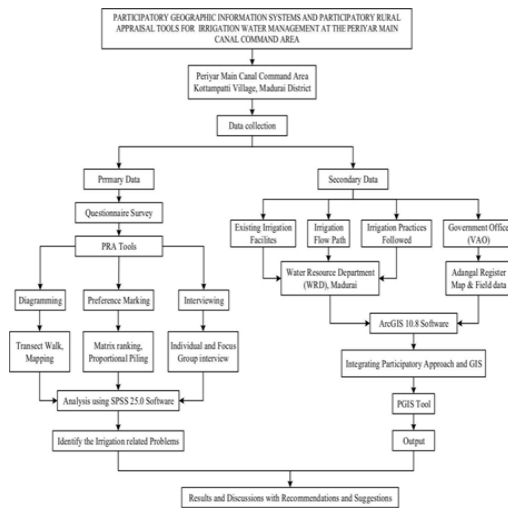


Fig. 3. Flowchart

1) PGIS for irrigation management

The study on the irrigation management in Kottampatti village of Command area is done by using participatory methods. The selected village is located in Madurai district and lies in the head reach of the command area (Figure 1 & 2). The irrigation management using PGIS in Kumaram village is discussed under four major headings as irrigation and agricultural practices, problems related to irrigation management, strategies of irrigation management and mitigation practices for irrigation management.

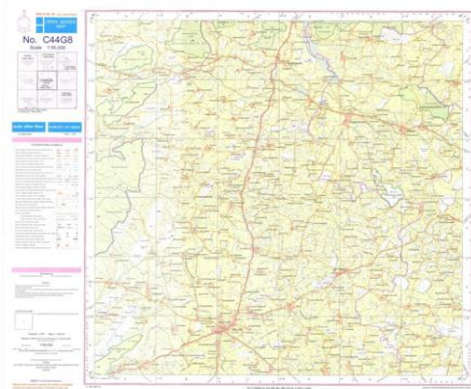


Fig. 4. Toposheet of Kottampatti village – 58J/8

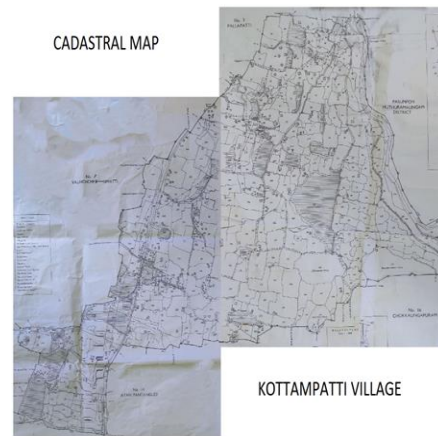


Fig. 5. Cadastral Map of Kottampatti village

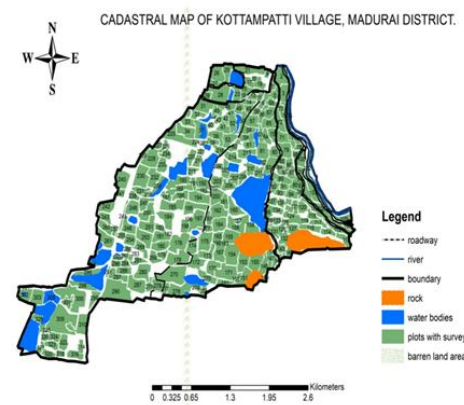


Fig. 6. Digitized map of Kottampatti village

6. Irrigation and Agricultural Practices

The Irrigation and agricultural practices of Kottampatti village are discussed under these headings as given below

A. Land use / land cover

The Land Use pattern of the area brings out the actual and specific use of land and it changes from time to time according to human use. Out of the Total Study Area the following LULC is categorized. Viz., Built Up Area, Agriculture Land, Fallow Land, Water Body Category like Tank, Canal, Pond and are mapped by the farmers during the participatory mapping process.

LANDUSE AND LANDCOVER		
LULC	Area in Hectares	Area in Percentage
Built Up Area	58.96ha	8.39%
Agriculture Land	68.87ha	9.98%
Fallow Land	424.79ha	60.44%
Tank / Pond	137.12ha	19.51%
Canal	13.21ha	1.88%

Fig. 7. Land use and land cover

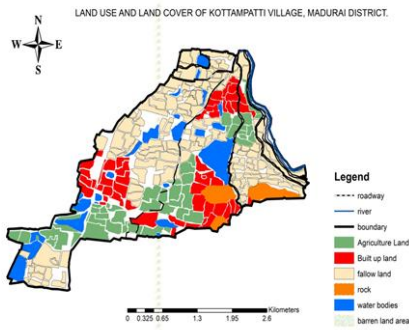


Fig. 8. Digitized map for LU/LC of Kottampatti village

**B. Sources of irrigation**

Irrigation source is analyzed with the help of local farmers using participatory mapping method and the map is digitized in GIS platform. The Major sources of irrigation in Kottampatti Village include Ground Water (Bore Well), canal, tank and well and pond. At Present, the irrigation in the village is fully dependant Groundwater (Bore Wells upto 500feet depth) Before 10 - 15years, the irrigation was fully dependant on Periyar Main Canal and during rainy season Palar River Basin supplies water to some tanks present along the parallel side of the river. From the transect walk and group discussions were carried out with the local farmers, the infrastructure facilities for canal irrigation is sufficient.

SOURCES OF IRRIGATION	
Source Of Irrigation	Percentage Covered
Bore Well Irrigation (Ground Water)	76.47%
Tank Irrigation	10.29%
Pond Irrigation	5.34%
Well Irrigation	4.13%
Canal Irrigation	3.77%

Fig. 9. Sources of irrigation

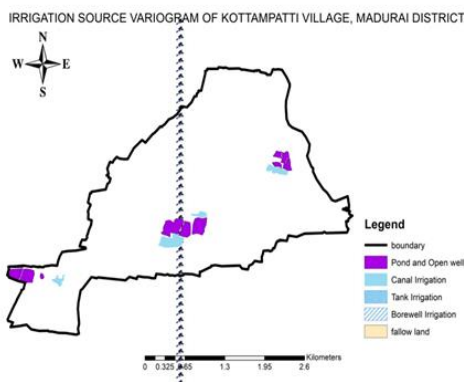


Fig. 10. Digitized map for sources of irrigation in Kottampatti village

**C. Cropping pattern**

In the Present Study, transect walk was done and it was found that Coconut, Banana Tree, Paddy, Vegetables are predominantly cultivated in the Kottampatti village and in

summer, pulses have been cultivated depending upon the Groundwater (borewell) irrigation. A map on cropping pattern is created with the help of local farmers using participatory mapping method and the map is digitalized in GIS platform. Intercropping pattern is followed, mainly when it comes to coconut tree and banana tree in the same acre of land.

CROPPING PATTERN		
Crop Type	Area in Ha	Percentage
Coconut	45.15Ha	65.56%
Banana	13.99Ha	20.32%
Paddy	4.30Ha	6.25%
Ground Nut	2.97Ha	4.32%
Vegetables	2.44Ha	3.55%

Fig. 11. Cropping pattern

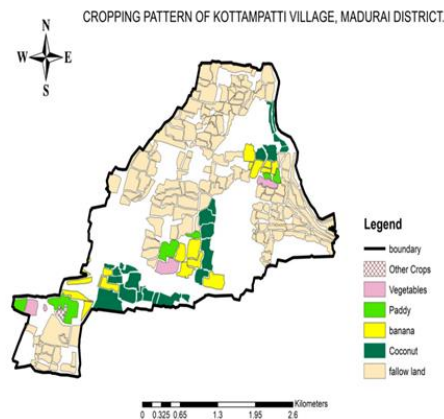


Fig. 12. Digitized map for cropping pattern in Kottampatti village

**D. Irrigation practices**

Irrigation practices are analyzed with the help of local farmers using participatory mapping method and the map is digitalized in GIS platform. The Major types of irrigation practices followed are Surface irrigation, Localized irrigation, Sprinkler irrigation, Drip irrigation, Sub irrigation, Manual irrigation.

Irrigation Practices	Percentage Covered
Sub Irrigation	62.35%
Localized Irrigation	15.36%
Micro Irrigation	14.87%
Manual Irrigation	6.14%
Surface Irrigation	1.28%

Fig. 13. Irrigation Practices

VARIOGRAM OF IRRIGATION PRACTICES IN KOTTAMPATTI VILLAGE, MADURAI DISTRICT.

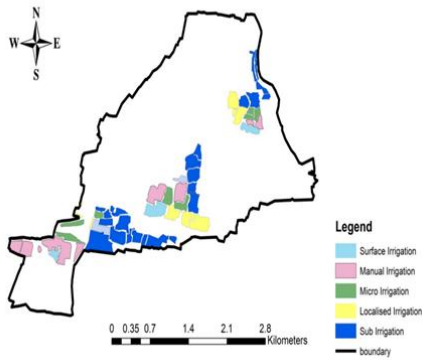


Fig. 14. Digitized map for irrigation practices in the Kottampatti village

SOIL-CROP CHARACTERISTICS MAP OF KOTTAMPATTI VILLAGE, MADURAI DISTRICT.

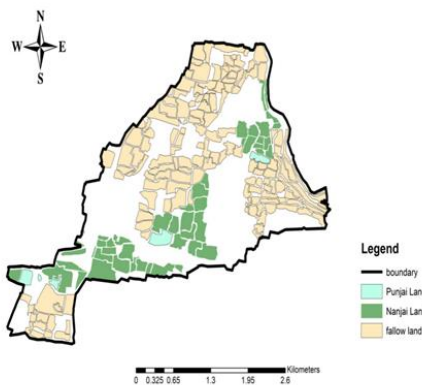


Fig. 15. Digitized map for soil crop characteristics in the Kottampatti village

### 7. Soil Crop Characteristics

The Land cultivable where paddy can be produced is called NanjaiNilam. It is called as Wet Land. The Land cultivable where cereals and pulses (Other than Paddy) are produced is called PunjaiNilam. It is called as Dry Land.

### 8. Water Bodies Classification

WATER BODIES IN KOTTAMPATTI VILLAGE, MADURAI DISTRICT.

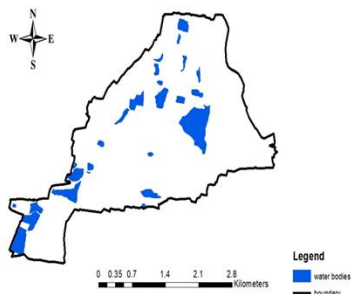


Fig. 16. Digitized map for water bodies in the Kottampatti village

### 9. Problems Related to Irrigation Management

The problems related to irrigation management have been identified and information is collected through focus group discussion. This method was adopted for all farmers and were

consolidated and presented and discussed in subheadings here under

#### A. Problems Identified in Irrigation Infrastructure

##### 1) Insufficient Quantity of Water

The problem of insufficient quantity of water supply is due to inadequate rainfall is reported by 89% of the farmers; (Annual Precipitation – 927.9mm). This interprets, the village people is getting insufficient water and I cross checked with the rainfall data where it was actually very sufficient and concluded that they have to save the rainwater by installing rain water harvesting system thereby including the rainwater with their daily use of water.

##### 2) Labour Problems

The labor problems during the cultivation period is faced by 65%. This is because the women labors are shifting to MGNREGA. This is actually due to that they are getting a sure money every day on the daily basis of wages, so that farmers are saying they are really tough to handle. The work they do whether you like it or not, you have to adhere by them. Otherwise you cannot get the labour from them. This is the major problem almost existing in all the villages. This can only be rectified if the farmers give them the assured labour costs.

##### 3) Theft of irrigation

While the theft of irrigation infrastructure (Electricity wires and irrigation motor pump set) is reported by 20%. This usually happens whenever the costly equipment which cannot be stored in a closed surface, it is highly vulnerable and it has a high chance of being theft. Because these farmers aren't enough to construct a small place for the storage of equipment.

#### B. Water User Association

##### 1) Ineffective Water User Association

The Focus Group Discussion meeting in the present study area has revealed that the water user association is established. The WUA effectively functioned before 5years, but currently it is inactive due to some internal problems. This is also a major hurdle in irrigation management in this village. 85% of farmers have suggested that the WUA should be activated to take over the responsibilities of canal maintenance, equal distribution of water and farmer needs.

#### C. Problems Identified in Farming Activities

##### 1) Unprofitable Cultivation

The Focus Group Discussion meeting in the study area has identified problems related to farming activities, which are unprofitable cultivation reported by 63% of people. This can be interpreted as the profit which they get through the harvest actually those profits are being given as the labour charge.

##### 2) Less Selling Price

There is a very less selling price for agricultural produce and 74% of people have reported. This less selling price actually severely affects the livelihood of the people. This in turn affects each and every aspect of the living condition for that people. The profit is also being adversely affected for the people due to the less selling price.

##### 3) Lack of Finance and Loan

Lack of finance and loan at the time of cultivation for low

income group reported by 79% of people. This lack of finance and the loan actually facilitates banks and governments but it doesn't fulfil the necessary requirement. It has to facilitate the local people and their livelihood. It is formed for a purpose but they aren't resolving it.

## 10. Strategies of Irrigation Management

### A. Area Required the Involvement of farmers

#### 1) Operation and Maintenance of Structures for the Distribution of Water

Kottampatti Village has good canal infrastructure facilities. As far as the canal water supply is considered 95% of the local farmers show interest in the maintenance of the canal structure for the distribution of water and they have given 1st priority. This is prioritized as 1st and so that they are willing that the government has to take decision for this issue primarily.

#### 2) Suggestion for Distribution of Water

They are interested to work with their neighboring farmers. Whereas, the 2nd priority is given to involve the farmers in the distribution of water reported by 53% of people because, it depends upon the farmer's needs. The farmer's needs are very clear that they had to involve themselves, because the reason they say is they have been frustrated depending upon the officials and government. So, they became self-responsible for all to fulfil their needs themselves.

#### 3) Design of Irrigation System

The 3rd Priority was that 21% of the farmers have suggested involving them for the design of irrigation system. This is actually because of the modern and better irrigation system might give them the water they are expecting for and they also involve themselves in the design of the irrigation system.

#### 4) Construction of Irrigation System

The 4th Priority was given to involve themselves in the construction of the irrigation system by 5%. The construction of irrigation system actually is the continuation of the design. So that, if both of these are done then it will be easy for the farmers to get rid of their problems.

### B. Role of Motivators

#### 1) Trained Government Official

The role of catalyst is most important to motivate the farmers to participate. At the time of discussion 89% of the local farmers feel that during the cultivation period, Government officials of the department of agriculture have to train the farmers based on the availability of water about the various cultivation procedures and the list of crops to be cultivated in order to enhance their agricultural produce.

#### 2) Any person who knows farmers and their problems

Whereas, 26% of the farmers feel that any person who knows farmers and their problems can act as catalyst and has given 2nd priority. These expectation from the farmers clearly tells us they aren't knowledgeable and aware of information's and news around them. They are in need of an external person who could guide them as their well-wishers.

#### 3) Farm Leader

11% of farmers suggested that a farm leader can also motivate the participation of farmers for irrigation management

because they have to take strong decision regarding farmers problems and convey it to the government authority. This farm leader who would act as the mentor for those villagers and provide necessary clarification, awareness and knowledge to the farmers.

### C. Use of Technologies in Irrigation Water Management

#### 1) Mobile Phone

The recent technologies plays a major role in irrigation management. One of the recent technologies namely GIS and Participatory approaches effectively contribute to spatial planning, management and development. During the Village meetings, question is asked to the farmers regarding the recent technologies that can be used in guiding their irrigation management. Positively, all the local farmers have given the 1st priority to mobile phone technology, because all of them use mobile phones.

#### 2) Television

The other technologies are in their order of preference is television 95% , because farmers watch the program related to irrigation management directly and is more effective in self-understanding. This prioritized that the programmes can be held by the government related to their scheme and other valuable information can be provided through this media.

#### 3) Computer

Use of Computer is 21% has been reported by the people. This clearly shows that the usage of computer is very less and very minimum. The usage of the computer actually is very low since it requires some knowledge to operate. These farmers aren't literates and so that they obviously cannot operate system.

#### 4) Internet

The usage of Internet is 5% only. Since, they don't get the bandwidth of tower in the remote areas. They actually don't get signal properly even for normal call conversation. So that they aren't interested even to use the internet and don't also know the purpose of it.

#### 5) Mobile Application

The usage of mobile app is 5%. Because all the mobile applications that needs the internet to be used, they aren't aware of mobile apps also. The next stat comes with the usage of the smart phones. That also is very low. The person with the smart phones only can use the applications. Because most of them are not aware about these technologies.

### D. Media to be shared in Dissemination of Information

#### 1) Mobile Phone

The local farmers have given the 1st priority for mobile phone, because all the farmers feel that if information is given through mobile by means of SMS/ Automated Calls it can be easily accessed for effective irrigation management. All the farmers have mobile phones and they can get the farm related messages immediately and so the farmers feel mobile phone can be very well used for the dissemination of information.

#### 2) Television

The 2nd Priority is given to Television is 74%. This shows that the people watch television regularly and so that the people are actually expecting to share the information through the

television. They can conduct and organize many orientation programmes and they could share the media info.

#### *E. Awareness of Mobile App*

##### *1) No*

Mobile application is probably used in all fields. It can be of so much use and so convenient to be downloaded. The agriculture ministry and central government have launched a number of mobile apps for farmers. The application aims to provide information about the latest agriculture trends, equipment's, technologies and methods being used for agriculture.

##### *2) Yes*

In the present study, the awareness about the mobile app related to farming activity is discussed among the farmers. From the study, it is found out that 95% of the farmers don't know about the mobile app because most of them farmers don't know have smart phone and few of them are illiterates.

#### *F. Information used from mobile app*

##### *1) Crop Insurance*

From the study it is evident that few farmers know about the information in mobile app that too only 5% of them know about crop insurance information. The remaining farmers are not aware of mobile app, as they seldom use smart phones, which can display all farming related information.

#### *G. Information to be Included if Participatory GIS is developed*

##### *1) Government Subsidies*

The local farmers of 53% addressed that it should be government subsidies, because these subsidies are most important for the farmers as they spend too much and not aware of these subsidies. These can be of a great help for the farmers. They aren't aware of these subsidies and aren't availing this.

##### *2) Crop Insurance*

Farmers suggested of 42% as information related to crop insurance, since these crop insurance plays a vital role as they often get the problem of crops that won't get the necessary cultivation. They can't bear these losses. If these losses can overcome by the crop insurance, then it will be of a great help to the farmers.

##### *3) Market Status*

Farmers of 37% as market status of agricultural produce, this is due to the factor the agricultural price is determined by the government in favor of the stake holders. But they should also consider the persons who produced it and give them the necessary profit so that all the sides may be satisfied.

##### *4) Soil Fertility*

Farmers of about 26% as soil fertility, this shows that the soil should be fertile enough to get the necessary output. If the soil is infertile then the crops won't give the valuable output. The soil should be fertile naturally or else some techniques has to be followed to check for the fertile soil. The fertility of the soil lies with the NPK content which can be enriched by the usage of fertilizers.

##### *5) Land Characteristics*

Farmers of 11% as land characteristics, So that the land

characteristics should be checked for the necessary nutrient contents. Since, they could actually improve the output of the produce. These characteristics should be cross checked with the needed land properties. If it is not satisfied, then necessary measures should be taken to improve it.

## **11. Results and Discussion with Suggestions and Recommendations**

- The effective Water User Association.
- Trained govt. official to catalyst participation of farmers in irrigation management.
- Loan facility for cultivation activities.
- Crop insurance during crop failure.
- Government support to labour for agriculture.
- Appropriate information related to farming activity.
- Periyar Main Canal has to be facilitated by better canal infrastructure for irrigation.
- Palar River should be desilted and connected to the tanks.
- Government Subsidies can be increased for encouraging different irrigation practices.
- A separate team can be arranged for ensuring that all the information reaches the end users.
- Awareness should be brought by using the media effectively.
- Severe action should be taken against Tank Encroachment.
- Theft should be severely controlled.
- Price and Market Status for Agricultural Produce should be decided by the Farmers.
- Soil Fertility and Land Characteristics can be improved by some stabilization techniques.

## **12. Conclusion and Summary**

In general it appears that PPGIS is an appropriate and advantageous tool for community. In kottampatti village, and should have much wider applications in participatory development work. It has a number of distinct advantages over more traditional approaches to this type of complex management issue:

- If it is viewed as a participatory process it can empower the Farmers by involving them in the decision-making process, and raise their expectations of information availability for them.
- It can be used to effectively combine quantitative and qualitative approaches to community people and rural development in general.
- All the maps, resource management information and other spatial data can be given to Farmers to aid with their decision making and negotiations without the need for them to have access to a GIS.
- Information can be easily collated, analyzed and returned to stakeholders
- The appropriate level of information can be returned

to stakeholders

After the maps were completed, validated and officially turned-over to the farmers, the members of the community, the researcher and the GIS specialist, who helped prepare the map once again sat down with the members of the community, to open a discussion on the significance and utility of maps that were produced. This also became the venue for the researcher to share with the community the state of the water resources management in the pilot area and how it is related to their own locality. In this way, it was hoped that community understanding would lead to improved use and management of their water resources. However, the technology does have the potential to assist extractive collection of information, and GIS can disempower disadvantaged groups, and further distance them from the decision making process. It was found that the emphasis had to be firmly on participation rather than technical issues, and a system based approach that actively encouraged participation was found to be the key requirement for a useful Participatory GIS. The present study revealed the use of Participatory GIS for irrigation management. A participatory approach helps in gathering data from local farmers by exploring the geographical area through their eyes and experience. Kottampatti village is dependent on the PMC irrigation and the infrastructure facility for canal irrigation isn't sufficient. The local farmers faced major problems like insufficient quantity of water supply, unprofitable cultivation, very less selling price for agricultural produce, labour problems during cultivation period, lack of finance and loan at the time of cultivation, ineffective water user association and theft of agricultural equipments and infrastructure. On analyzing the strategies of efficient irrigation management, they felt that water supply should reach every one of farmers land. The local farmers feel that during the cultivation period government officials belonging to the department of agriculture have to train the farmers based on the availability of water about the various cultivation procedures and the list of crops to be cultivated in order to enhance their agricultural produce. The recent technologies play a major role in irrigation management. The media for sharing farm related information through mobile by means of SMS /automated call can be easily accessed for effective irrigation management. Farmers represent the flexible solution for irrigation management and the information to be provided to farmers through mobile phones are government subsidies, crop insurance and information, market status of agricultural produce, soil fertility and land characteristics. The result of Participatory and GIS for irrigation management concluded that the information provided by the participatory methods like transect walks, focus group discussion, participatory mapping, and ranking method are useful for the development activities with regard to irrigation management in the study area. This methodology can be applied for any study area to assist in better irrigation management. PRA analyses have a good performance for irrigation management.

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