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3.	Breeding of Culinary Types of Banana *Biju Daniel*
4.	Utilisation of Embryo Rescue Techniques in Improvement of Horticultural Crops. *Shankar G.*
5.	Conservation and Utilisation of Medicinal Plants With Anti Retroviral and Anti HIV Properties *Ganapathy V.*
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5.	Technology Assessment and Validation Through Farmers Participatory Research *Swapna T.R.*
6.	Rural Employment Study in Palakkad District *Pratheesh V.S.*
7.	Capital Formation in Households of Kerala – A Study in Kodakara Block of Thrissur district *Rani G.*
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CO-ORDINATION – THE MISSING LINK IN DEVELOPMENT ADMINISTRATION

By

SUNIL KUMAR ROY

(2000-21-22)

SEMINAR REPORT

Submitted in partial fulfillment of the course

Ag. Ext.751. Seminar

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DECLARATION

I, **Sunil Kumar Roy** (2000 - 21 - 22) here by declare that this seminar report entitled **Co-ordination - the missing link in development administration** has been prepared by me independently, after going through the various references cited herein and that I have not copied or adopted from any of the fellow students or previous seminar reports.

Vellanikkara
21.07.2001

Sunil Kumar Roy
(2000-21-22)

INTRODUCTION

Co-ordination is the vital function of administration. It connotes the different parts of administration attuned to each other. "Co-ordination means establishing harmonious relationship between the efforts of individual and group for the accomplishment of objectives of the organization" (Roy, 1999).

It is the essence of management rather than one of its functions "Co-ordination, being synchronization efforts of human beings in an organization is intrinsic to management as management also tries to synchronize group efforts for achieving organizational objectives" (Prasad, 1999).

"Co-ordination is the orderly synchronizing of efforts of the sub-ordinates to provide the proper amount timing and quality of execution so that their unified efforts lead to the stated objectives (Halmann, 1992). It is a continuous and dynamic process and emphasis on unity of efforts, which is the heart of co-ordination. Co-ordination is necessary to link the function of the department division together and assume their combination to total results. Special efforts of co-ordination are regarded in organization where large number of personnel involved then differential functions, interdependence of organizational units and sub units and people working there. "Co-ordination is an administrative process which seeks to bring about unity of purpose in order to achieve common objectives effectively" (Purkat, 1996).

"Co-ordination is a process meant to accomplish the desired interaction, co-operation and/or collaboration to an working in union with one focus in view or for achieving some common goal/ target/ aim/ theme/ purpose/ objectives" (Sharma, 1992).

Co-ordination in development administration is not something that can be achieved merely by working for it. It is rather the fruit of complicated administrative activities and process. There are many factors affect the effective co-ordination internally and extensively.

Co-ordination is the most facilitating and delicate intellectual exercise among all development activities in development administration. As a process "Co-ordination is an endeavor to aggregate the different experience, whether those of one functionary, these of two or several or those of two or more sub systems. It aims at an interlinking between one experience and another with an emerging synthesis (Muttalib, 1990).

"Co-ordination involves the exercise of authority by the incumbent of the office over lower levels, on the other hand and discharging of responsibility in relation to higher levels, on the other. Thus co-ordination is a running thread that interweaves various levels together and thereby, become a grand vehicle for affected equilibrium in the organization as a whole" (Metcaf, 1996).

"Co-ordination as a facilitating function or a device to ensure the achievement of goals within stipulated time and cost parameters. Better co-ordination, more expedition and successful implementation can be expected (Mishra, 1995).

"Co-ordination is fundamental to any organization and a device need for effective and efficient administration. It is a pivot around which the whole machinery of developmental programmes revolves" (Gupta, 1992).

"Development administration is the achievement of development goals that stand the best possible chance of being fruitful" (Sapru, 1992).

"Development administration is concerned with maximizing innovation for development" the planned or intended change in the direction of modernity or nation building and socio economic change" (Weidner, 1990). At development administration as "organized efforts to carry out programmes or projects throughout by those involved to serve developmental objectives" (Riggs, 1989).

In brief, development administration is that process of carrying out development programmes and projects is the direction of nation building and socio-economic progress through an administrative organization. It is through public as well as non-public organizations and their proper management that a developing country can carry development policy measures for the realization of national goal and objectives.

Development administration is constructed as the mechanism consisting of the structural, personnel and procedural components through which programme projects and schemes or simply activity for the socio-economic development of the people of the regions are implemented or actualized.

Development administration is that part of administration concerned with the development of country's economy and society" (Sharma, 1992). Development administration covers the vast area viz. educational, health, rural, urban, roads and communication, forest, public sector cooperative sector, power generation, water, Agricultural Horticultural development administration. In each area the vital function of co-ordination is to maintain effective link with the development administrates activities.

At the present, development programmes, are multi dimensional in nature. The need for co-ordination arises from the natural tendency of the member of any large group when left to themselves, to drift in different directions thus giving rise conflicts. In day to day, inter and intra departmental, ministerial, agencies and organizational unhealthy conflicts is gradually increasing due to 1) overlapping in the work of the employees or units of an organization may arise from an ignorance of one another activities, 2) there is a tendency among men in charge of particular function or activities to attach so much importance to their own work on be unmindful of the needs of others and make enrichments on the latter sphere. They refused to see this particular change as the part of a larger whole to which it must be duly subordinated.

Conflict in the grid for power and importance where heads of organization, specially the more pushing and vigorous ones have. They indulge in empire building is seeking constantly to expand the sphere of their own organization by adding to it new activities which impinge on the jurisdiction of other organization. This situation is aggravating due to missing the link of co-ordination with development administration. Not only that almost all the third world and developing countries and even also developed countries in the world facing this unhealthy situation due to that agriculture production calls force a systematic approach through co-ordination of different organizations. No organization can attain its goal without adequate co-ordination among units and their functions. Effective co-ordination is therefore necessary between different units under the same organization and among different agencies working towards a common end. Co-ordination implies a co-operative situation where two or more participants have a common goal and where each has sufficient information as to what others are going to do to enable him to make correct decision. It will be usually ineffective in absence of co-ordination for where co-ordination exist teamwork automatically exist and teamwork plays the vital role for co-ordination which is ultimately acts as better link with development administration. Effective co-ordination can minimize the conflict and creates a healthy atmosphere in development administration. This is the burning issue. Mishra *et al.* (1995) studied on 'Co-ordination in agricultural development' and showed that the relative position of co-ordination among the factors of agriculture.

Table 1. Relative position of co-ordination among the factors of agricultural development

Sl. No.	Factors	State	District	Block	Panchayat
1	Input	1	1	1	1
2	Irrigation	111	111	111	111
3	Training	1V	1V	1V	1V
4	Organization	V1	V11	V1	V11
5	Co-ordination	11	11	11	11
6	Technology	V	V	V	V
7	Marketing	V11	V1	V11	V1

Source: Mitra, B., B. Das And C. Satapathy, 1995

Table showed that among seven important factors of agricultural development, the position of co-ordination is second in all levels. Even though agencies and departments dealing with inputs, irrigation, training and improved technology are well designed at all levels, the implementation at agricultural programmes faced the problems due to lack of proper co-ordination among them. This is evident from the poor perception of officials about co-ordination at almost all levels, where development programmes are being implemented.

The accountability for proper co-ordination should primarily rest with the personality. This plays an important role in co-ordinating the work of their sub-ordinates. But achievement of the target objectives are not up to the mark due to improper link of co-ordination with development administration domain (Rao, 1996).

Conclusion

The analytical review suggested few valuable suggestions for effective co-ordination are put forth.

1. Brotherhood relation rather than bossism should always be maintained with the subordinates.
2. Joint supervision is essential in implementing the development activities under development administration.
3. An atmosphere should be created, so that the employee, workers can work together willingly.
4. Organizing inter departmental seminar time to time to maintain the proper linkage with various concerned departments.
5. There must be provision to incentive to efficient workers. This may be given either cash or kind for inspiration.

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DISCUSSION

A great number of factors are associated with effective c-ordination. Some factors are more essential than others. Due to the absence of any of them co-ordination missing from the development administration. In relation to this, a study was conducted by Pelz on "Factors associated with co-ordination in agriculture". He ranked the factors of co-ordination (Table 2).

Table 2. Ranking of factors based on Median score of six groups of Judges

Sl. No.	Factors of Co-ordination	Median scores	Relative ranks
1	Team work	63.5	1
2	Aptitude & initiative	60.5	2
3	Methodical & timely action	60.5	2
4	Funds & Supplies	60.5	2
5	Authority for decision close operational level	60.5	2
6	Capable & Co-operating personnel	60.5	2
7	Communication	59.5	3
8	Co-ordination Committee	58.0	4
9	Supervision	57.8	5
10	Reduction in multiplicity of agencies doing same type of jobs	57.5	6
11	Workable & non-conflicting policy	57.5	6
12	Peoples co-operation	56.0	7
13	Simplified procedures	56.0	7
14	Single line of command	55.5	8
15	Desirable load of work	52.0	9
16	Single unified organization	48.0	10

Source : Pelz, D. C. & Singh, 1990

Based upon the pooled judgement of six judges the element or factor teamwork is essential to implement agricultural development programme like IADP, which is lacking in the development administrative structural and functional problems. In the agricultural district programme implementation, 'methodical and timely action' is essential because it is farmers associated. The other factors favourable aptitude and initiative of staff, adequate findings and supplies, communication, supervision are important for effective co-ordination which create the better climate with development administration but these are lacking in the development administrative functions (Table 2).

Co-ordination is missing at various levels of development administration specially in Agricultural development administration due to various reasons. Intra departmental and inter departmental co-ordination lacking is evident. Singh (1995) conducted a study on "Co-ordination between agricultural and co-operative determinants". In case of inter developmental co-ordination at state level.

Table 3. Scores of state level of agriculture officials and co-operative officials on selected factors of co-ordination

Sl. No.	Factors of co-ordination	Agriculture officials	Co-operative officials
1	Team work	35	42
2	Aptitude	33	17
3	Initiative	54	70
4	Methodical & timely action	54	64
5	Fund & supplies	19	12
6	Co-ordination Committee	9	9
7	Communication	76	53
8	Capability	62	53
9	Co-operativeness	65	47
10	Mean	45.2	44.1
11	Grand mean	44.65	
12	r value	0.86**	

** Indicates 1% level of significance.
Source : Singh, K. N. & N. Prasad, 1995

It reveals that co-ordination between Agricultural Officials and co-operative officials at state level was well (Table 3).

Table 4. Scores of block level Agriculture and Co-operative officials on selected factors of co-ordination

Sl No	Factors of co-ordination	Agriculture officials	Co-operative officials
1	Team work	27	25
2	Aptitude	50	50
3	Initiative	42	20
4	Methodical & timely action	35	32
5	Fund & supplies	29	12
6	Co-ordination Committee	9	9
7	Authority for decision at block level	50	0
8	Communication	62	59
9	Capability	45	13
10	Co-operativeness	64	53
11	Mean	40.4	27.8
12	Grand mean	34.1	
13	r value	0.63NS	

Source : Singh, K. N. & N. Prasad, 1995

The finding reveals that mean score of block level Agriculture and Co-operative officials on the selected factors of co-ordination were 40.40 and 27.80 respectively with their grand mean 34.1. The result is insignificant even at five per cent level of significance. It indicates that the co-ordination was unsatisfactory between the block officials or Agricultural and co-operative department working of the Agricultural Officer and Co-operative officers in isolation way. Their communication is well but decision making and initiative are lacking from the co-operative officials (Table 4).

The co-ordination between Agriculture Officials and Co-operative officials at village level on the same study.

Table 5. Scores of agriculture officials and Co-operative officials at village level on selected factors of co-ordination

Sl. No.	Factors of co-ordination	Agriculture officials	Co-operative officials
1	Team work	25.0	25.0
2	Aptitude	50.0	35.0
3	Initiative	31.0	31.0
4	Methodical & timely action	33.0	33.0
5	Fund & supplies	19.0	12.0
6	Co-ordination Committee	9.0	9.0
7	Communication	40.0	60.0
8	Capability	54.0	7.0
9	Co-operativeness	69.0	44.0
10	Mean	36.4	28.2
11	Grand mean	32.3	
12	r value	0.41NS	

* Indicates 5% level of significance
Source : Singh, K. N. & N. Prasad, 1995

The finding reveals that at grass root level the coefficient of correlation between the scores of Agriculture officials and co-operative officials was insignificant even at 5 per cent level of significance. It is concluded that co-ordination was unsatisfactory at grass root level workers of Agriculture and Co-operative sub inspectors. Their teamwork and initiative are same in both the officials but due to faulty communication co-ordination is not up to the satisfactory level. It is clear that the co-ordination gap started from village level or grass root level (Table 5).

The Agricultural development programmes fails in India due to the lacking of interdepartmental co-ordination. Mitra (1995) studied in relation to this in Orissa.

Table 6. Gap in co-ordination among Departments

Sl. No.	Departments	State	District	Block	Village	Mean
1	Co-operatives	3.06	3.00	5.00	5.00	4.51
2	Co-operative banks	3.15	3.06	12.50	10.55	7.31
3	Fertilizer agencies	2.00	2.00	2.00	2.16	2.04
4	Agro industries	2.00	17.85	22.22	13.06	13.37
5	NSC	2.00	8.00	17.85	23.91	12.94
6	Private input agencies	37.88	19.55	8.00	2.00	14.60
7	Irrigation	0.00	2.00	5.00	5.00	3.00
8	OSEB	12.97	13.04	23.91	22.22	18.03
9	OSCMF	10.00	12.50	22.20	22.22	16.73
10	Mean	8.11	8.22	13.74	11.98	

OSEB - Orissa State Electricity Board
OSCMF-Orissa State Co-operative Marketing Federation
Source : Mitra, B., B. Das And C. Satapathy, 1995

The finding reveals that maximum co-ordination gap with the department of OSEB followed by OSCMF, private input agencies, agro industries and NSC in that order. However the co-ordination of fertilizer agencies is found to be the highest. In view of the findings it can be stated that co-ordination is lacking in most agencies of supply and marketing.

At state level lack of co-ordination is found to be the highest with private input agencies whereas at district level it is with the agro-industries.

At block level and village level with that of OSEB, NSC and OSCMF. The findings concluded that the input dealing agencies and agency for power supply fails to keep pace with desired co-ordination with other agencies for agricultural development.

Sharma (1994) studied in relation to co-ordination gap in Himachal Pradesh in Indo-German project

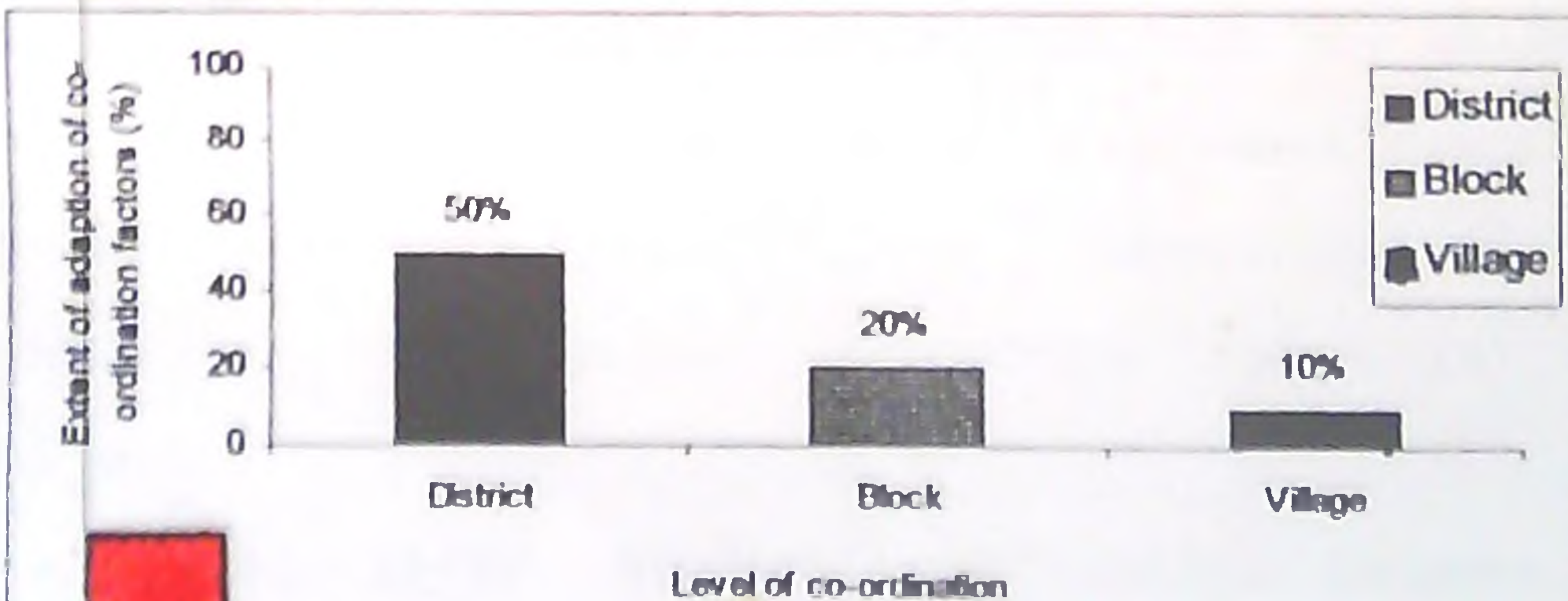


Fig. 1. Showing the extent of adaption of co-ordination factors in the different levels of development administration

Source: Sharma and Sohal, 1994

The finding reveals that there is a progressive decline in the extent of adoption of co-ordination factors in the different levels of development administration. At district level, teamwork, co-operation, planning and implementation attitude and role performance are satisfactory level. At block level communication, authorities for decision making and co-ordination committee are satisfactory level and village level, funds and supply and capability are satisfactory level. It is concluded that co-ordination gap started from village level due to interdepartmental co-ordination conflict.

Linkage is the most important and the vital factor of effective co-ordination in the development administration. Pickeing (1989) concluded that the linkage mechanism largely depends upon four key analyzing factors viz; macro policy climate, government commitment to agriculture, target group identification and recognition of physical production potential and constraints.

Sunil (1993) studied on "Linkage between the department of agriculture and soil conservation unit in the implementation of soil and water conservation programme in Kerala" and showed the important factors perceived by the officials in the Department of agriculture, which affect the linkage between soil conservation unit and the Department of Agriculture.

Table 7. Factors affecting linkage between officials in the Department of Agriculture and soil conservation unit as perceived by the officials in the Department of Agriculture.

Sl. No.	Factors	Mean	Rank
1	Inadequate contact between officials in the department of Agriculture and soil conservation unit in implementing scheme	2.50	1
2	Negative attitude towards functional integration of the soil conservation unit with Department of Agriculture	2.41	2
3	Lack of team work between the officials in the Department of Agriculture and soil conservation unit	2.32	3
4	Possible areas of joint activity left undefined	2.22	4
5	Lack of formal and informal communication between officials in the Department of Agriculture and soil conservation unit	2.00	5
6	Absence of separate Department for soil and water conservation	1.97	6
7	Overlapping of soil conservation works arranged by officials in the Department of Agriculture and soil conservation unit	1.84	7

The finding reveals that among seven factors; inadequate contact between officials in the department of Agriculture and soil conservation unit in implementing scheme ranked first followed negative attitude towards functional integration of the soil conservation unit with Department of Agriculture and lack of team work between them are the important reasons for missing the linkage between two units which ultimately created a co-ordination gap (Table 7).

Kunju (1989) studied on linkages between and among the research, extension, client and input subsystems and reported that there was difference in the extent of linkages activities between and among those RSS, ESS and CSS subsystems but there was no significant difference in the linkages activities of the ISS with the other three subsystems.

Table 8. Linkages between and among the research, extension, client and input subsystem results of Friedman two-way non-parametric analysis of variance test

Subsystem	Sum of the ranks for linkages				X^2
	RSS	ESS	CSS	ISS	
Research N=52	-	88	92	132	22.77*
Extension N=134	310	-	251	233	22.67*
Client N=110	247	156	-	257	56.31*
Input N=32	68	59	65	-	1.71^{NS}

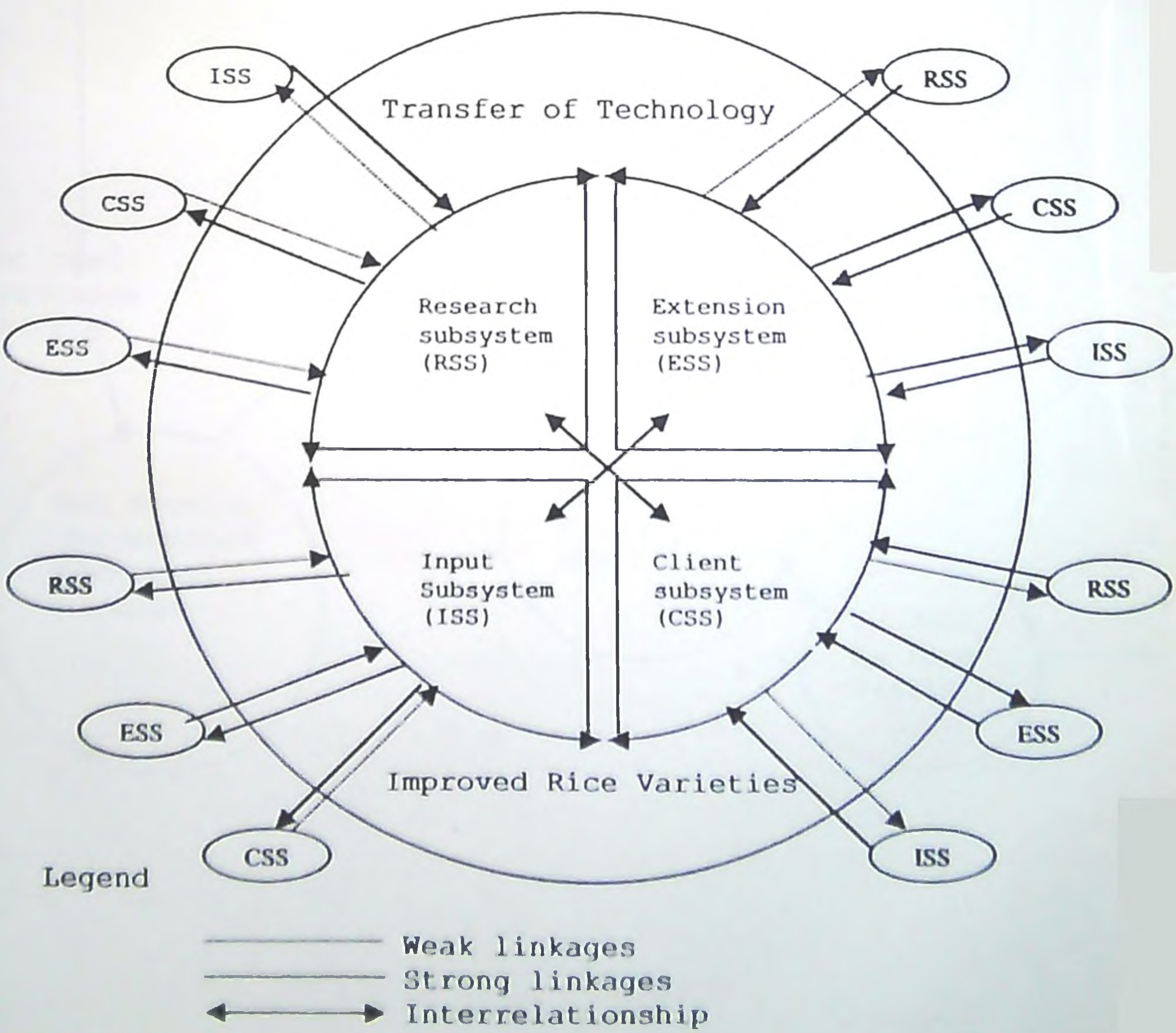
Kunju, 1989

* Significant at 5% level of probability

Kunju (1989) developed a empirical model of the linkages between and among the research, extension, client and input subsystems and showed the strong and weak linkages. Though in RSS perceived to have strong linkages with the ESS and the CSS; the ESS on the CSS found to have weak linkages (dotted line arrows) with the RSS.

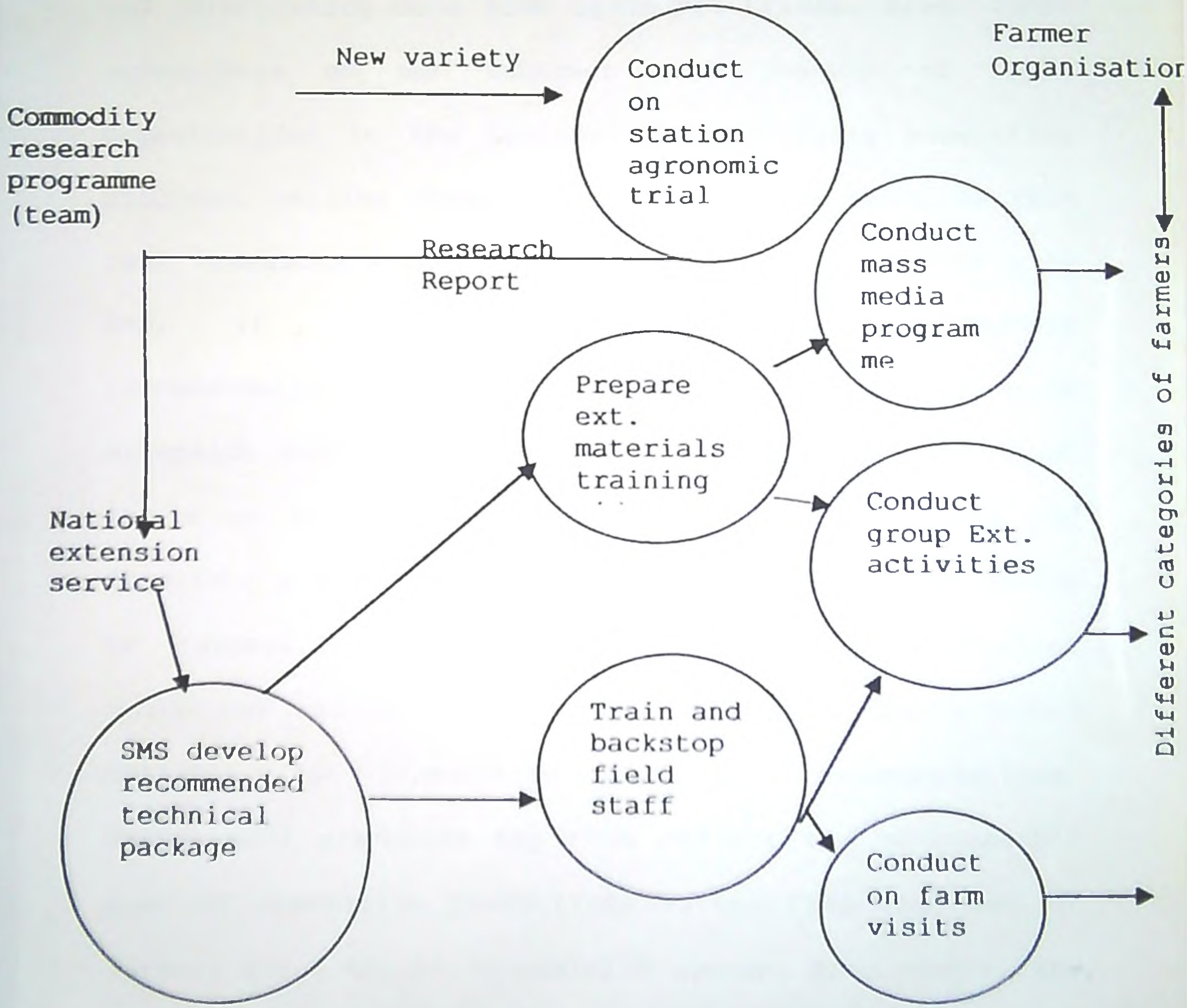
Similarly, the ISS though it perceived to have strong linkages with the RSS at the CSS, these two subsystems were found to have weak linkages with the RSS. Thus the RSS was found to be the weakest link followed by the ISS in the TOT of improved rice varieties released by the KAU. The results of the study pertaining to the structural linkages indicate that there was inadequate linkage forms in the case of the ISS.

Fig. 2. Empirical model of the linkages between and among the research, extension, client and input sub-system in the TOT of improved rice varieties released by KAU



Burton (2000) studied in "strengthening research extension - farmers linkage"

Fig : 3 poorly linked research extension System



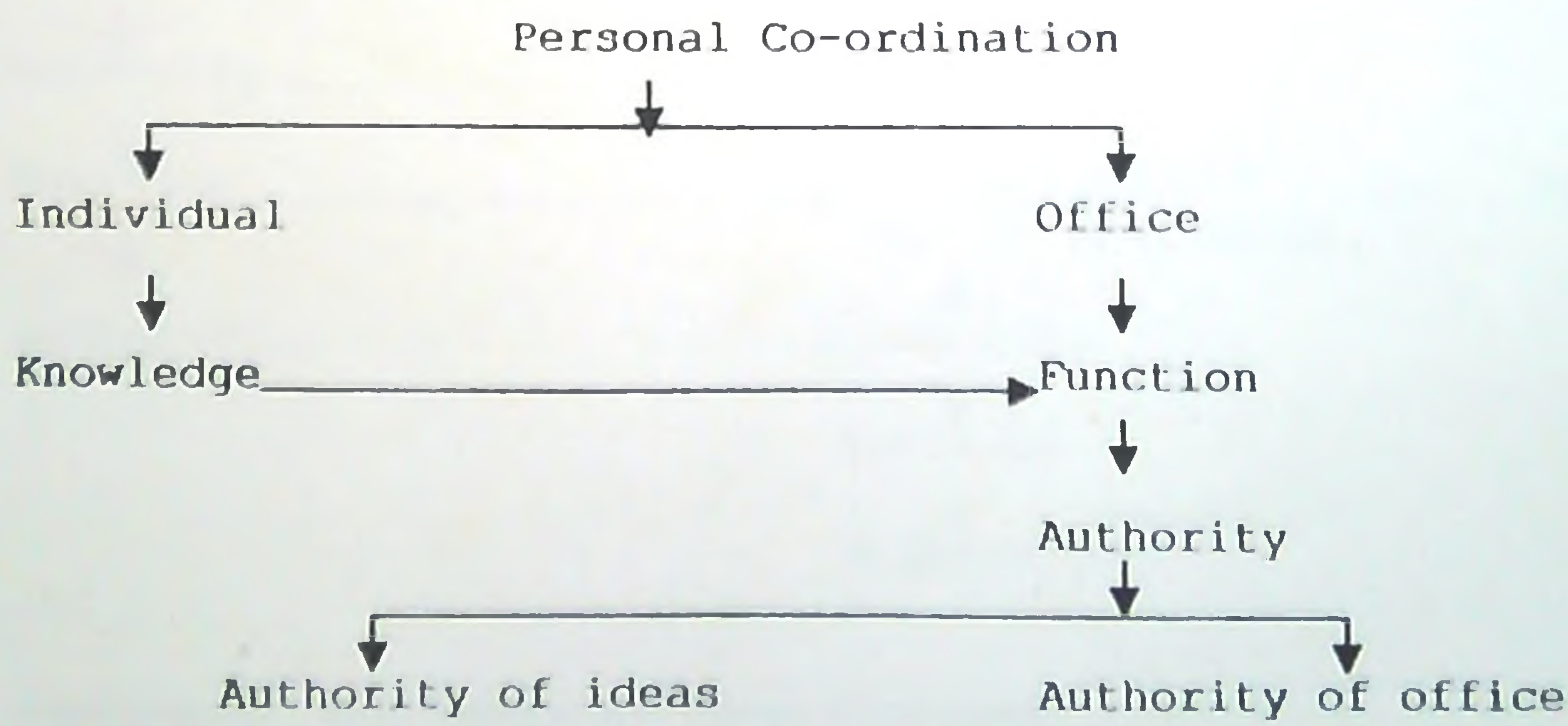
The finding reveals that a poorly linked research and extension (R&E) system, were the commodity research team does not collaborate directly with extension's subject-matter specialist (SMS) in planning, conducting and interpreting data from agronomic trials. Also, these researchers do not interact with farmers or their organizations in the process of identifying production problems, setting research priories. Furthermore, in this case researchers do not discuss research findings with SMS, in the process of developing farmers recommendations, rather than send a research report to extension that summarizes their findings. At this point it is up to the SMS to interpret these findings and formulate a package of recommendations for dissemination to farmers. However, most SMS lack of sufficient analytical skills including the ability to use economic criteria in formulating technical recommendations. Recommended practices may thus reflect the government's goal of maximizing productions rather than the goal of farmers which may be to maximize income. As a result, the package of recommendations may not be suitable for the most farmers especially resources poor farmers.

Co-ordination gap is created due to so many reasons:

Personal co-ordination

Muttalib (1990) perceived in his study that in this case, individual knowledge, leads to function and then functions leads into authority of office and authority of ideas. Between these two, administrators always use authority of office, which is detrimental, and authority of office creates a bridge between ends and means. Due to the absence of authority of ideas creates a co-ordination gap is created.

Table 9. Personal co-ordination



Inter agency co-ordination

In the same study, three types of authority there layman authority (which is a politician or elected person) generalist authority (which is a administrator) and specialist authority (which is a scientist or technologist). Their individual function is completely different to each other. Layman diagnosis the needs, generalist provides appropriate prescription and specialist administer the ways and means. Co-ordination is basically a generalist function that makes a bridge between. Specialist and layman but failure due to gap in inter agency co-ordination.

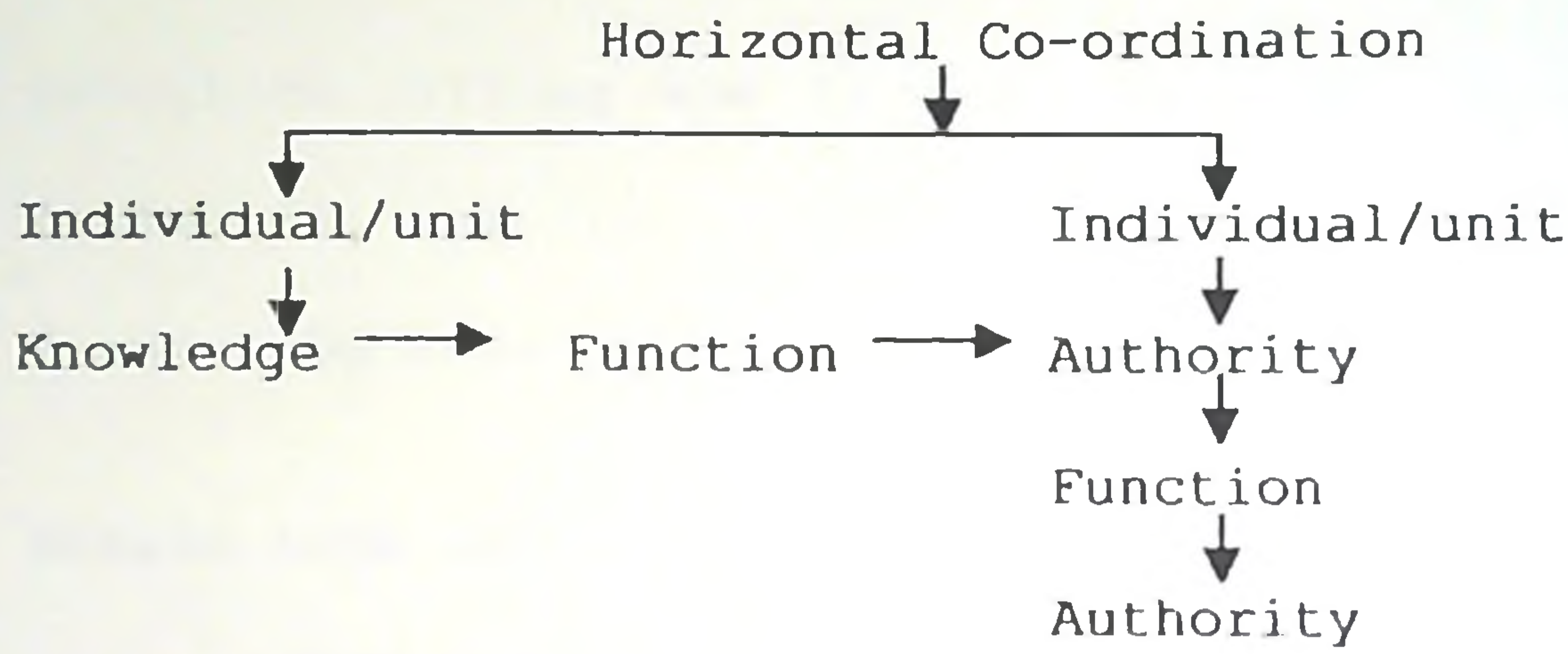
Table 10. Inter agency co-ordination

Layman/unit (in the role of layman)
↓
Knowledge
↓
Function generalist/unit (in the role of generalist)
↓
Authority → Knowledge
↓
Function → Specialist/unit (in the role of specialist)
↓ ↓
Authority → Knowledge
↓
Function
↓
Authority

Horizontal and vertical co-ordination

In the same study Muttalib (1990) also perceived that according to the situation horizontal and vertical co-ordination method are to be used. In small scale organization vertical and large organization horizontal co-ordination is to be used. But due to the variation in using the appropriate type of co-ordination method, a co-ordination gap is orated in the organization.

Table 11. Horizontal and vertical co-ordination



Cultural gap

Muttalib (1990) reported that a co-ordination gap was created between layman and administrator due to cultural variation in Andhra Pradesh and Maharashtra where the politician (layman) are predominantly with rural background with less education, enjoying not too high a social status. On the other hand, the administrator come from urban areas, mostly better educated enjoying higher social status. The latter is more sophisticated in their behavioural style. Thus the cultural gap created a co-ordination gap there.

Dissimilar level of functionaries

In the same study he reported that due to dissimilar level of functionaries a scheme of District Development Board in Andhra Pradesh was failed, where district administration which is headed by Deputy Commissioner and Zila Parishad level which is headed by executive officer are in the same rank and status. A co-ordination gap is frequently created due to dissimilar level. The same situation in Bangladesh.

Single line administration

District administration in India, Bangladesh, Africa, where Deputy Commissioner is to act as Deputy head of all departments and he will have direct control for all officers in District. It creates anarchy among the heads of the different department and is creating a co-ordination gap due to single line administration.

Multiplicity of agencies

Muttalib (1990) reported that due to multiplicity of agencies a co-ordination gap was created agriculture and co-operative in Maharashtra and Andhra Pradesh agricultural administration where inputs were supplied by both the agencies. This same problems occurred in Thailand, Malaysia and Indonesia. Recently Andhra Pradesh minimized the gap through better integration creating a single line multiplicity agency instead of multiplicity of agencies.

Absence of reward, recognition and appreciation

Muttalib (1990) reported that the good works are mostly kept by the officers themselves rather than passing them to the field works. Reward, recognition and oral or written appreciation accelerates the effective co-ordination which is absent in development administration and ultimately creates a gap between the superiors and subordinates.

Insufficient and untimely supply of input

Gupta (1992) reported that insufficient and untimely supply of inputs creates a very serious problem which make a field workers unascertained and unrealized and further creates a co-ordination gap in the agricultural development administration.

Lack of technical knowledge

Gupta (1992) reported that due to lack of technical knowledge there was a conflict aroused between generalist and specialist. Generalists were not well equipped in technical knowledge than specialist. So there is less participation of specialists in development planning and execution in all levels.

Vertical hierarchy

Rama (1992) reported that at the state level in Kerala, the number of departments increased considerably and each of them established a vertical hierarchy. Many co-operatives were formed by the departments. The departments and co-operatives undertook the same type of schemes at the local level through their vertical hierarchy. Even when a number of programmes for the rural poor were introduced, they did not co-ordinate at the local level.

Communication

Morey (1998) reported due to the lack of interpersonal communication in Vietnam a co-ordination gap was created among the department of Agriculture.

Consequences of co-ordination

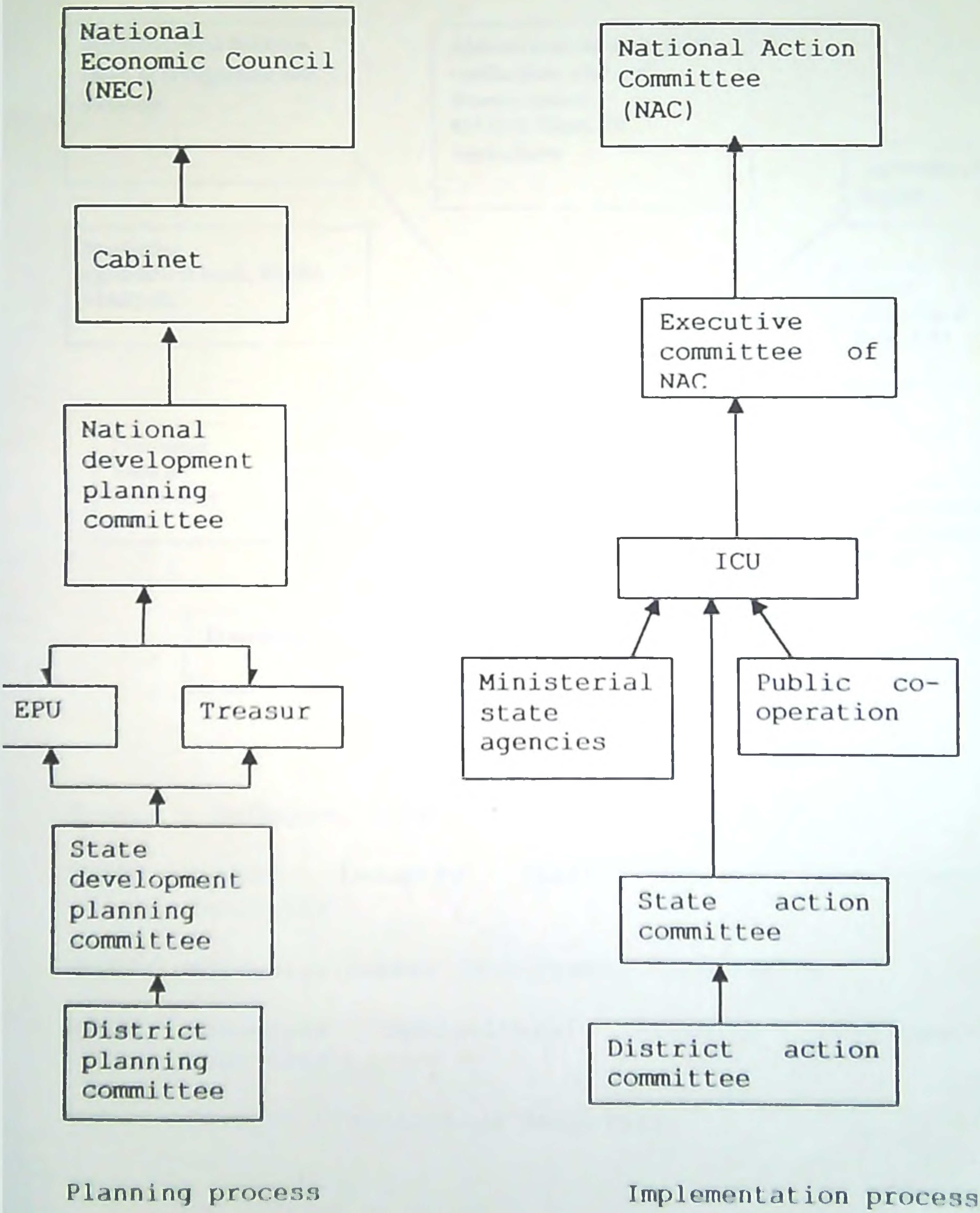
Due to missing the co-ordination with development administration functions, the intellectual authority scientists provided some suggestions to minimize the Co-ordination gap in development administration. Consequently some positive and negative consequences aroused.

Structural changes

Thomas (1997) reported that the government of Andhra Pradesh change structure for better co-ordination. Instead of 330 middle tier Panchayat Raj, newly formed 1104 Mandal Praja Parishad (MPP). Each MPP consists of 3 to 4 Praja Parishad (PP) and each of the MPP covers the area of 24 revenue villages with 35 to 55 thousand people. The MPPs are sought to be developed as units of decentralization rural administrative system where all important government departments are to operate without changing the earlier power with the Panchayat.

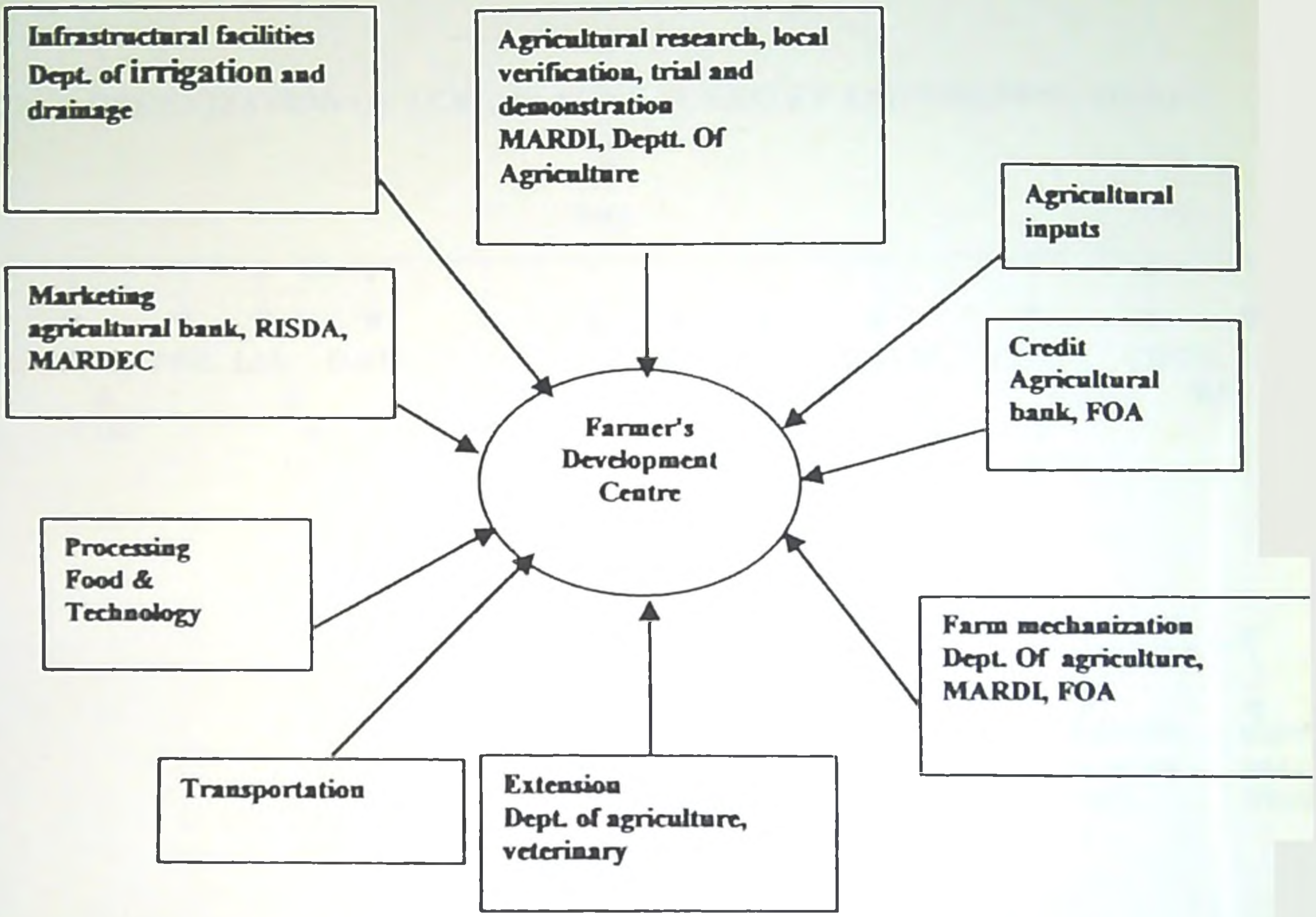
Haldipur (1996) reported that recently, Malaysia changed their structure and increased economic growth rapidly. In Malaysia, introduce, 'implementation co-ordination unit' (ICU) into their previous structure and established a 'farmers development centre' (FDC) that are assured with all the concerned departments for improving production. All the departments are conducting effectively.

Fig. 4. Agricultural planning and implementation process



Source: Haldipur, 1996

Fig. 5. Co-ordination of function at the farmer's development Centre



Source : Haldipur, 1996

RISDA : Rubber industry small holders development authority

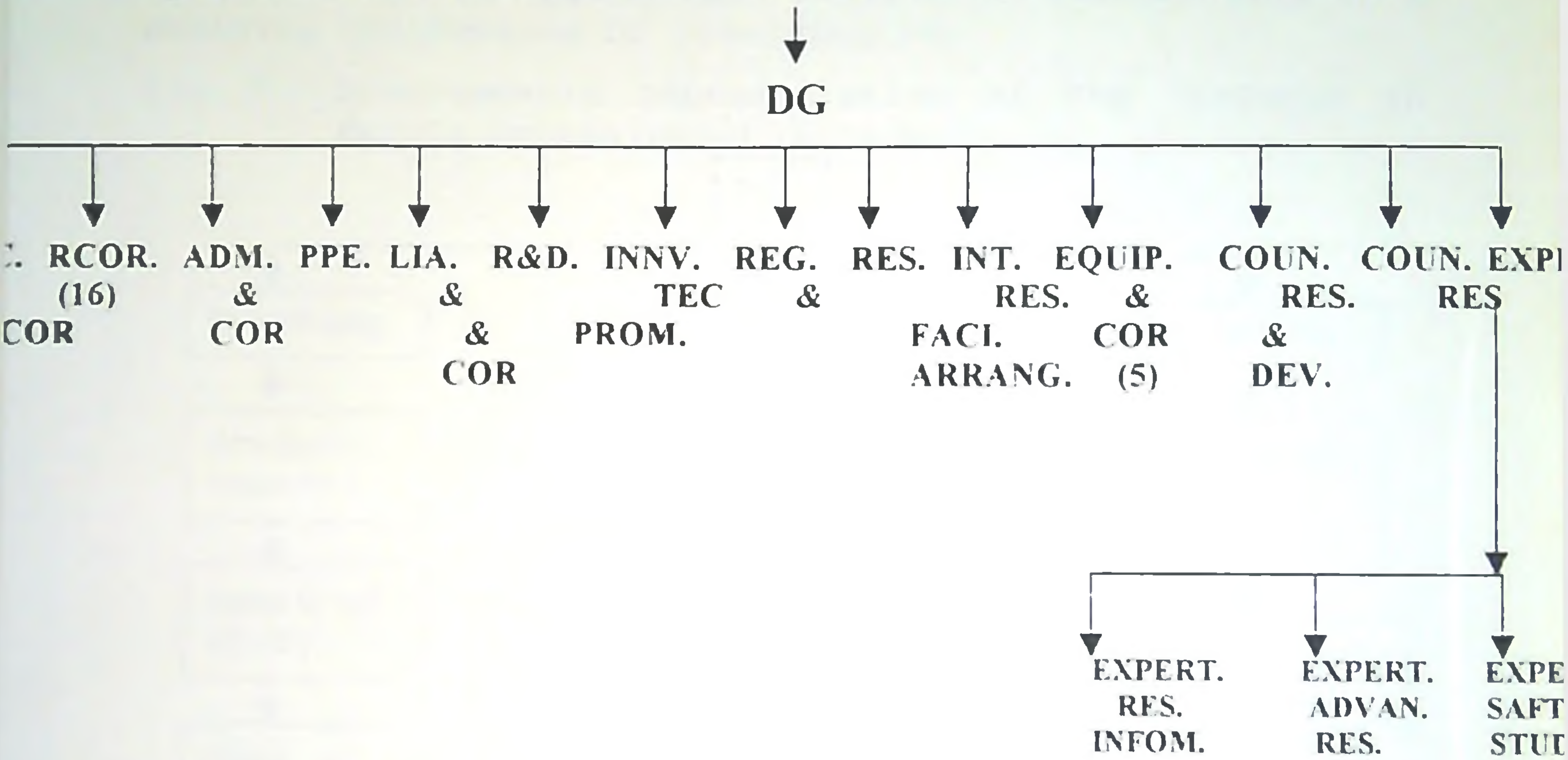
MARDEC : Malaysian Rubber Development Corporation

MARDI : Malaysian Agricultural Research Development Institute

FOA : Farmers Organization Authority

Pushpa (1995) reported that Japan increased agricultural productivity rapidly due to structural change.

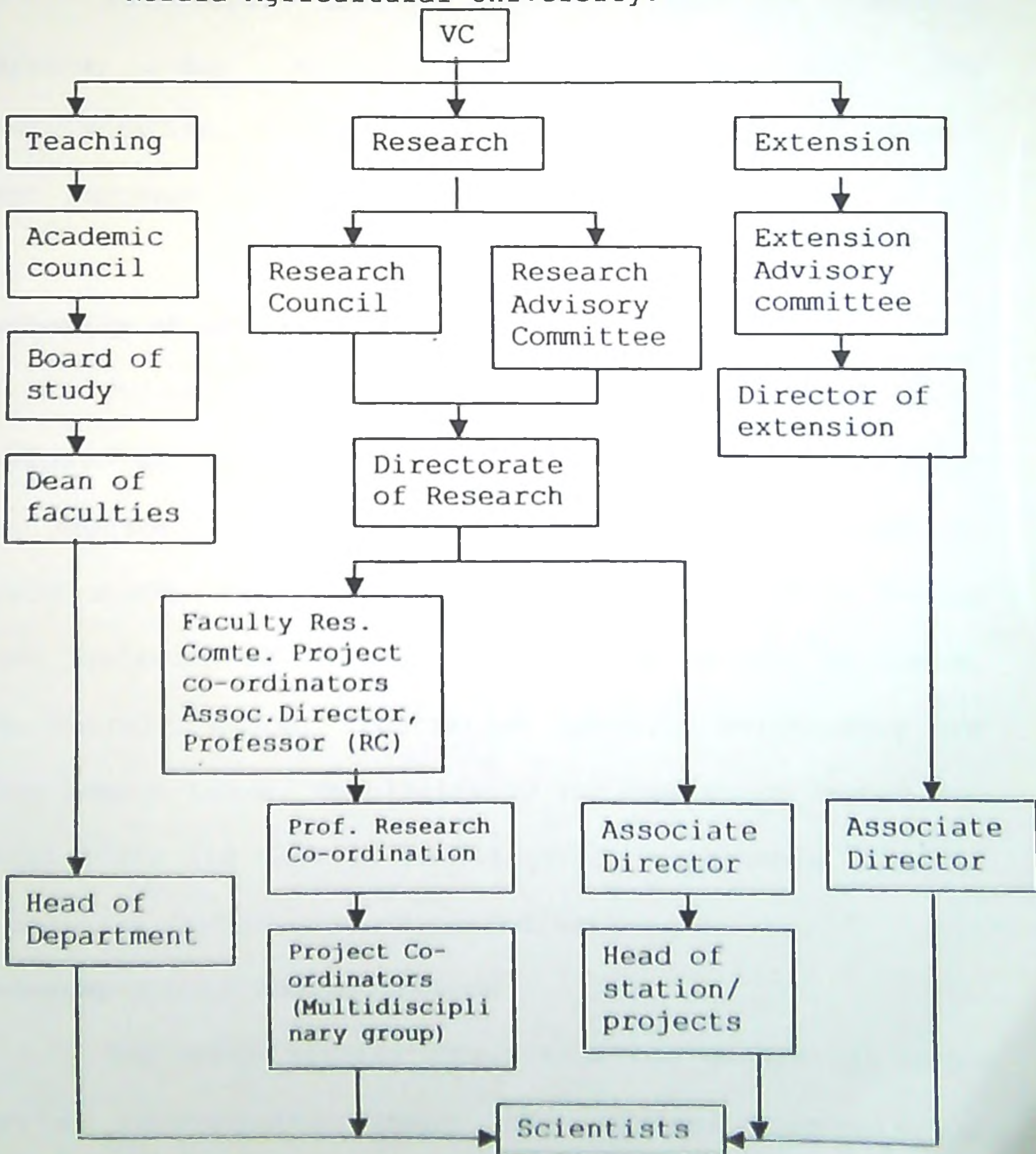
Fig. 6. ORGANIZATION OF AGRICULTURE, FORESTRY AND FISHERIES (JAPAN)



ADM :ADMINISTRATION
ADVAN :ADVANCED
COR :CO-ORDINATION
COUN :COUNCELLOR
DEV :DEVELOPMENT
EQUIP :EQUIPMENT
FACI :FACILITY
INFOR :INFORMATION
INNV :INNOVATIVE
INT :INTERNATIONAL
LIA :LIASSON
PPE :POLICY PLANNING & ECONOMIC
PROM :PRÓMOTION
R&D :RESEARCH & DEVELOPMENT
RC :RESEARCH COUNCELLOR
REG :REGIONAL
RES :RESEARCH
TEC :TECHNOLOGY

Kunju (1989) reported that the KAU is a multi campus university. All the research works under the university is being carried out by the scientists and post-graduate students in the five teaching campuses at Vellanikkara, Mannuthy, Vellayani, Padannakad and Tavanur as well as in the 23 research stations under the university located in different point of the state but the linkage is effective and ultimately co-ordination is effective due to appropriate structural change. This is a positive consequence of co-ordination.

Fig. 7. Diagrammatic representation of the linkages in Kerala Agricultural University.



Linkage

Morey (1998) Due to effective linkages in recent years in Vietnam have been highly encouraging. The economy has been increasing at near 10 per cent per annum. This is a positive consequence of co-ordination.

Pattanayak (1994) reported that in Tanzania (Africa) due to effective linkage with the administration, the development activities 12 to 19 per cent improved than the previous years.

Authority of office

Prines (1998) reported that co-ordination is hampered because agencies do not have uniform practices for representation or the degree of authority given to field staff. Administration in India, Bangladesh always uses authority of office instead of authority of ideas. So, anarchy, Chaos, frustration generate bureaucracy are very common there. Complexity is extreme where layman and generalists are lack of knowledge and experience. This is a negative consequence of co-ordination.

Interception of Administrators

The administrator drawn from the generalist cadre as a co-ordinator among the various segments of administration a anarchy arise between head quarter and field officers. Technical officers are required to function to head and his technical boss as well as Deputy commission's job. They fall in dilemma whether they will perform the departmental job or DC's job. This is a negative consequence of co-ordination.

Departmentalization

Due to excess departmentalization the implementation of development activities is delayed. In Bangladesh, all the divisions are unified under one organization i.e. Department of Agriculture. So, implementation of all the development project activities delayed due to excess departmentalization. This is a negative consequence of co-ordination.

Inter departmental conflict

Sharma (1992) due to interdepartmental conflicts, lots of duplication of work in the state planning in Himachal Pradesh in India. This is a negative consequence of co-ordination.

Establishment of co-ordination council

Haldipur (1996) reported that in the Phillippines, a Rice and Corn Production Co-ordinating Council (RCPCC) was established under the offices of the President to co-ordinate in the transfer and utilization of new technology to the farmer. The immediate result during the first year was a surplus in rice. This is a possible consequence of co-ordination.

Suggestions for improving effective co-ordination

In order to improve the co-ordination function Mitra (1995) studied on "co-ordination in Agricultural development for providing some suggestion for intra departmental co-ordination".

Table 12. Suggestions for Intra departmental co-ordination

Sl. No.	Suggestions	Frequency(%)	Rank order
1	Sincerity	30.00	1V
2	Punctuality	20.00	V
3	Monthly conference	15.00	V11
4	Informal meeting	15.00	V11
5	Brother hood relation rather than bossism	77.00	1
6	Clean & unbiased administration	20.00	V1
7	Enforcement of rules and regulations rigidity	25.00	V
8	Co-ordination committee	15.00	V11
9	Willingness to work together	55.00	11
10	Incentives to efficient worker	40.00	111

Source : Mitra, B., B. Das And C. Satapathy, 1995

The finding reveals that among eleven suggestions, brother hood relation rather than bossism ranked first followed by willingness to work together and incentive to efficient workers (Table 12).

In case of inter departmental suggestion in the same study

Table. 13. Suggestions of interdepartmental co-ordination

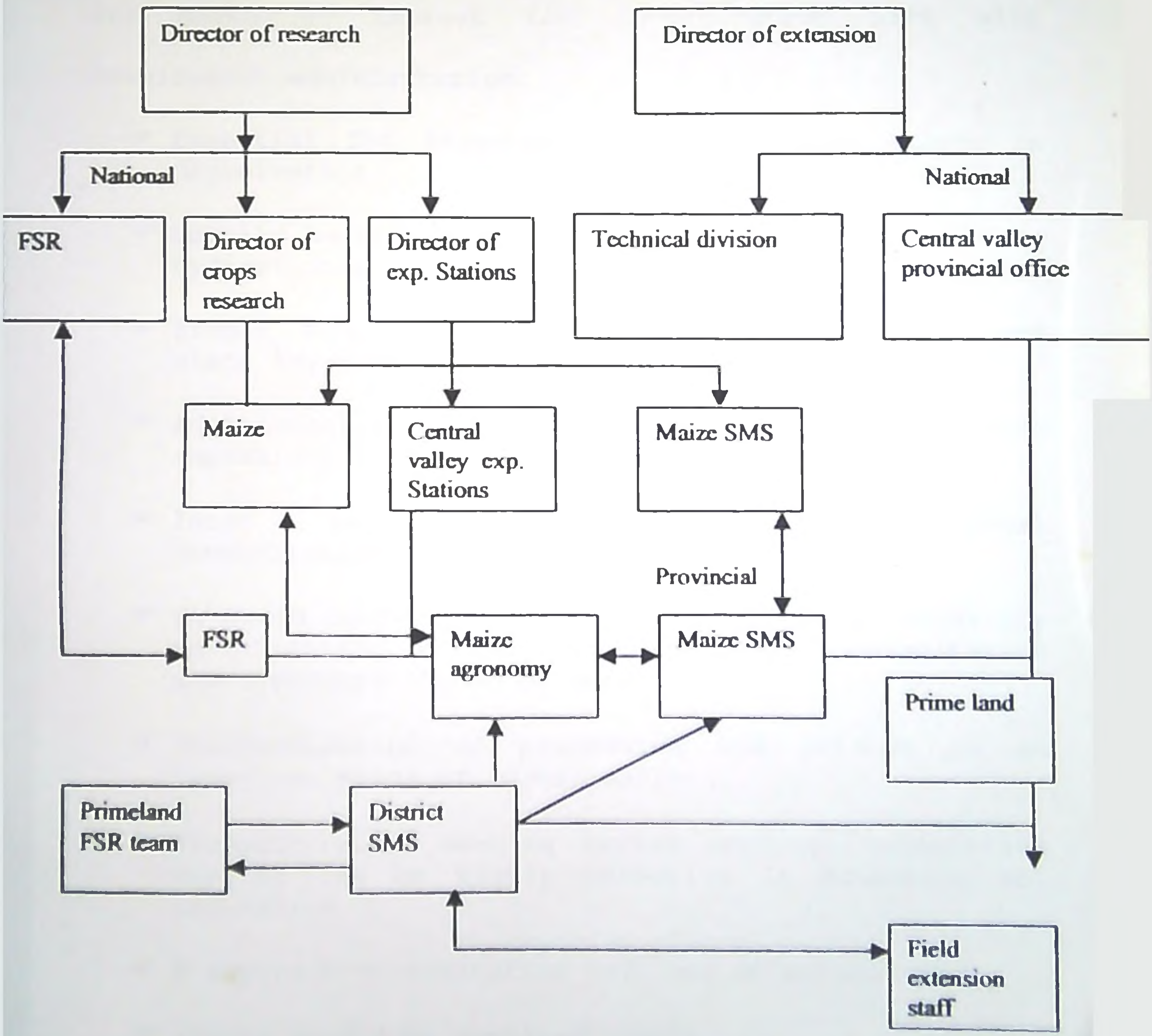
Sl. No.	Suggestion	Frequency(%)	Rank order
1	Inter departmental seminar	50.00	111
2	Equal importance to all co-ordinating departments	45.00	1V
3	Minimization of communication gap	30.00	V
4	Setting up co-ordination committee	75.00	1
5	Joint supervision	70.00	11
6	Recruitment of proper personnel in all the co-ordinating department	30.00	V

Source : Mitra, B., B. Das And C. Satapathy, 1995

The finding reveals that the setting up co-ordination committee ranked first followed by joint supervision and inter departmental seminar.

Burton (2000) explored a simplified research and extension structure illustrated a fully linked system and it enhances an effective co-ordination between them

Fig: 8 Simplified research and extension structure illustrated a fully linked system



The structure showed the horizontal linkage between research and extension generally involve planning, review and collaborative activities.

Based on the detailed findings some suggestions are given to improve the co-ordination link with development administration.

- Essential for structural and functional change in organization
- Usually horizontal and in some instance vertical co-ordination method should be used
- Proper steps should be taken by the central and state level to avoid overlapping scheme
- Administrative co-ordination should be more emphasized in democratic decentralization
- Inter organizational and inter personal communication is essential
- To avoid conflict and duplication of work, voluntary co-ordination method like reference, consultation and clearance should be used
- Standardisation of procedures and methods is an important means of co-ordination
- Periodic staff meeting review meeting, orientation meeting can be highly effective in promoting co-ordination
- A separate co-ordination cell may be established
- Inputs should be supplied timely
- Proper integration should be maintained between teaching, researches and extension through frequent

organizing workshop, seminar and joint collaborative research

- ☛ Brotherhood relation should always be maintained by the administrator

- ☛ Formation of co-ordination committee, joint supervision, inter departmental seminar and equal importance to all contributing departments should be given priority

Co-ordination –the missing link in Development Administration

SUNIL KUMAR ROY[1]

ABSTRACT

Co-ordination is missing in the development administration in almost all the third world, developing and even developed countries in the world. Consequently, intra and inter departmental, ministerial, agencies and organizational conflict is gradually increasing. Effective co-ordination can minimize this unhealthy situation.

"Co-ordination means establishing harmonious relationship between the efforts of individual and groups for the accomplishment of objectives of the organization" (Roy, 1999).

Co-ordination connotes the vital function of keeping different parts of administration attuned to each other. It is the essence of management rather than one of its functions. "Co-ordination, being synchronization effects of human beings in an organization is intrinsic to management as management also tries to synchronize group efforts for achieving organizational objectives" (Prasad, 1999).

Co-ordination is the most facilitating and delicate intellectual exercise among all development activities in the development administration. At present, development programs are multidimensional in nature. So, effective co-ordination among different organizations, agencies are obvious.

This presentation critically reviews and analyses the theoretical and psychological aspects, the missing links, gaps and factors contributing to effective co-ordination and the consequences there on. Most of the studies highlight factors like; team work, aptitude and initiative, fund and supplies, authority for decision close to operational; level, intra and inter personal communication and methodical and timely action affecting the co-ordination missing in the development administration (Mitra; 1995, Purkat, 1996, Muttalib, 1990, Metcaf, 1996 and Morey, 1998).

Based on the analytical review, the following suggestions for effective co-ordination are put forth:

a) Brotherhood relation rather than bossism should always be maintained with the subordinates b) joint supervision, c) willingness to work together, d) organizing inter-departmental seminar, e) incentives to efficient workers.

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GEOGRAPHICAL INFORMATION SYSTEMS

By

ANUP BALAKRISHNAN
(2000 – 21-19)

SEMINAR REPORT

Submitted in partial fulfillment for the requirement of the course
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THRISSUR.

DECLARATION

I, Anup Balakrishnan (2000 – 21 - 19) hereby declare that this seminar entitled **'Geographical Information System'** has been prepared by me independently after going through the various references cited here. I have not copied from any of my fellow students or other seminar reports.

Vellanikkara,
18-08-2001

Anup Balakrishnan
(2000 – 21 - 19)

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I. INTRODUCTION

Information about geography of a location is the basis of all developmental procedure occurring at a particular place. History of using geographic information dates back to Cro-Magnon era 35000 years ago. The Cro-Magnon hunters used geographic information when they drew on the cave walls the pictures of animals they sought. Associated with the animal drawing were the track lines and tallies that depicted the migration routes. This helped the cave men to keep track of when and where they would have the best chance of finding the greatest number of animals. Today the scientists have combined the Stone Age idea with high tech computers to evolve the Geographic Information System or GIS.

GIS technology manages geographically- referenced information and provides the tools to analyze spatial relationships between events or phenomena. It is an important technology because "Everything Happens Somewhere". GIS have been designed to address the two types of questions:

1. What happens in a particular place?
2. Where does a particular thing happen?

A third question supposedly to be answered is the time factor i.e. when a particular thing happens, is also ventured into by some modern day GIS.

GIS can act as a tool to answer the above posed question and is useful for planning and decision-making in all those enterprises and projects, which need to ask them. Agriculture and agricultural research is no exception. Even though research into agriculture has been carried out for millennia, increasing demand for agricultural products caused by population growth and a growing environmental awareness means that research must be continued. Spatial analysis facilitated by implementing GIS tools offers researchers new and exciting approaches to answer some of mankind's oldest questions.

Agricultural planning in India is being carried out for years on the basis of human interpretation of Geographical Information provided in various modes by numerous governmental and non – governmental agencies that erred in geographic data handling and interpretation. The use of GIS as a tool for agricultural planning therefore has tremendous potential in India as the planning and management is still a leap away for overall sustainable development.

A. TECHNOLOGY OF GIS

Any planning operation using GIS needs thorough understanding of technology by the personnel involved in handling data to evolve output for making plans and decisions. A brief description of how GIS works or technology is envisaged.

II. Definition:

Numerous definitions exist for GIS. Not a single one is complete by itself as the users based on their needs define them all. Some of them are:

- An information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially referenced data, as well as a set of operations for working [analysis] with the data. (Star and Estes, 1990)
- GIS is a powerful set of tools for collecting, storing, retrieving at will transforming and displaying spatial data from the real world. (Burrough, 1986)
- GIS is a database system in which most of the data are spatially indexed, and upon which a set of procedures operational in order to answer queries about spatial entities in the data base (Smith *et al.*, 1987)

GIS is also defined as:

- GIS is a computerized, integrated system used to compile, store, manipulate and output mapped spatial data.
- A computer based tool for mapping and analysing geographic phenomenon that exist and events that occur on earth.
- A GIS is an integrated set of hardware and software tools used f or manipulation and management of digital spatial and related attribute data.

All the above definitions are true but not a comprehensive one. A comprehensive definition should include the components of GIS and may be defined as "An organized collection of computer hardware, software, geographic data and personnel designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information." (ESRI, 1990)

III. Components Of a GIS

A successfully working GIS has a series of components that operate in concert to make the system functional. A functional GIS integrates five key components. **(FIG.1)**

a) Hardware: It is the computer system on which GIS operates. A wide range of hardware from centralized computer servers to desk top computers used in stand alone or networked configuration serve as a host for the GIS software.

b) Software: GIS software provides the function and tools needed to store, analyse and display geographic information. Some of the commonly used software is Arc Info, Arc view, ISROGIS, ILWIS, GRASS, GRAM etc.

c) Data: Data in GIS refers to any information collected by software /personnel and/or manipulated to needs into layers, to give an entire picture to a geographic topic. It is the most important component and forms the backbone of GIS.

d) People /users: The term users refer to any individual who will use GIS to support projects/program goals or to an entire organisation that will employ GIS in support of its overall mission. USGS (1988) classified users into two:

i System users: They are those persons who have actual hands-on use of the GIS hardware and software. These persons have advanced technical skills in the application of GIS. They design, maintain, update and manage the system and develop plans for applying it to real world problems.

ii End users: They are those persons who do not have actual hands-on use of the system. They make use of the information products generated by the GIS. They may or may not be technically skilled but use GIS output to support project/

program. They can be individuals, groups or organisation using GIS output for supporting overall mission.

e) Methods: Methods refer to the rules and plans that decide the model and operational practices of GIS output by an end user. It is unique for each organisation.

IV. GIS SUBSYSTEMS

A GIS has four main functional sub-systems. These are:

i Data Input: A data input subsystem allows the user to capture, collect, and transform spatial and thematic data into digital form. The data inputs are usually derived from a combination of hard copy maps, aerial photographs, remotely sensed images, reports, survey documents, etc.

ii Data Storage and Retrieval: The data storage and retrieval subsystem organizes the data, spatial and attribute, in a form which permits it to be quickly retrieved by the user for analysis, and permits rapid and accurate updates to be made to the database. This component usually involves use of a database management system (DBMS) for maintaining attribute data.

iii Data Manipulation and Analysis: The data manipulation and analysis subsystem allows the user to define and execute spatial and attribute procedures to generate derived information. This subsystem is commonly thought of as the ***heart of a GIS***, and usually distinguishes it from other database information systems and computer-aided drafting (CAD) systems.

iv Data Output: The data output subsystem allows the user to generate graphic displays, normally maps, and tabular reports representing derived information products.

V. Data

The most important component of any GIS is data and the primary function of a GIS is to manipulate and analyse data to generate derived output. GIS utilizes two data-types.

V. a. Data types:

GIS technology utilises two basic data types.

i Spatial data: describes the absolute and relative location of geographic features. It tells us where something occurs.

ii Attribute data: describes characteristics of the spatial features. These characteristics can be quantitative and/or qualitative in nature. Attribute data is often referred to as tabular data. It tells us what occurs.

Every GIS provides the ability to store and manipulate both the spatial and associated attribute data.

V. b. Data models:

Data model is a set of logical definitions or rules for characterizing the Geographical data. The data model represents the linkages between the real- world domain of geographical data and the computer or GIS representation of features. Data model help not only in organizing data on geographical features but also help in capturing users perception of these features (Marble, 1982). All data models are approaches for storing geographic features in a database. Data models are used to simplify the data shown on map into a more basic form that can be easily and efficiently stored in the computer. Data models are of two types:

i **Spatial data model:** Traditionally spatial data has been stored and presented in the form of a map. All spatial data models are approaches for storing the spatial location of geographic features in a database. The basic types of spatial data models for storing geographic data digitally are:

- Vector data format: A vector model stores all spatial data as primitive features or points, lines, and polygons. Vector storage implies the use of

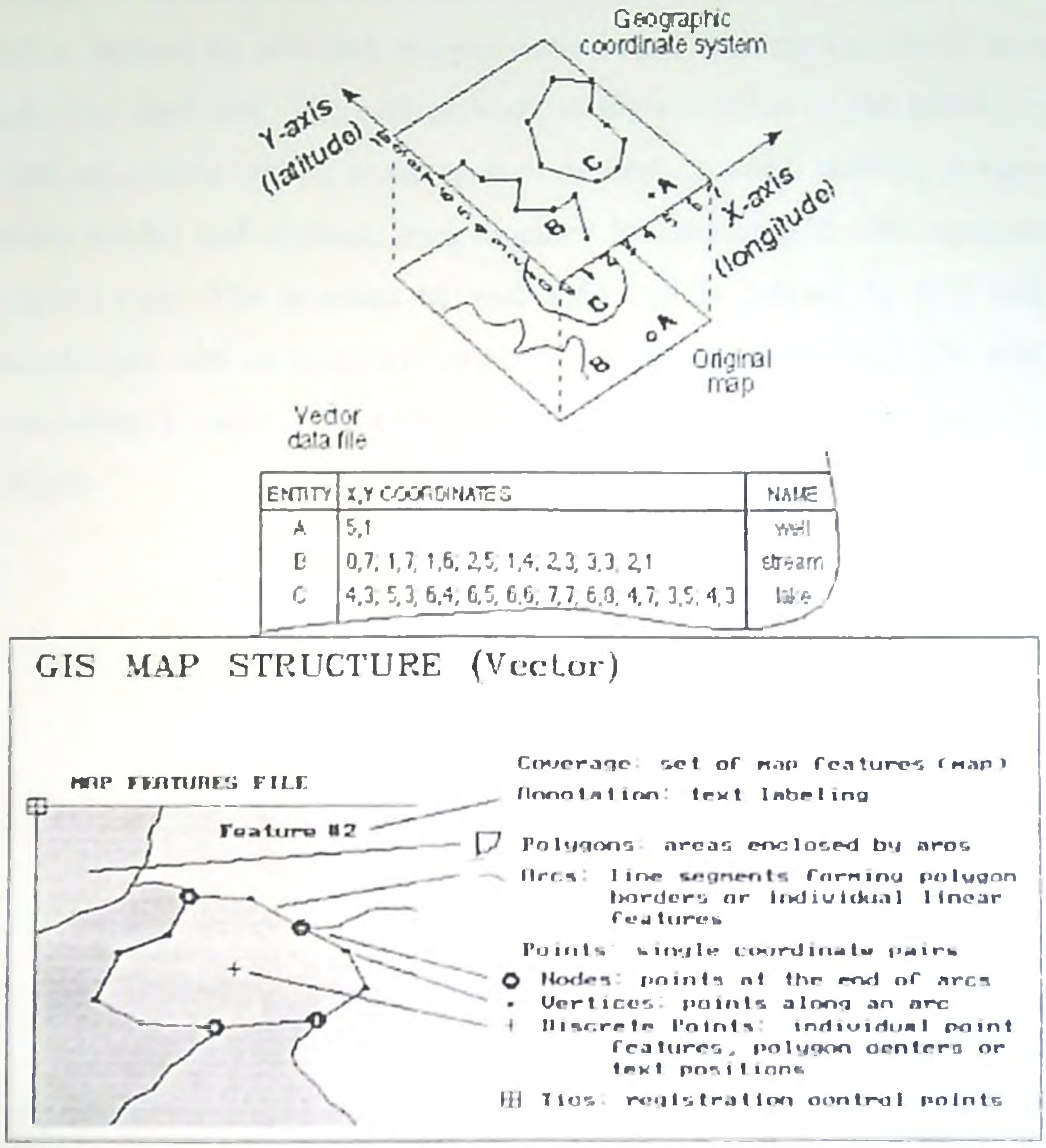


Figure 2. Vector representation of geographic data

vectors (directional lines) to represent a geographic feature. Vector data is characterized by the use of sequential points or *vertices* to define a linear segment. Each vertex consists of an X coordinate and a Y coordinates. Vector lines are often referred to as *arcs* and consist of a string of vertices terminated by a *node*. A node is defined as a vertex that starts or ends an arc segment. One coordinate pair - a vertex, defines point features. Polygonal features are defined by a set of closed coordinate pairs. Attributes of vector units are stored in computer files as records or tuples that may be linked to them. The end result of converting a map to a vector data file is a GIS compatible -compatible digital data file. **(Fig.2)**

- Raster Data Formats: Raster data models incorporate the use of a *grid-cell* data structure where the geographic area is divided into cells identified by row and column. This data structure is commonly called *raster*. The location of each grid cell is defined by row and column coordinates with an associated attribute tag linked to each cell. The grid network defines location of the entities with each pixel associated with a square parcel of land on earth surface. A raster model stores spatial and attribute data together for sets of grid cells registered to the original map. The location of each grid cell is defined by row and column coordinates with an associated attribute tag linked to each cell. The end result of converting a map to a raster data file is a GIS-compatible digital data file. (Fig.3)

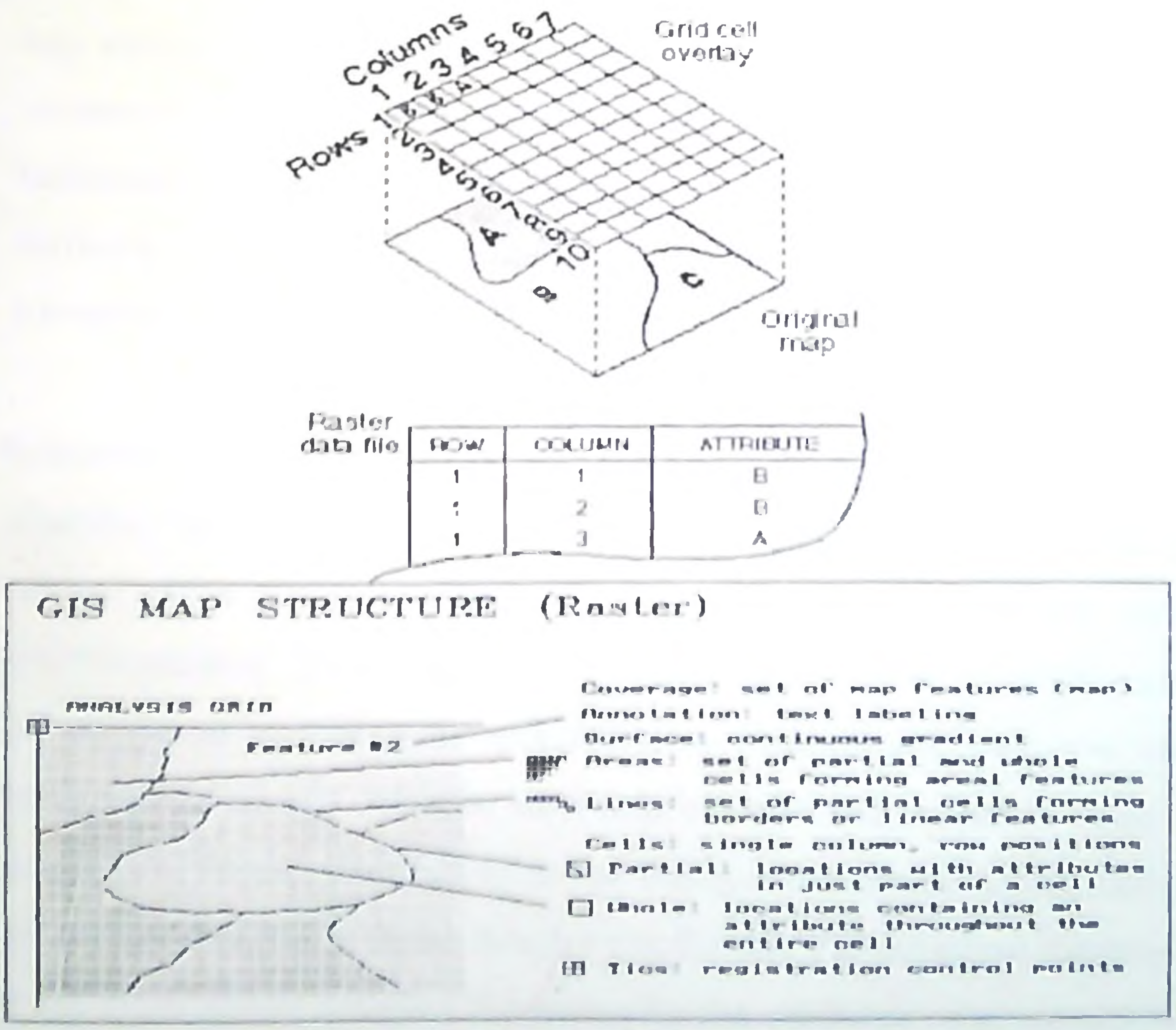


Figure 3. Raster representation of geographic data

ii **Attribute data model:** Attribute data model is used to store and maintain attribute data for GIS software. A variety of data models exist for the storage and management of attribute data . The most common are :

- Tabular: The simple tabular model stores attribute data as sequential data files with fixed formats for the location of attribute values in a predefined record structure. This type of data model is outdated in the GIS arena.

- Hierarchical: The hierarchical database organizes data in a *tree* structure. Data is structured downward in a *hierarchy* of tables. The hierarchical system assumes that each part of hierarchy can be reached using a key (a set of discriminating criteria) that fully describes the data structure and there is a good correlation between the key attributes and associated attributes the item may posses. Hierarchical DBMS have not gained any noticeable acceptance for use within GIS

- Network: The network database organizes data in a network or *plex* structure. Any column in a plex structure can be linked to any other. Network database structures are very useful when the relations or linkages can be specified beforehand. They avoid data redundancy and make good use of available data. Network DBMS have not found much more acceptance in GIS than the hierarchical DBMS.

- Relational: The relational database organizes data in *tables*. Each table, is identified by a unique table name, and is organized by *rows* and *columns*. Each column within a table also has a unique name. Columns store the values for a specific attribute. Rows represent one record in the table. In a GIS each row is usually linked to a separate spatial feature. Accordingly, each row would be comprised of several columns, each column containing a specific value for that geographic feature. This serves as the linkage between the spatial definition of the feature and the attribute data for the feature. The relational database model is the most widely accepted for managing the attributes of geographic data. In the relational design, data are stored conceptually as a collection of tables. Common fields in different tables are used to link them together. Data are extracted from a relational database through the user query known as Structured Query Language (SQL). A relational database format is shown in the **Figure 4**.

- Object Oriented: The object-oriented database model manages data through *objects.* An object is a collection of data elements and operations that together are considered a single entity. The object-oriented database is a relatively new model. This approach has the attraction that querying is very natural, as features can be bundled together with attributes at the database administrator's discretion.

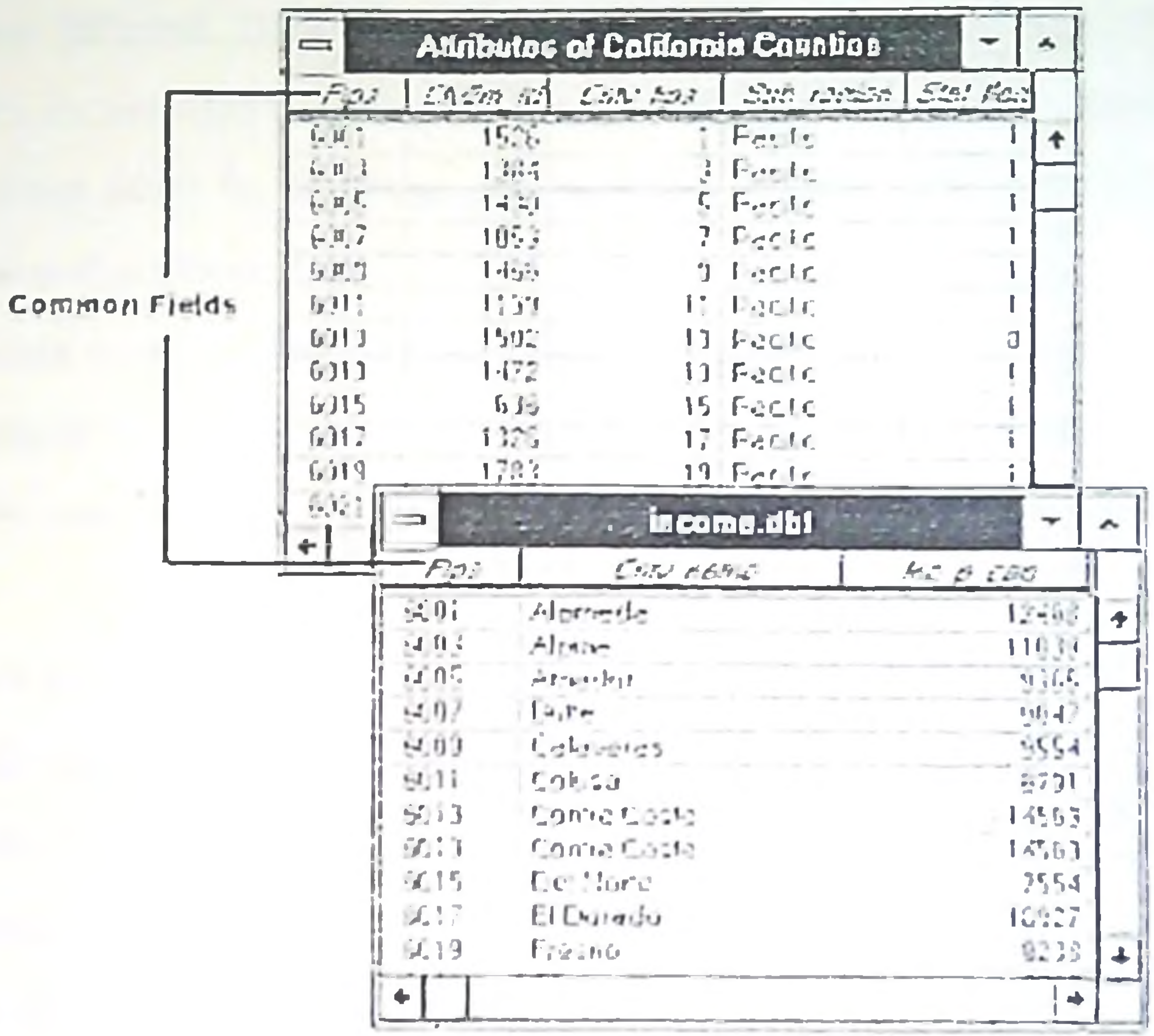


Figure 4. Representation of relational data model

VI. Spatial Data Relationships

The nature of spatial data relationships is of concern since the primary role of GIS is the manipulation and analysis of large quantities of spatial data. To date, the accepted theoretical solution is to *topologically structure* spatial data. It is believed that a topologic data model best reflects the geography of the real world and provides an effective mathematical foundation for encoding spatial relationships, providing a data model for manipulating and analyzing vector based data.

Topology

Topology is a mathematical approach that allows us to structure data based on the principles of feature adjacency and feature connectivity. It is in fact the mathematical method used to define spatial relationships. Without a topologic data structure in a vector based GIS most data manipulation and analysis functions would not be practical or feasible. Since most input data does not exist in a topological data structure, topology must be built with the GIS software. The topological model is utilized because it effectively models the relationship of spatial entities. The major disadvantage of the topological data model is its static nature

VII. Data Sources

Data input into a GIS as mentioned are spatial data and attribute data. So their sources are also different. Data input into a GIS is digital data and is the most expensive part of the GIS. In any GIS data acquisition, data compilation and database development accounts for about 60 to 80 % of the cost incurred. A wide variety of data sources exist for both spatial and attribute data.

- Attribute data sources: Any textual, tabular, graphical data that can be referenced to the geographical feature serve as attribute data sources. Attribute data is usually inputted by manual keying or by a bulk loading utility of the DBMS software.

- Spatial data sources: Most commonly available spatial data sources are
    - Hard copy maps
    - Aerial photographs
    - Remotely-sensed imagery
    - Point data samples from surveys
    - Existing digital data files.

The most popular spatial data sources are the existing hard copy maps, or *analogue maps*. So the accuracy of the map inputted into the GIS decides the quality of the output of any GIS.

VII.a. Map:

The accuracy and quality of the map is a major factor deciding the output of any GIS. Therefore it need special attention or care while working with a map. Maps are fundamental tools used to portray spatial or geographic data. A map is a graphic representation of where features are, explicitly and relative to one another. A map is composed of different geographic features represented as points, lines, and/or areas. A geographic feature on a map is defined both by its location in space and by its characteristic features and therefore can be treated as a miniature model of the real world. The symbols and features used in a map describe its counterpart in real world and the map legend is the key linking the attributes to the geographic features. Any map portrays three kinds of information about geographical features. They are the:

- Location and extent of the feature identified explicitly by reference to a coordinate system representing the earth's surface. This is where a feature is.
- Attributes (characteristics) of the feature describe or characterize the feature. This is what the feature is.
- Relationship of the feature to other features implied from the location and attributes of all features.

VIII. Characterizing Geographic features

All geographic features on the earth's surface can be characterized and defined by points, lines, and areas, i.e. a point, line, and/or an area can in principle represent every geographic phenomenon (**Figure 5**).

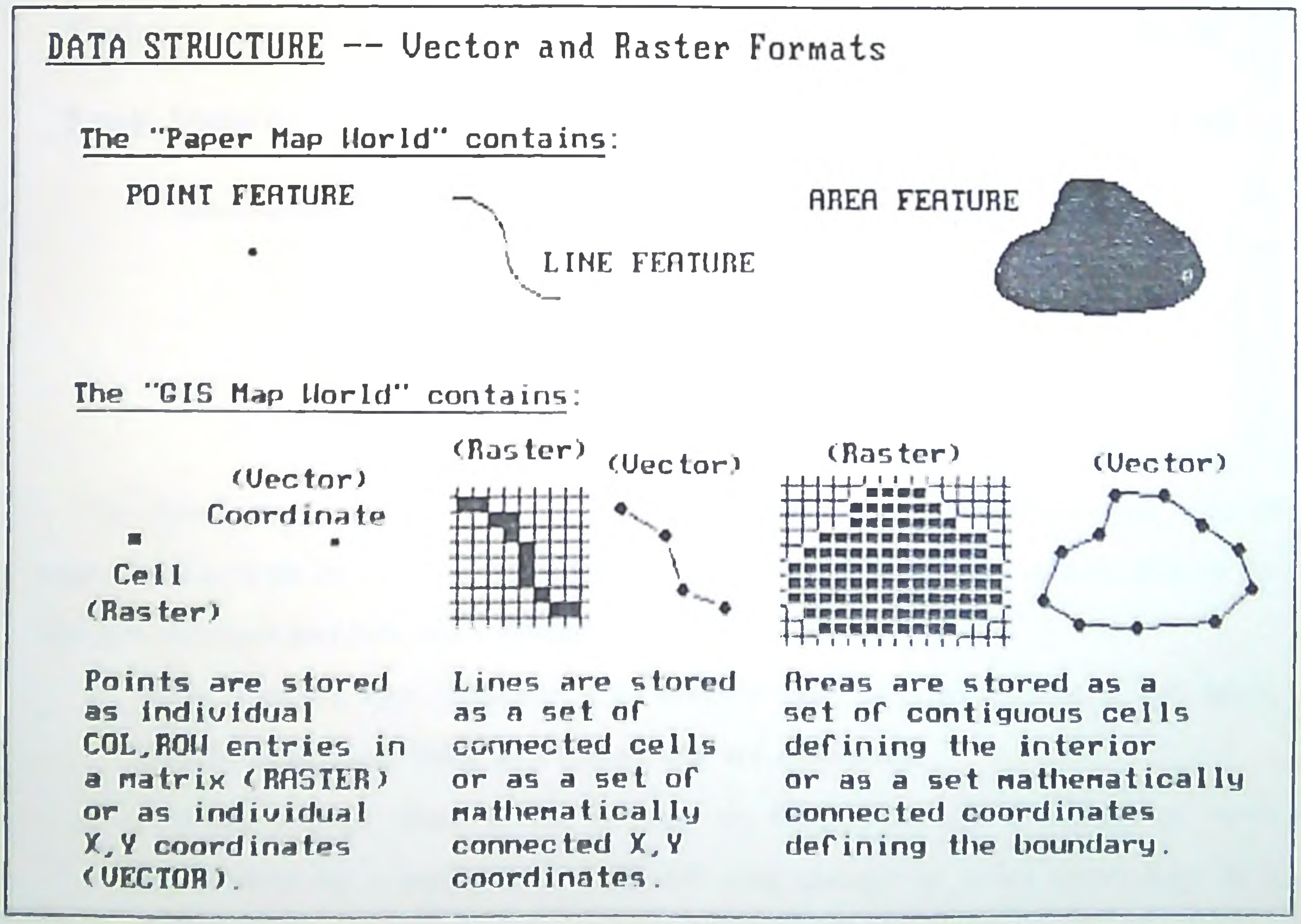


Figure 5. Characteristic representation of geographic features

Geographic features and symbols used to represent them is dependant on the scale used to represent the data. Scale is the ratio of a distance on an image/map to its corresponding distance on the scene. Therefore accuracy of a feature's location is lesser at a smaller scale than a larger scale. Generalisation of feature is an inherent characteristic of the data presented at a smaller scale.

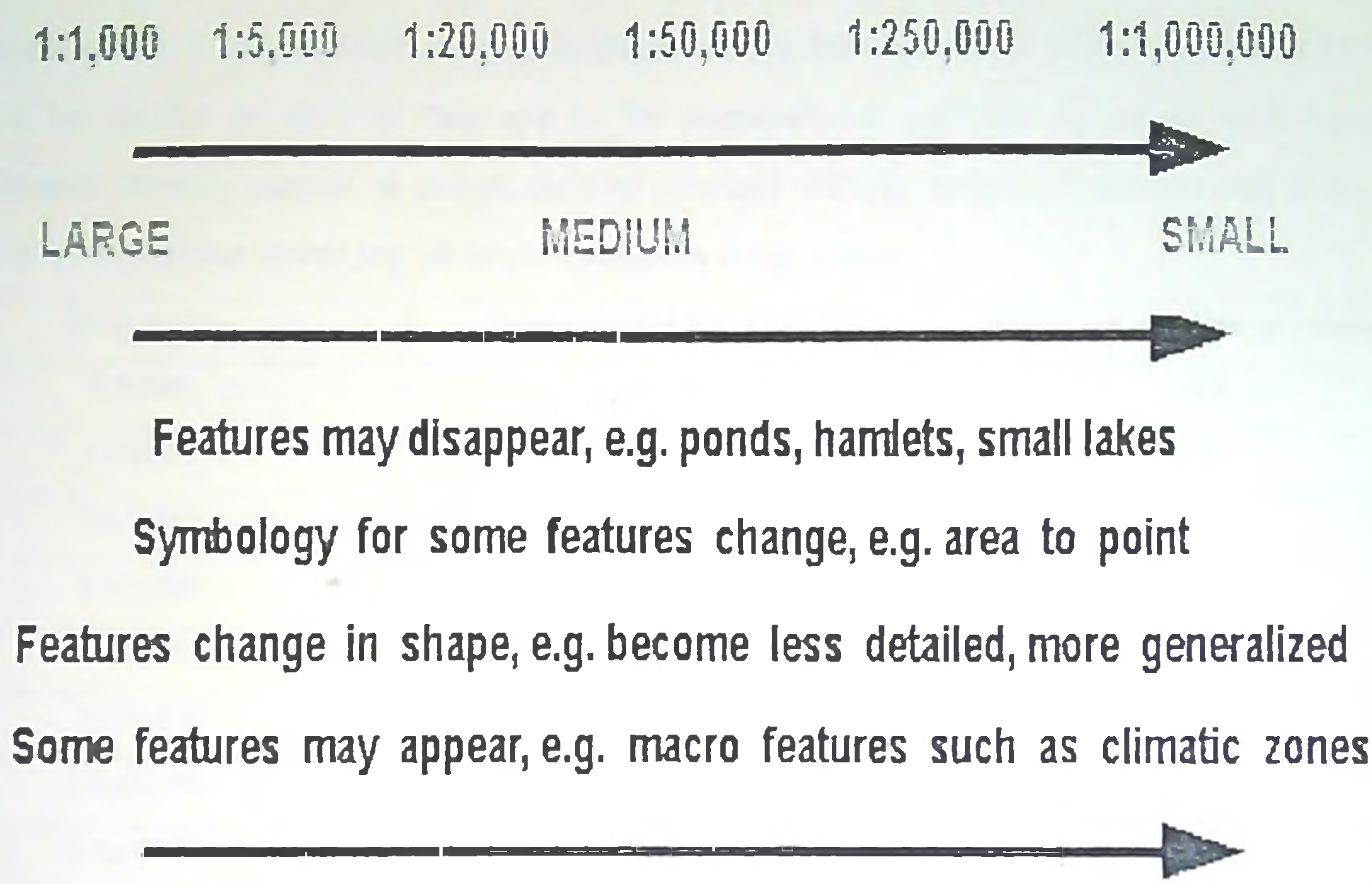


Figure 6a Generalisation of features with scale

The figure above depicts (Fig 6a) the changes that happen on a decreasing scale of maps. As the scale of map decreases from 1:1000 to 1: 1000000 the relative size of the features decrease and following changes may occur.

- Some features may disappear, e.g. features such as ponds, hamlets, and lakes, become indistinguishable as a feature and are eliminated.
- Features change from areas to lines or to points, e.g. a village or town represented by a polygon at 1:15,000 may change to point symbology at a 1:100,000 scale.
- Features change in shape, e.g. boundaries become less detailed and more generalized.
- Some features may appear, e.g. features such as climate zones may be indistinguishable at a large scale (1:15,000) but the full extent of the zone becomes evident at a smaller scale (1:1,000,000).

The table **(Table1)** shows the location accuracy at some common map scales. At 1: 5000 map scale 1cm^2 area on a map represent 0.25 ha in real world. Also any point on the map can locate a feature with an accuracy of ± 1.25 m, but as the scale decreases to 1: 1000,000 the area represented increases to 10000 ha and any point can represent a feature within ± 250m.Scale of map is important as because maps to be stored in a GIS must be similar in scale if they are to be manipulated together *i.e.* maps with large difference in scale cannot be compared and overlaid without serious distortion and error.

Table1: Location accuracy at some common map scales

Map scale	Area covered by 1cm^2/ ha	Maximum location accuracy/m
1:5,000	0.25	1.25
1:10000	1.0	2.5
1:15,000	2.25	3.75
1:20,000	4.00	5.0
1:25,000	6.25	6.25
1:50,000	25.00	12.5
1:1,00,000	100	25.0
1:2,00,000	400	50.0
1:250,000	625	62.5
1:5,00,000	2500	125
1:1,000,000	10000	250

IX. Data input

Once the data collection is over the data is entered into the GIS by:

1. Digitizing: digitizing is a simplification process that converts all spatial data to a point, line or polygon. Digitizing allows a user to trace spatial data from a hard copy product, e.g. a map, and have it recorded by the computer software. It can be done either manually or automatically.
2. Automatic scanning: This method employs use of scanning devices for capture of spatial data. This has the advantage of capturing spatial data at a greater speed. Still it is not popular in GIS technology as scanners are generally expensive to acquire and operate. Most scanning devices have limitations with respect to the capture of selected features, e.g. text and symbol recognition.
3. Coordinate Geometry: Another technique for the input of spatial data involves the calculation and entry of coordinates using coordinate geometry procedures.

This involves entering, from survey data, the explicit measurement of features from some known monument. This input technique is obviously very costly and labour intensive and it is rarely used for natural resource applications in GIS.

4. Existing digital data: This is yet another technique of data input where a variety of existing spatial data, including digital maps which are openly available from a wide range of government and private sources are input into the current GIS. The most common digital data to be used in a GIS is data from CAD systems and numerous software exist for conversion of CAD data into GIS. Some of the data formats common to the GIS are:
    - IGDS - Interactive Graphics Design Software (Intergraph / Microstation)
    - DLG - Digital Line Graph (US Geological Survey)
    - DXF - Drawing Exchange Format (Autocad)
    - GENERATE - ARC/INFO Graphic Exchange Format
    - EXPORT - ARC/INFO Export Format

X. Data Editing and Quality Assurance

The input data may be incorrect due to errors that arose during the encoding of spatial and non-spatial data. Most common errors are

- Incompleteness of the spatial data: This includes missing points, line segments, and/or polygons.
- Locational placement errors of spatial data: These types of errors usually are the result of careless digitizing or poor quality of the original data source.
- Distortion of the spatial data: Base maps that are not scale-correct over the whole image, e.g. aerial photographs, or from material stretch, e.g. paper documents usually cause this kind of error.
- Incorrect linkages between spatial and attribute data: This type of error is commonly the result of incorrect unique identifiers (labels) being assigned during manual key in or digitizing. This may involve the assigning of an entirely wrong label to a feature, or more than one label being assigned to a feature.
- Attribute data is wrong or incomplete: Often the attribute data does not match exactly with the spatial data. This is because they are frequently from independent sources and often-different time periods. Missing data records or too many data records are the most common problems.

These errors result in spatial data errors like :

- Slivers and gaps in the line work;
- Dead ends e.g. also called dangling arcs, resulting from overshoots and undershoots in the line work;
- Bow ties or weird polygons from inappropriate closing of connecting features.

These errors are to be cleaned by several tools provided by software of GIS. The process is called cleaning up of data.

XI. Organizing Data for Analysis

Once the data is cleaned they have to be organized for analysis. Most GIS software organizes spatial data in a thematic approach that categorizes data in vertical *layers.*

XI.a. Spatial Data Layers - Vertical Data Organization

In most GIS software spatial data is organized in themes as *data layers.* In this data are input as separate themes and overlaid based on analysis requirements. This can conceptualized as vertical layering the characteristics of the earth's surface. Spatial data layers are commonly input one at a time. Accordingly, attribute data is entered one layer at a time. Depending on the attribute data model used by the data storage subsystem data must be organized in a format that will facilitate the manipulation and analysis tasks that will be required. Themes, coverages, layers, levels, objects, and feature classes are the terms used to define data layers in commercial GIS software. Most GIS projects integrate data layers to create derived themes or layers that represent the result of some calculation or geographic model, e.g. forest merchantability, land use suitability, etc.

XI.b. Spatial Indexing - Horizontal Data Organization

The organization of data layers in a horizontal fashion within a GIS is known as *spatial indexing.* Spatial indexing is the method utilized by the software to store and retrieve spatial data. This involves the partitioning of the geographic area into manageable subsets or *tiles.* These tiles are then indexed mathematically, e.g. by quadtrees, by R (rectangle) trees, to allow for quick searching and retrieval when querying is initiated by a user.

XI.c. Data manipulation and analysis:

Once the data is input and converted to digital format in a GIS, it is compiled by relating all spatial features to respective attributes, cleaned, edited and errors corrected using specific processes. This prepares the data for the most important procedure in any GIS – the data analysis.

XII. Data analysis

This is the heart of any GIS and differentiates it from all other map-making softwares. Data analysis involves three processes

i. Manipulation and transformation of data
ii. Integration and modeling of spatial data
iii. Integrated analytical functions

These are performed by the toolkits available in the software. Toolkit is a set of generic functions that a GIS user can employ to manipulate and analyse geographic data.

XII.a. Manipulation and transformation of data:

These involves following procedures

- Co-ordinate thinning: Coordinate thinning involves the *weeding* or reduction of coordinate pairs, from arcs. This function is often required when data has been captured with too many vertices for the linear features.
- Geometric Transformations: This function is concerned with the registering of a data layer to a common coordinate scheme. This usually involves registering selected data layers to a standard data layer already registered.
- Map Projection Transformations: This function concerns the transformation of data in geographic coordinates for an existing map projection to another map projection. Most GIS software requires that data layers must be in the same map projection for analysis. Accordingly, if data is acquired in a different projection than the other data layers it must be transformed.
- Conflation / Sliver Removal : Conflation is formally defined as the procedure of merging the positions of corresponding features in different data layers. Conflation is concerned with the process for removing slivers and unifying the common boundary. More commonly this is referred to as *sliver removal*
- Edge Matching: Edge matching is simply the procedure to adjust the position of features that extend across typical map sheet boundaries. Theoretically data from adjacent map sheets should meet precisely at map edges.
- Interactive Graphic Editing: Interactive graphic editing functions involve the addition, deletion, moving, and changing of the geographic position of features.

Many of the editing that is undertaken involves the cleaning up of topological errors identified earlier. The capability to *snap* to existing elements, e.g. nodes and arcs, is critical.

XII.b. Integration and modeling of spatial data

These are the techniques that allow the GIS to answer complex how much? or where? and what if? questions. This is called spatial modeling. Spatial modeling refers to the use of spatial characteristics and methods in manipulating data.

XII.c. Integrated Analytical function in a GIS

Most GIS's provide the capability to build complex models by combining primitive analytical functions. Aronoff (1989) identifies four categories of GIS analysis functions. These are:

- Retrieval, Reclassification, and Generalization: Reclassification does the selection and presentation of a selected layer of data based on the classes or values of a specific attribute e.g. cover group. It involves looking at an attribute, or a series of attributes, for a single data layer and classifying the data layer based on the range of values of the attribute. Reclassification is an attribute generalization technique. Typically this function makes use of polygon patterning techniques such as crosshatching and/or color shading for graphic representation.
- Topological Overlay Techniques: Topological overlay is concerned with stacking polygon data over polygon data, e.g. soils and forest cover. However, there are requirements for overlaying point, linear, and polygon data in selected combinations, e.g. point in polygon, line in polygon, and polygon on polygon are the most common. The following diagram illustrates a typical overlay requirement where several different layers are spatially joined to create a new topological layer. By combining multiple layers in a topological fashion complex queries can be answered concerning attributes of any layer. (**Figure. 6)b.)**

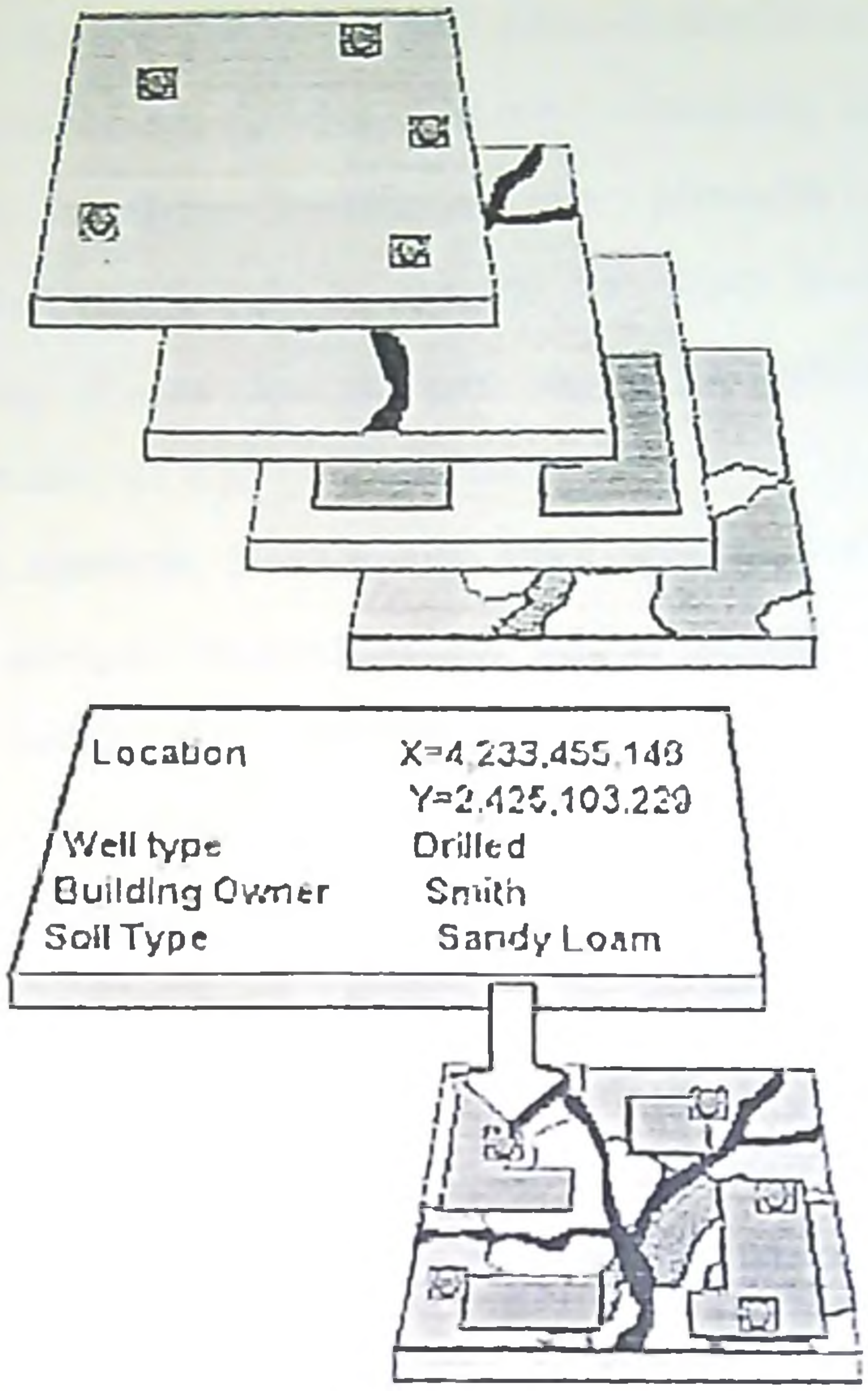


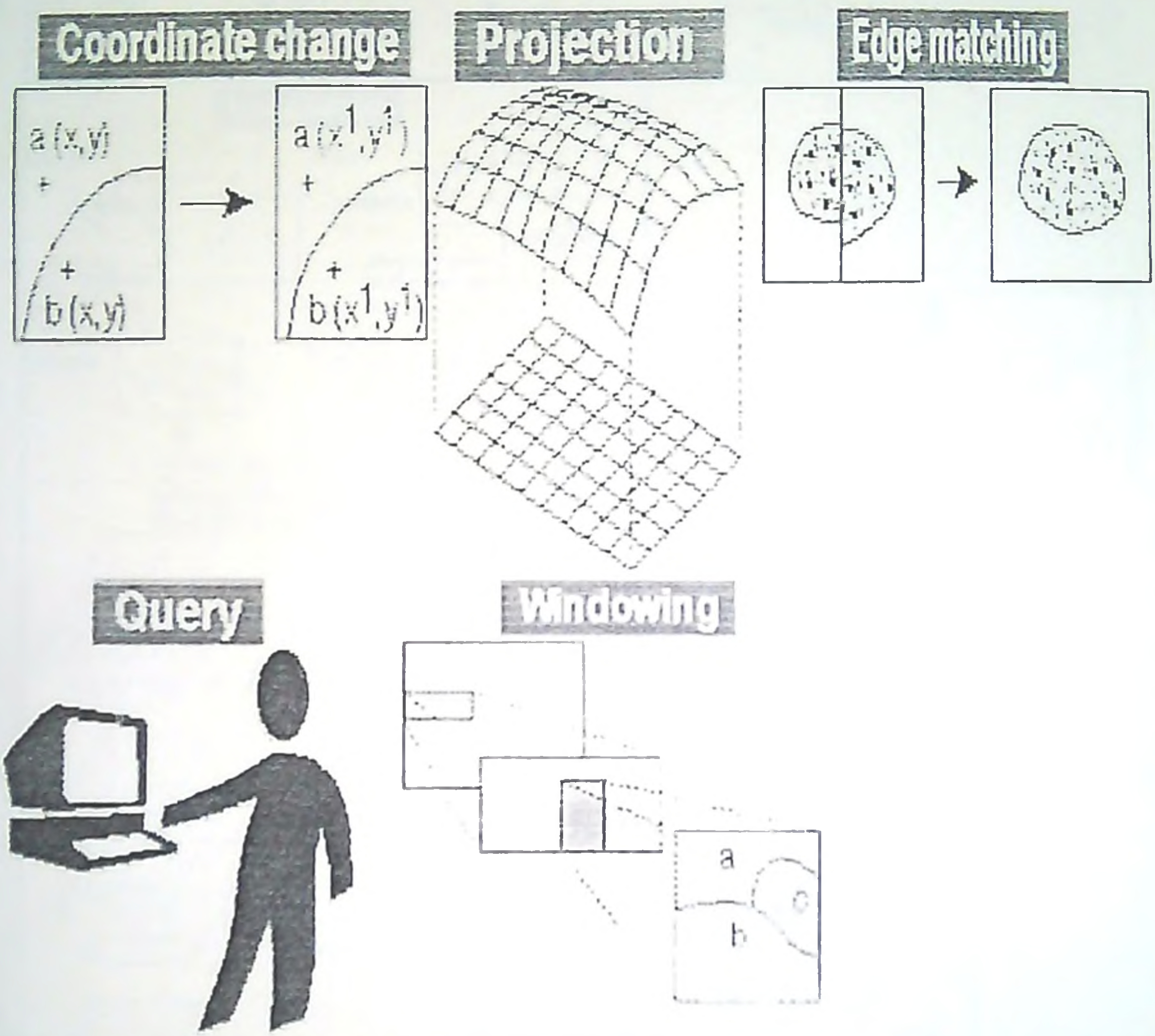
Figure 6.1 Overlaying function of a GIS

- Neighbourhood Operations:

Neighbourhood operations evaluate the characteristics of an area surrounding a specific location. This involves a variety of *point interpolation* techniques including slope and aspect calculations, contour generation etc. Interpolation is defined as the method of predicting unknown values using known values of neighbouring locations. The most common neighbourhood function is buffering. Buffering involves the ability to create distance buffers around selected features, be it points, lines, or areas. Buffers are created as polygons because they represent an area around a feature. Buffering is also referred to as corridor or zone generation with the raster data model.

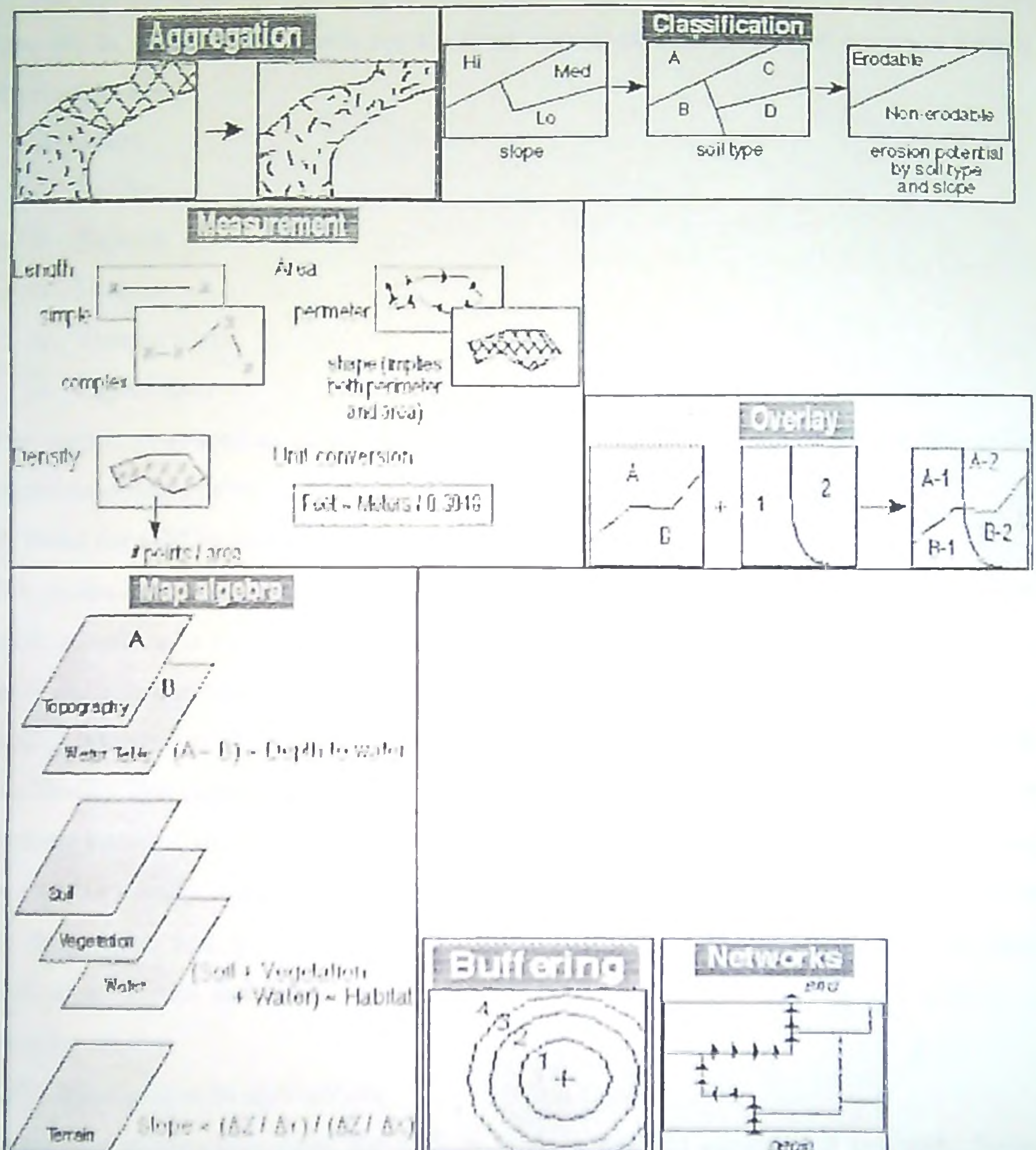
- Connectivity Functions: Connectivity functions include proximity analysis, network analysis, spread functions, and three-dimensional surface analysis such as visibility and perspective viewing. The most commonly used ones are
    - **Proximity analysis** techniques are primarily concerned with the proximity of one feature to another. *Proximity* is defined as the ability to identify any feature that is near any other feature relative to location, attribute value, or a specific distance.
    - **Network analysis** is a widely used analysis technique. Two example network analysis techniques are the *allocation of values* to selected features within the network to determine capacity zones, and the determination of *shortest path* between connected points or nodes within the network based on attribute values. This is often referred to as *route optimization*. Attribute values may be as simple as minimal distance, or more complex involving a model using several attributes defining rate of flow, impedance, and cost. Thus representation, management and manipulation of the network of linear features are an important operation of a GIS (Rao, 1992).

The **figures 7** and **8** below depicts in general the analytic and manipulative technique of any GIS



Data manipulation tools include coordinate change, projection, and edge matching, which allow a GIS to reconcile irregularities between map layers or adjacent map sheets called "tiles." Query and windowing are spatial retrieval tools. Query provides a way to retrieve user-specified data from the database. Windowing allows the user to select a specified area from a map displayed on the monitor to examine it in greater detail.

Fig.7: Manipulation tools of GIS



Data analysis tools include aggregation, classification, measurement, overlay, buffering, networks, and map algebra. *Aggregation* helps the user in interpreting the data, *classification* allows the user to classify areas within a map, and measurement can be used to determine the size of any area. The *overlay* function allows the user to "stack" map layers on one another. *Buffering* examines an area that surrounds a feature of interest such as a point. *Network functions* examine the movement of objects along an interconnected pathway. *Map algebra* utilities allow the user to specify mathematical relationships between map layers.

Fig.8: Analytic tools in a GIS

These analyses result in digital output, which is the final function of any GIS.

XIII. Output

All the manipulation and data analysis in any GIS end up in certain output or results that are in digital form, which are the final output of GIS. The most common output from a GIS are:

- Maps
- Tables
- Reports
- Graphs
- Textual form
- Digital data

The output generated as digital data has the advantage that it could be input into other digital modeling systems, statistical packages, and tools for further analysis.

B. Need for GIS in Agriculture

The technology discussed above is used for planning in several fields. GIS is currently used in solving a variety of problems. Agriculturists more than any other profession, have an intimate relationship with the land. The qualities of their land determine the quality of their crops or the well being of their animals that in turn decide their livelihood. The farmer always has to think about how she or he is going to manage various parts of the farm, because they are all different. That is, there is tremendous *spatial variability* in farmland and farmers need to understand the effects this will have on their crops and livestock. Scientists encounter similar spatial variability with their field experiments and trials. Therefore, these areas envisage the need of GIS as a planning tool.

XIV. Application in agriculture

Numerous applications exist for GIS in various field of agricultural research. Some important faculties in the field of agriculture using GIS are

XIV. A. Agronomy:

Brown and Steckler (1995) developed a method to use digitized colour infrared photographs to classify weeds. The classified data was integrated into a GIS a decision support system was developed to select the appropriate herbicide and amount. Similar application can be developed for predicting disease and pest management.

Association of remote sensing and GIS technologies with physiological growth models tried by Carbone *et al.* (1996) has opened a new vista for agricultural research. Remotely sensed data inputs to growth models provide a means to obtain predictions over large areas, which will increase the application of these models to site-specific agricultural management. Capability of GIS in irrigation management has been demonstrated by Dadhwal, (1994).

XIV. B. Watershed development:

Watershed development on a holistic basis requires data o natural resources that cover both physical and socio-economic aspect. These data, as discussed already, are in the form of maps/ tables. Preparation and execution of developmental plans and projects need analysis of these data for which GIS serves as a tool.

For effective planning of watersheds it is essential to integrate various resources information for identifying land areas having analogous characteristics, resource potential and constraints, which need similar treatment. GIS can be utilized in the following aspects of watershed management (Dutta and Sharma, 1997):

1. Watershed characterization
2. Watershed prioritization
3. Integrated land and water sources development planning
4. Agro ecological mapping
5. Run off modeling

Some of the applications where GIS is used in watershed development are:

a. Soil erosion modeling:

A regular record on erosional soil loss and soil erosion hazard is vital for effective soil conservation plans of a watershed for sustainable development. The potential of remotely sensed imagery and aerial photograph to map and asses land area characteristics that aid erosion has been extensively studied by Pande *et al.*, 1992.

A number of modeling approaches are used to quantitatively assess erosional soil loss. Some important models for erosional soil loss assessment employing remote sensing and GIS technology are:

- Universal soil loss equation USLE (Wishmeier and Smith, 1978)
- Morgan, Morgan and Finney model (1984)
- Sediment yield predictive equation (Flaxman, 1971)
- Silt Yield Index (Bali and Karale, 1977)

Spanner *et al.* (1982) demonstrated the use of GIS for erosional soil loss assessment using USLE. Several studies later showed the potential use of Remote Sensing and GIS for assessing erosional losses (Saha *et al.*, 1991; Saha and Pande, 1993). Flow diagram

(Saha,1997) of methodology for erosional soil loss prediction using RS and GIS is depicted in **Figure 9.** Kudrat and Saha (1996) showed the feasibility for assessing sediment yield using SYPE. The schematic diagram of methodology used by them is shown in the **Figure 10.** ASD (1996) used SYI as an index to soil erosion modeling.

b. Water shed prioritization

Prioritization of watersheds help in ranking the soil conservation measures to be employed there. Prioritisation helps in identifying erosion prone areas within a watershed and helps us in planning appropriate soil conservation measures. Watershed prioritisation can be done using RS data integrated into a GIS based on USLE (ASD, 1996), SYPE (Kudrat and Saha, 1996). Generally SYI is commonly used for watershed prioritization (Dohare *et al.*, 1985). Sidhu *et al.* (1998) prioritized upper Machkund watershed of Andhra Pradesh based on SYI approach using GIS and RS.

c. Run off modeling

Watershed based runoff modeling using GIS and RS has been demonstrated by Das (1997). In his study he ranked 36 watersheds in the Tilaiya catchment of Bihar based on run off indices. The methodology used is schematically represented in **Figure 11** and the **Figure 12** shows the Tilaiya catchment of Bihar. He ranked the watersheds based on the run-off coefficient obtained by modeling. The watershed with most runoff flow and the least on are indicated in the map. Runoff flow was simulated using SLURP watershed model in conjunction with ILWIS GIS as data input at Bhakra dam outlet of Sutlej Catchments (Jain *et al.*, 1998). They observed that simulated flows compared well with observed flows. A sustainable watershed development plan envisages the assessment of natural resources potential of the watershed and identification of the local problems, which would lead to suggestion of location specific, plans for development. Sharma (1997) suggested a detailed remote sensing and GIS based methodology for this **(Figure 13)** .

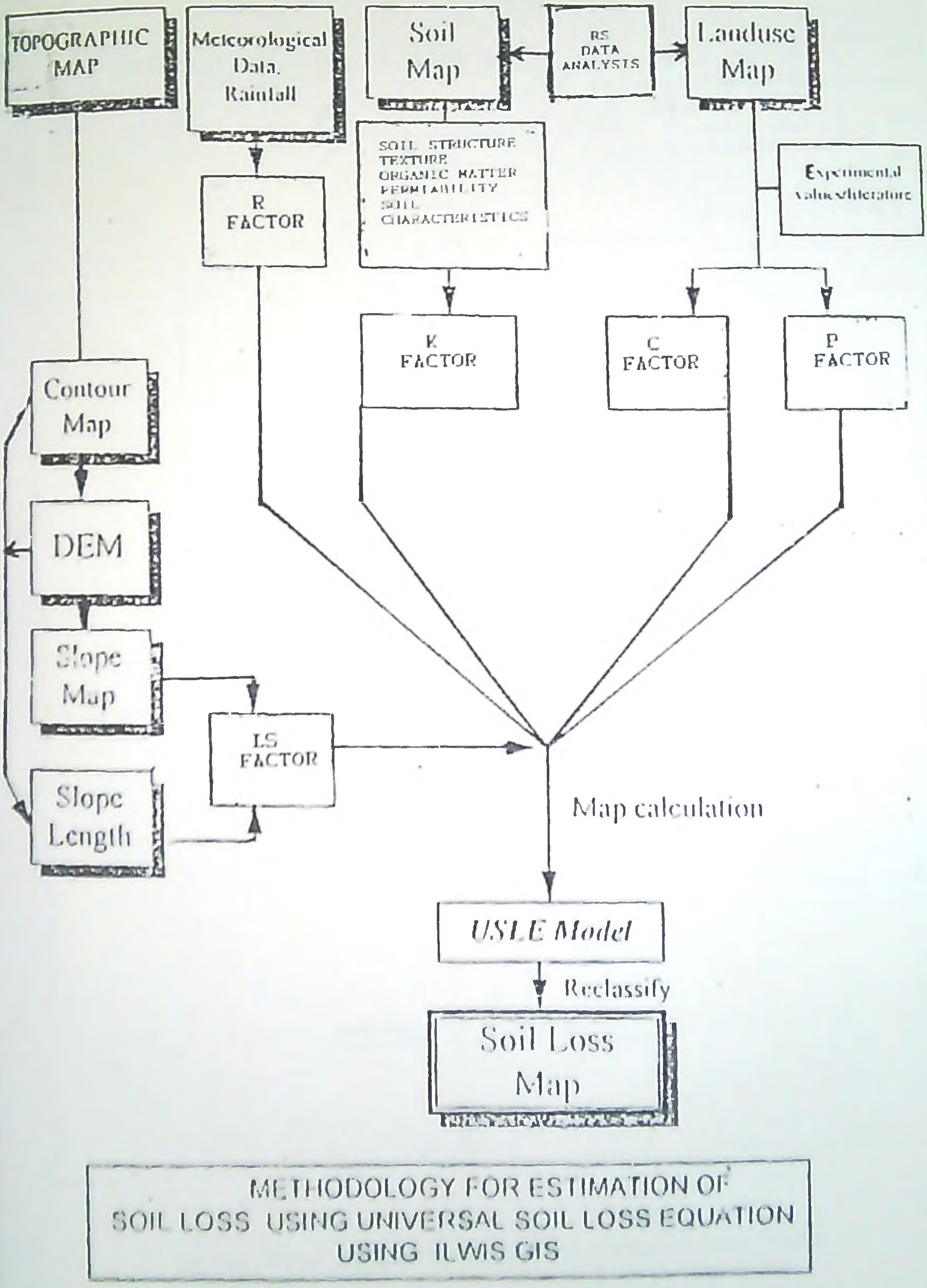


Fig.9: Flow diagram for estimating soil loss using USLE. (Saha,1997)

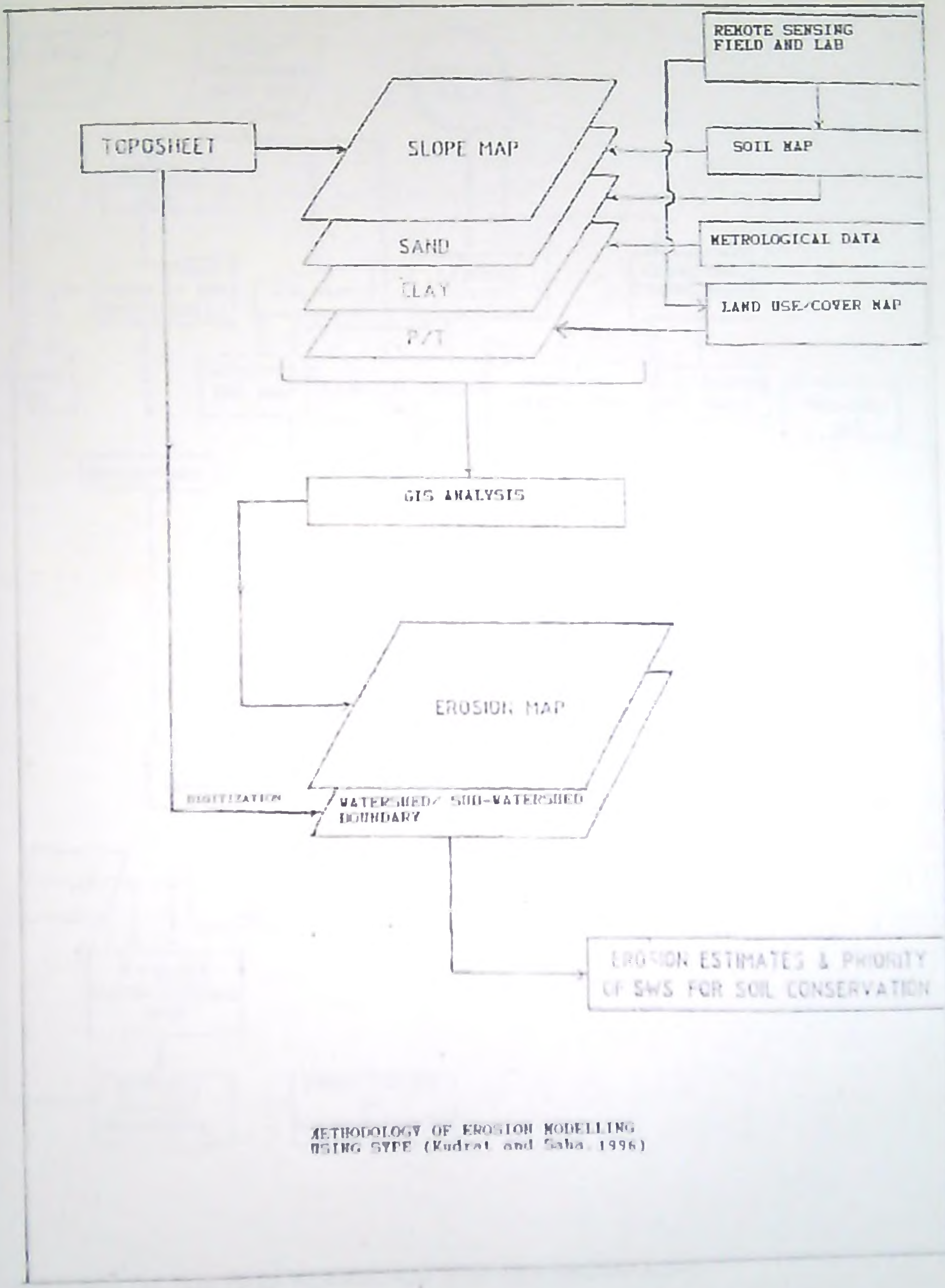
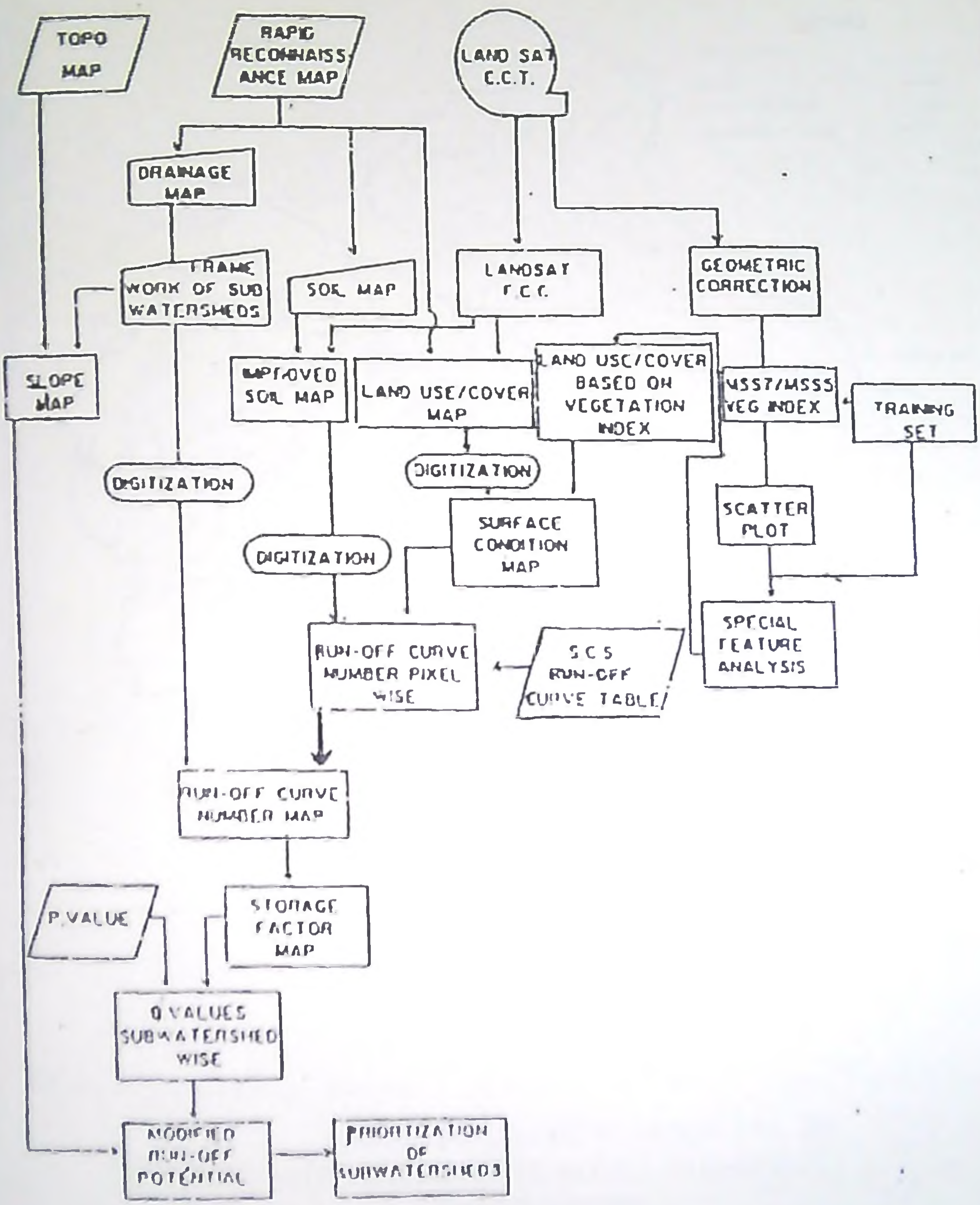


Fig.10: Flow diagram for estimation of erosion using SYPE.



OUTLINE OF THE PROCEDURE FOR RUN-OFF MODELLING

Fig.11: Run- off modelling (Das,1997).

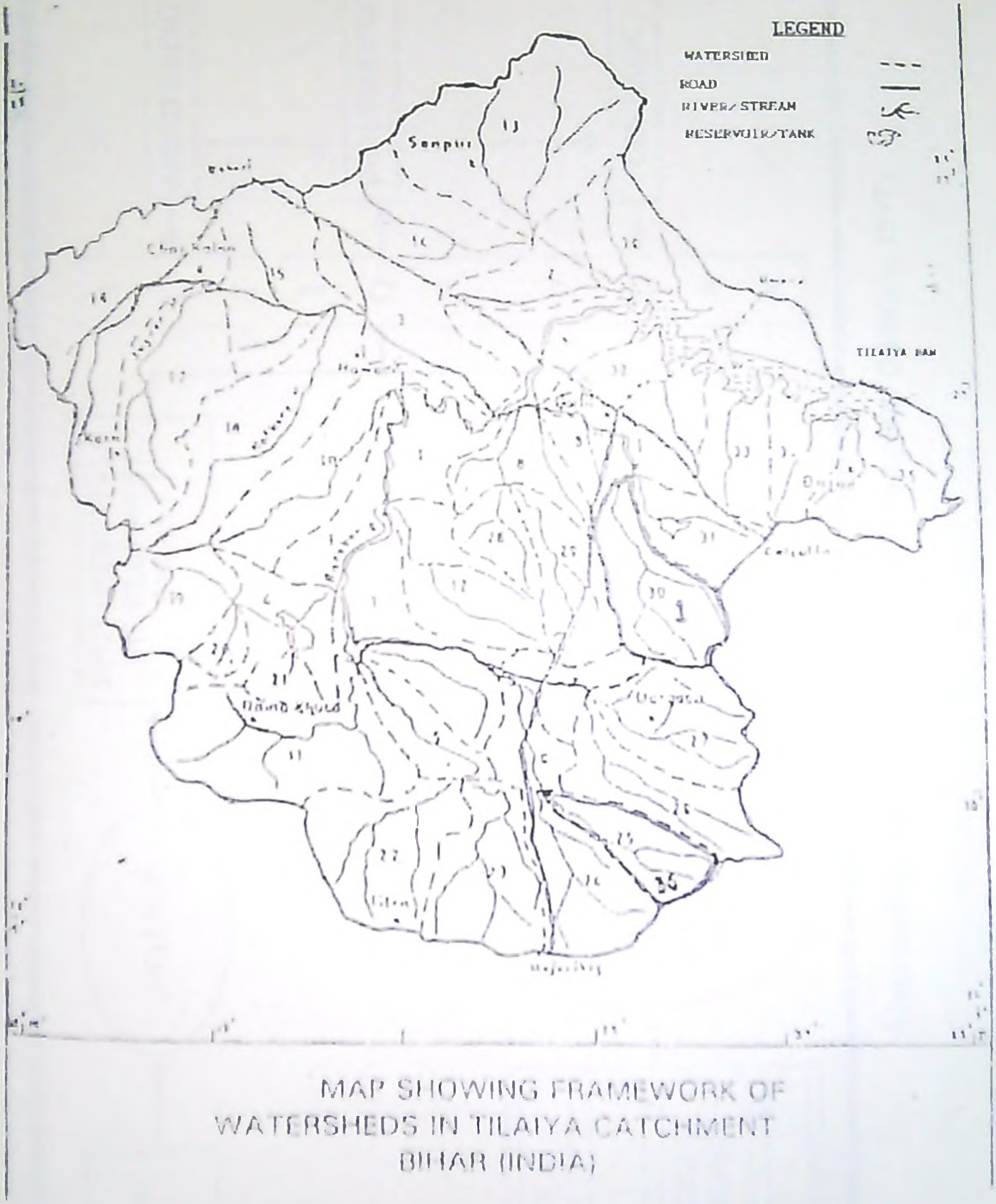
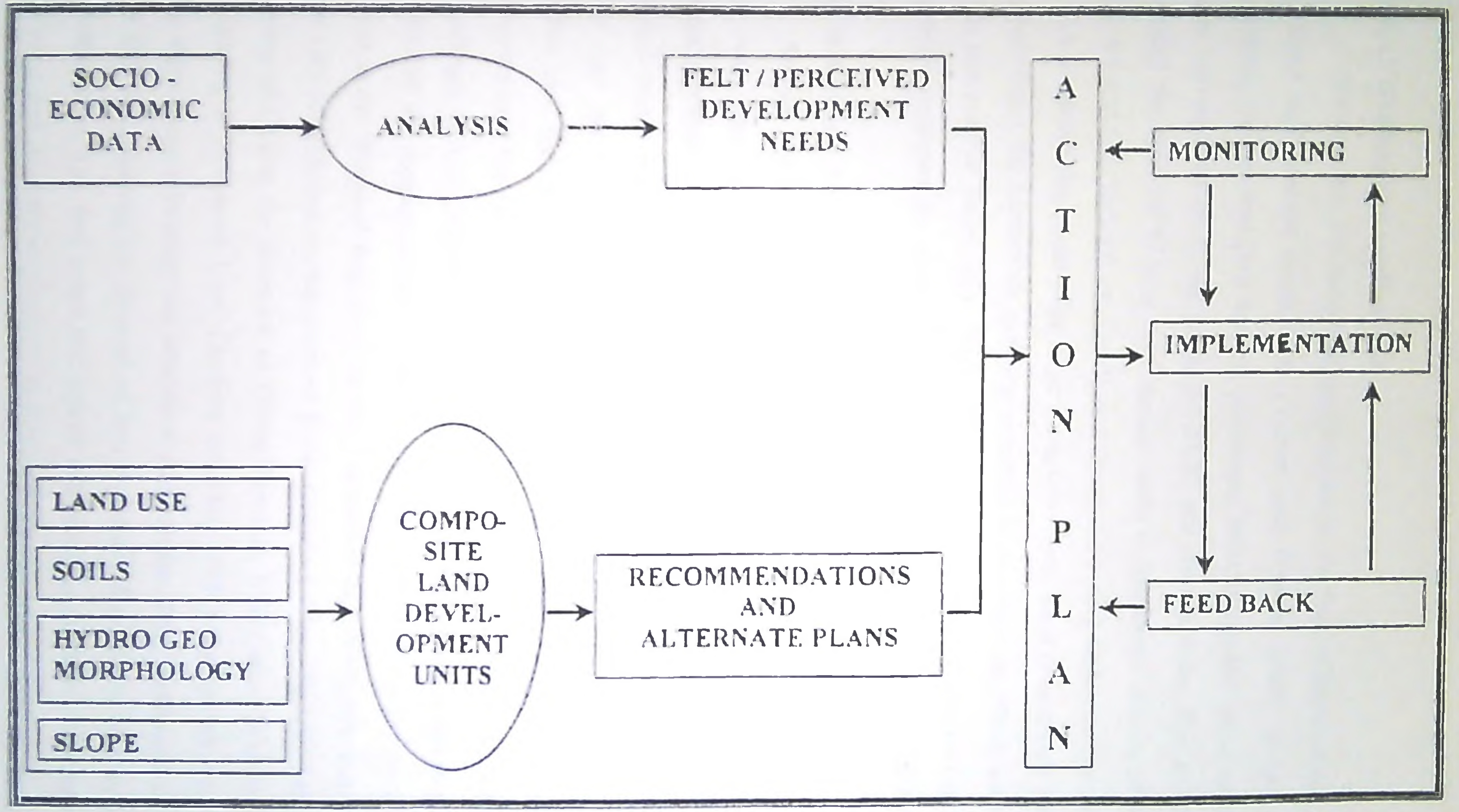


Fig.12: Watershed prioritisation based on Run-off in Tilaiya catchments of Bihar.



Methodology used for generation of action plans (Sharma, 1997)

Fig.13: Action plan development using GIS (Sharma,1997)

XIV. C. Horticulture applications

GIS has also got numerous applications in the field of horticulture. GIS can be employed in landscape horticulture (Turner and Bowen, 1998). It has potential in identifying storage and post harvest processing units at needful areas as post harvest losses estimated to be in the range of 20-40 per cent in India. Ray *et al.* (*Internet*) identified the need of 57 new cold storage units in Burdawan district of west Bengal using RS and GIS technology. Gupta and Owais [*internet*] demonstrated the capability of GIS in identifying areas with large cardamom cultivation potential in Sikkim. They concluded that the cardamom growing potential is very high at whole watershed level and in non-reserve forest area. They also developed a decision supporting system and suggested measures for improved production and marketing opportunities using the DSS.

XIV. D. Forestry Application

Remote sensing and GIS has been a monitoring tool for conservation of forest. These were used for formulation of strategies for forest preservation (Malyvanh and Feldkotter, 1999). In the Forest Cover Monitoring Programme in Laos PDR they generated recent reliable information about existing forest cover, forest resource use pattern and socio-economic status leading to forest distribution. Their planning ministries and agencies to formulate strategies and policies to preserve the existing forest cover used this information. Nair and Menon (1998) used IDRISI – a raster based GIS package, IRS (LISS) multi spectral imagery and aerial photograph in conjunction with GIS link for supplementing GIS and Image processing Package to estimate bamboo resources in the Wayanad Region of Kerala. Lakshmi *et al.* (1998) reported the need of RS and GIS for efficient management of forest resources. They illustrated the potential application of GIS in development of Forest Resource Information System for micro-level planning at Divisional level. Lakshmi and Dutt (1998) highlighted the success of Peoples Participatory Forestry Development Programme. They envisaged the need of RS and GIS in projecting the demand of fuel wood and fodder and its supplies to the user communities. The fuel wood and fodder sustainability could be forecasted for the next 25 years and 50 years respectively by this technology.

XIV. E. Bio Diversity Conservation

Potential of GIS in conjunction with remote sensing and other data sources to estimate forest cover, prepare vegetation cover maps, and to chalk out migration path of fauna can aid in bio-diversity conservation.

Prasad *et al.* (1998) identified potential areas for bio-diversity conservation in Kerala by integrating several theme maps using GIS. They suggested an action plan for bio-diversity conservation in Western Ghats of Kerala.Prasad (1998) used GIS to analyse forest habitats and transformation over 30 years for Western Ghats of India. He reiterated the need of GIS in habitat change analysis for conservation planning in India. The traditional spatial approach using RS alone could not suffice as long-term ecological studies were non spatial in nature and therefore need a GIS where spatial and non-spatial data could be integrated for analysis.

GIS models were used for identification of biospheres to conserve North America's rare orchids (Sperduto and Congalton, 1996). The location of valuable medicinal plants based on phyto-habitat can also identified using GIS models Mustalish *et al.* (1996).

A sustainable approach for biodiversity conservation could be achieved by integration of several spatial and non-spatial characteristic of a location that could easily be undertaken by GIS.

XIV. F. Land Use Planning

RS and GIS can effectively be used in various land use planning schemes. In a soil reclamation project in UP GIS was employed to identify location of specific villages/area of interest that satisfied suitable condition for selection based on specific parameters. Pre and post monsoon fluctuation in water table was also monitored using GIS for defining spring level and flow direction. GIS also had been employed to delineate shallow water table area, zonation based on ground water table, locate suitable boring sites and pump set installation, plan drainage development to enhance existing drainage system and to identify the catchments of the drain. Thus it has been reported by Thakur(*internet*), that environmental monitoring data can be integrated on GIS platform for analysis and evaluation of sustainability of reclamation, selection of project villages, post reclamation monitoring and behavioural changes in ground – water levels and quality. Maji *et al.* (1999) suggested a land use plan in different agro ecological region of Arunachal Pradesh using soil resource database and analysis of different thematic maps, problems and potential in a GIS environment. The capability of GIS in conjunction with remote sensing to develop a digital map has been shown by Nair *et al.*(1996).

XIV. G. Works Undertaken at Centre for Land Resources Research and Management, Kerala Agricultural University.

Centre For Land Resource Research And Management under Kerala Agricultural University is a pioneer research center undertaking GIS works. The center under the guidance of Dr. N. Saifudeen was instrumental in developing soil resource map of Thrissur named '*SRI Thrissur*'. The potential land use in the Thrissur District has been suggested based on the soil resources and suitability for various crops. The flow chart of various operations and processes involved in developing the soil resource map has been included **(Fig.14).** The center also has guided the students of 1996 RAWE batch to develop the map of the watershed they surveyed. The center developed a map of the main campus of Kerala Agricultural University that was found to be accurate to ± 2 m. This work has been undertaken as a part of M. Sc thesis submitted to the University during the year 1999.

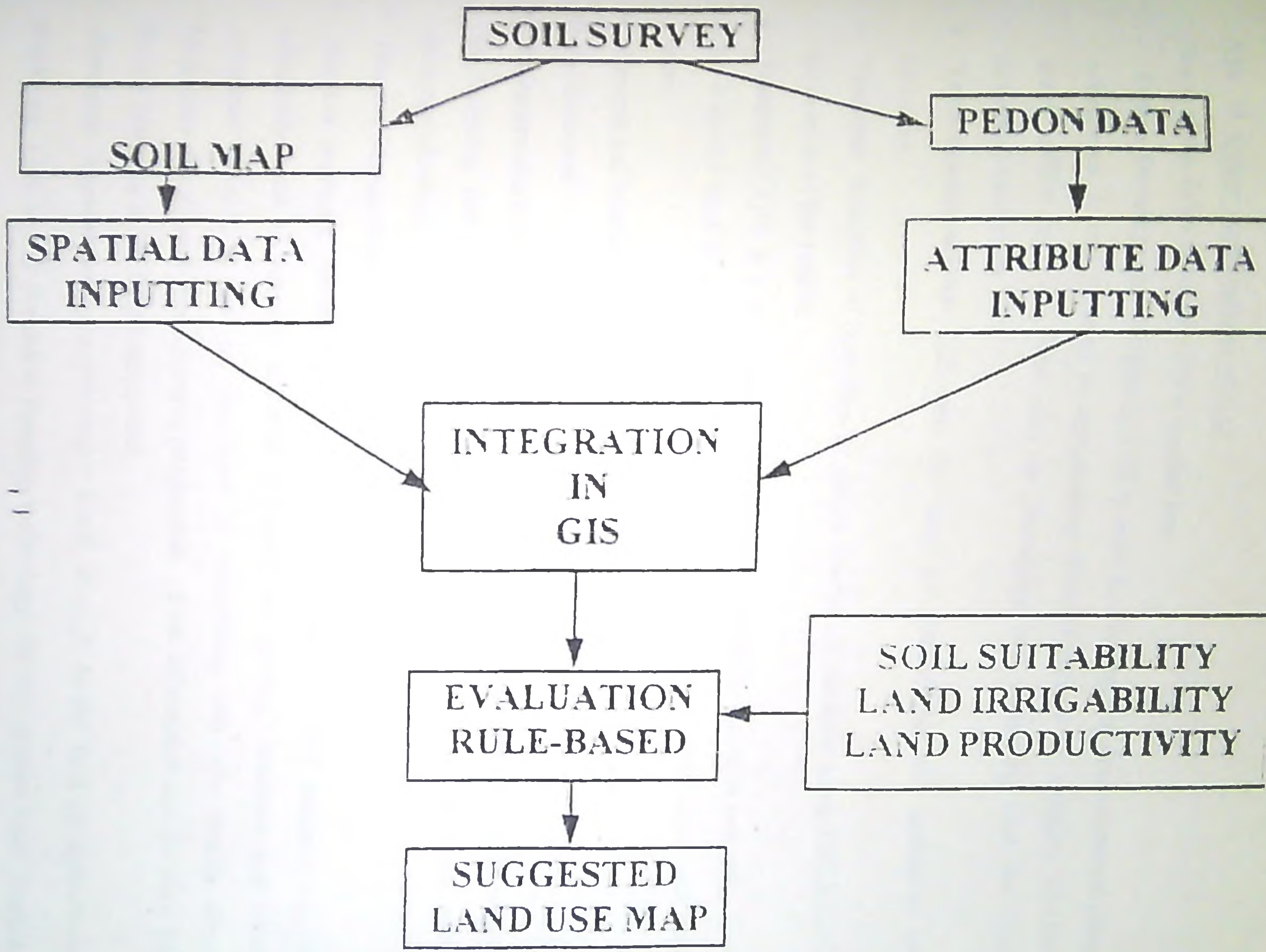


Fig. 14: Flow chart of methodology followed to prepare the land use map of Thrissur by CLLRM, KAU, Thrissur.

XIV. H. Other Applications of GIS

Some of the fields in which GIS is applied are:

* **Urban Development Planning:** GIS is used in chalking out developmental plans in urban area. It can be used in demarcating different sectors for industry, residential areas, office area *etc.* and also in identifying and allocating land for further developmental plans.
* **Telecommunications:** GIS may be used for establishing and managing cable networks.
* **Tourism:** Selection of best sites to attract tourist can be done using GIS based on the criteria of the tourist.
* **Transport:** GIS is a good tool for management of traffic on roads and rails. It can be a useful tool in suggesting an alternate route in case of roadblocks and traffic jams.
* Coastal and Marine Applications
* Environment
* **Infrastructure Development Planning and Civil Engineering:** GIS could be used in designing and planning sewage disposal channels, pipelines for drinking water, drainage channels, roads and highways *etc.*
* Disaster Management
* **Market analysis, health cure, Banking, Insurance etc:** GIS database can be effectively used to identify potential customers in banking, insurance and other consumer market. It can be also used in maintaining area wise details about healthcare details and immunization programme. Such information can be used for further planning in the healthcare sector.
* **Precision Agriculture:** Another major break through in the field of agriculture employing GIS is the Precision Farming technology. In this system each farming area having tremendous spatial variability is demarcated using hi-tech equipments and technologies. Global Positioning System (GPS) in conjunction with images from aeroplane and satellite borne cameras with satellite navigation system delineates the farm area into different input groups in a GIS environment. The intention of this system is to allow the farmer to use the right amount of chemicals at the right time in

XV. CONCLUSIONS

A developing and highly populated country like India has tremendous pressure on its various resources. With the increasing demand of the growing population the development and improvement on a sustainable basis needs adequate planning on utilizing the available resources. For an integrated developmental plan various data need to be assessed in relation to others for arriving at a holistic plan. Hence it is necessary to have the information system capable of integrating information from several resources in different fashions and in conjunction with socio-economic and demographic set up of that region in arriving at alternate plans and decisions. The integration can be successfully done by any GIS and therefore has got a great potential in our country. Now it is the time to grab the opportunity and adopt the state of art technology of GIS for effective resource planning for a bright future.

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DISCUSSIONS

Q. What are the limitations of GIS in Indian context?

Ans.: There are several limitations for employing GIS in Indian scenario. Some of them are:

a. The most important component of any GIS is quality data (spatial and atribute) on which all its analysis and results depend. In India dearth of quality data is one of the major constraints. The agents generating data are not reliable and the available ones are of poor quality.
b. GIS softwares and accessories are very costly and using them at personal and for small scale planning is not cost effective. This can now be utilised only on an institutional basis.
c. Though GIS software can be operated by any computer literate with a brief training but the manipulation and moreover analysis using GIS need technological experts or resource persons. Non availability of technically trained resource persons are also limitation to GIS application in India.
d. Data if available also need constant updation and maintainaence which is a must for effective functioning of GIS. This is a costly and a tedious task. If data is not available then generation of data is also a herculian task which consumes about 80% of resources and time in functioning of aGIS.
e. The data avilable are mostly of poor quality. A poor quality data result in illogical and irrelevant results.

Q. Can we use GIS in selection of cropping patterns?

Ans.: GIS can effectively be used in selecting cropping pattern if sufficient data is available on the parameters for selection of cropping pattern. The digital data from any GIS is compatible to other digital modelling systems. This capability can very well be used to arrive at a cropping pattern for an area.

Q. Where does the common people gain entry into the operation of a GIS project?

Ans.: There are several avenues in a GIS project where the common people play an important role. The interraction of common people and GIS start from the data generation process and procedures. They are the primary sources for information of data. Any computer literate person can also take part in inputting, organising, and other manipulation and cleaning of data. They can also take part in the regular updation exercises.

ABSTRACT

The idea of using geographic information for the sustenance of mankind dated back to Cro-Magnon era about 35000 year ago. Today in the era of IT revolution scientist have combined the stone-age idea with hi-tech computer to evolve Geographical Information System (GIS).

Geographical Information System is defined as a powerful set of tool for collecting, storing, retrieving at will transforming and displaying spatial data from the real world (Burroughs, 1986).

GIS has four functional subsystems of which Data manipulation and analysis subsystem is the most important. This differentiates the GIS from other mapping software.

A functional GIS has got five components – hardware, software, data, people and methods. The accuracy of data component and its periodic updating decide the worth of the GIS. Data (spatial and attribute) in a GIS is stored as data models. Most common spatial data models used are vector and raster. Of various attribute data models, relational model is most widely used in GIS.

Most important component of any GIS is data. So data sources play an important role in the functioning of any GIS. Some of the spatial data sources are maps, aerial photographs, satellite imagery, etc. therefore handling of data especially the popular source – the maps need special attention. Attribute data is available in the text, table or graphic form. (e.g. Socio-economic survey, Census, Panchayat surveys).

The data input converts the raw data into a computer compatible format. This make the data ready for various manipulation and analysis process. The tool kit of GIS performs this manipulation and analysis function. The result of manipulation and analysis is the output, which is now in a digital form that can be converted to graphs, text, tables or maps.

GIS has a wide array of application in the field of Natural Resource Management, Disaster Management, Telecommunications, Urban Planning, Oil and Gas Exploration, Market Analysis, Agriculture, Forestry, Land Use Planning etc.

Precision Agriculture (site specific farming) envisages the use of GIS along with the other hi-tech facilities like GPS & RS. GIS help the farmer to identify the right input, at the right time at right amount, which not only save wastage of input but also reduce pollution due to excessive use of inputs (Senay *et al.*, 1998).

In agriculture, GIS in conjunction with Remote Sensing can be employed for classification of weeds (Brown and Steckler, 1995), identifying potential crop producing areas, determining the need for storage, Processing and packaging units. It has been widely used in watershed development as tool for erosion modeling (Das, 1997; ASD, 1997). Watershed prioritization can also be done using GIS (Sidhu *et al.*, 1998). Action plan for watershed can also be generated using GIS (Sharma, 1997). GIS has also been widely used in producing digitized maps (Nair *et al.*, 1996) and is employed in development of potential land use. GIS can also be employed in irrigation and water management (Dadhwal, 1994).

Thus GIS can be employed in various spheres of agriculture. So an effective use of this tool can lead to better planning of research because in agriculture "everything happens somewhere".

CYBER EXTENSION

SEMINAR REPORT

By

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(2000 – 21 – 10)

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Seminar Report

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DECLARATION

I, PARVATHY, S. (2000-21-10) hereby declare that seminar entitled "CYBER EXTENSION" have been prepared by me, after going through the various references cited here and has not been copied from my fellow students

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(2000-21-10)

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1. Introduction

Improved communication and information access are directly related to social and economic development. Access to quick, reliable and credible information is a crucial requirement for sustainable agricultural development.

In today's world there is only one class distinction the rich and the poor. The richness or the poorness is calculated on the basis of information they possess or don't. The growing digital divide between the rich and poor the urban and the rural spaces is increasing.

New information and communication technologies are generating possibilities to solve problems of rural poverty inequality and giving opportunity to bridge the gap between the information rich and the information poor and support sustainable development in rural and agricultural communities.

A range of communication technologies have been used to meet the information needs of the rural population. These include rural radio, participatory video using a methodology called Rural Audio-Visual Pedagogy which uses participatory video as a communication tool for mediating between rural people's needs and information sources to respond to these needs. Modern communication technology when applied to rural areas can help improve communication, disseminate knowledge (Vijayalayan, 2000). The recent advancement of IT aided communication system comes as a great tool in that it would now handle the image based database systems much more efficiently than everbefore. Given the fact that images and audio messages not only charm and tend to get retained with any ordinary human being, these avenues open up a vast arena of opportunities.

The internet is emerging as a tool with the potential to contribute to rural development. Internet gives access to vast global information and assistance from other development organizations and offers opportunities for two-way communication. It is said that cyber extension which means extension through the internet, would be the major form of technology dissemination in the near future (Mishra, 1999).

2. The internet

Internet is an interconnection of several millions of computers belonging to various networks in the world. Any computer user can make contact on the Internet anywhere in the world, just like a telephone user can communicate with another anywhere in the world. It started way back in 1969 in the US when the Department of Defence was in need to transmit their important information to the military researchers. Internet functioned on the Internet protocol addressing system by using numeric addresses and each host computer had a IP number. But nowadays the domain naming system is used which uses lettering. The advent of internet on communication scenario offers enormous potential for two way online communication.

3. What is cyber extension

Cyber space is the imaginary or virtual space of computers connected with each other on networks, across the globe. These computers can access information in the form of text, graphics, audio, video or animation tools.

Agricultural extension according to Benor (1984), relates to the process of carrying the technology of scientific agriculture to the farmers in order to enable him to utilize the knowledge to produce a better and more profitable crop. Extension is central mechanism in agricultural development process both in terms of technology transfer and human resource development (Samanta, 1993).

Agricultural extension in the current context has become recognized as an essential mechanism for delivery information and advice as an input into modern farming (Gwyn 1997).

Combining both cyber extension can be defined as the extension over cyber space i.e., using the power of online networks, computer communications and digital interactive multimedia to facilitate dissemination of agricultural technology.

Cyber extension include effective use of information and communication technology, national and international networks, internet, expert system, multimedia learning systems and computer based learning systems to improve information access to farmers, extension workers, research scientists and extension managers.

3.1. Certain unique features of communication in cyber space are:

1. Access to an ~~astounding~~ outstanding store house of information, that too free of cost.

2. The information is available instantaneously round the year and twenty four hours a day.

3. Communication can be interactive.

4. Communication is available from any point of the globe.

5. Communication is dynamic and ever-growing.

3.2. Limitations of traditional extension methods

Before one can appreciate the question of what really makes cyber extension necessary it may be helpful to take a look at some of the limitations of traditional extension processes and techniques.

1. Traditional extension is expensive: it costs a lot of money to produce and print extension messages and brochures. It is also expensive to train a whole lot of extension personnel right from the district level, sub-divisional level, at the block level, to the village level extension worker to understand the new technology, and to answer the possible queries from farmers.

2. Traditional extension is very time consuming process: for a message to pass from University/zonal research station (ZRS)/Krishi Vigyan Kendra, to the farmer, it may take many actors to understand the same and deliver it to the next layer. This process takes a lot

of time and effort on the part of the extension machinery of the state.

3. In traditional extension the quality of the message gets eroded as it passes through different layers. A number of evaluation studies of Training and Visit system indicate that the quality of the message gets heavily eroded when it reaches the farmers.

Poor communication capacity of the existing extension system. Most technical staff within the departments lack the capacity to effectively communicate with both the research system and the stakeholders groups. Firstly the flow of information from the research to extension tends to be top-to-down rather than a two way interactive process aimed at identifying and solving serious problems. Secondly there is little use of electronic communication to improve feedback and technical support and to facilitate administrative communication. It is found that the capacity of traditional extension system is very limited, and the challenge in terms of reaching all the villages and all the farmers is becoming more and more difficult to meet. It is observed that the farmers are more dependent on other than public extension system for getting technical advice as well as farming inputs. A visual presentation of the strength of linkages among various extension agencies to the farmer is given below. It is noted that the linkage between farmers and Block Development Officer/Agricultural Officer is poor as compared with the linkage between farmers and traders - market/seed suppliers and farmers and television/radio.

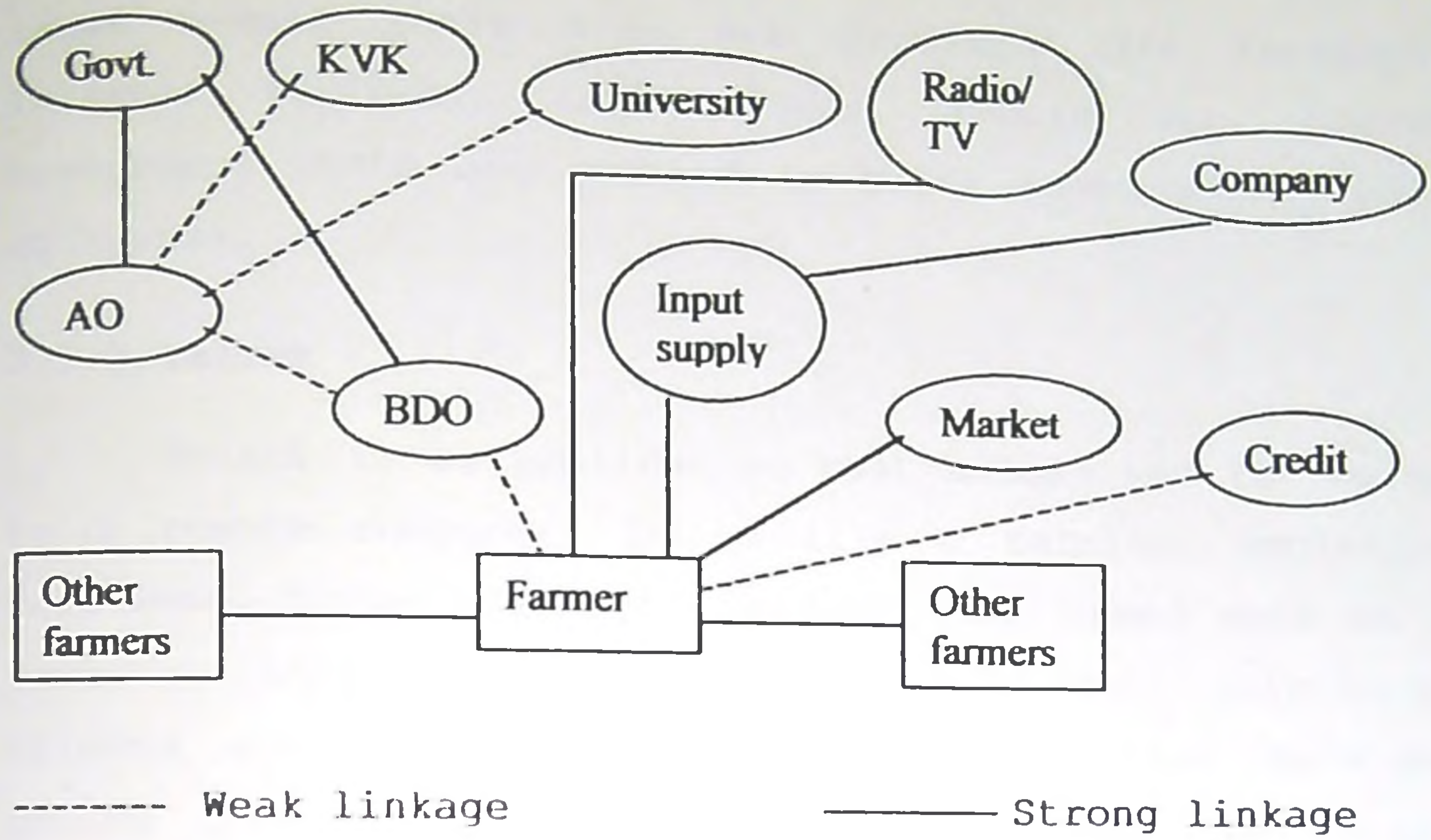

Fig. 1. Information linkage between farmer and other agencies

3.3. Important tools of Cyber Extension

The important tools of cyber extension include:

1. E-mail
s. Telnet
3. FTP
4. Gopher, Archie, Veronica
5. Usenet Newsgroups
6. World Wide Web

3.3.1. E-Mail

E-mail (electronic mail) is the most frequently used application in the cyber extension. Currently is being used by over 50 million people for business and personal use. E-mail allows us to send and receive text messages to other users of the Internet. For many people e-mail is the only internet application used. e-mail can be send/read using a number of tools. Some are fee programmes, and some are shareware. Some of the well known e-mail tools are: Web Browsers like Netscape, Internet Explorer, Lotus Notes, Eudora etc. Usenet newsgroups posts are scanned to match names with e-mail addresses.

3.3.2. Telnet

Telnet is an application that allows you to log on to a remote computer. It is like a terminal emulation programme. Telnet sessions present text based data as a terminal would. However GUI (Graphic User Interface) clients are now available which offer better service. Before the advent of World Wide Web (WWW) the telnet sessions were very common, but now most of the organizations use web sites for applications such as this.

3.3.3. FTP (File Transfer Protocol)

FTP use to send copies of the files from one computer to another and is responsible for highest percentage of data transferred on Internet. FTP transfers can either through "anonymous" connection or by password protected ID. Command line and graphic user interfaces are also available.

3.3.4. Gopher, Archie, Veronica

Gopher was the first attempt of making it easy to access resources on the Internet. Gopher was considered the most useful Internet tool. Gopher uses text based nested menus to access FTP sites, directories, files and documents. Gopher was designed by computer scientists at the University of Minnesota. Gopher sites did a good job of organizing FTP sites, but it did not take long before the number of Gopher sites was unmanageable. Archie, Veronica, Jughead, and other sites were all developed to assist with finding the right Gopher site. Gopher and its derivatives have been largely made obsolete by the search engines available on the web today. Web clients can handle Gopher transactions, and in fact a user is offered link to a Gopher site without realizing it.

3.3.5. Usenet Newsgroups

More than 20,000 Usenet Newsgroup categories are currently organized which cover almost any imaginable area of interest. Newsgroups provide a bulletin board type area where users can read others opinions and can sent entries of their own. Modern web browsers like Netscape and Explorer include software for reading and posting to Usenet. Email mailing lists are an alternative for Usenet groups as these lists are normally more focused.

3.3.6. World Wide Web (WWW)

The World Wide Web has become so popular that it has almost replaced all the above internet tools and is slowly becoming synonymous internet. The web is the most popular place to be on the internet. This is what has brought the masses to the Internet. What is World Wide Web (WWW)? WWW is an organization of hypertext documents containing text, images, animation, sound, video and increasingly interactive programmes. Almost all the universities across the globe are having their presence at WWW. The web is truly worldwide. As simple mouse click can easily transport you from a server in India to one in North America or to one in Europe or Australia, and even

Antarctica. An endless variety of images, sounds, videos and multimedia applications are used to present information. The World Wide Web is called what is because sites around the world can be accessed, and because documents seem to stretch web like through endless hyper links.

The WWW is thus the most important tool of cyber extension. The web sites hosting a particular institution or organizations are searched and browsed through search engines and several of them are available. Some 320 million web pages are currently are online. Search engines are required to wade through this vast mass of information and cull out the required information. The best way to access a web site, however is to know its address technically known as Uniform Resources Locator (URL). More and more extension information is expected to be on the web in very near future. The packaging and hosting of technical extension material and establishing connectivity at Krishi Vigyan Kendras (KVKs), District Agricultural Officers (DAOs), District Rural Development Agency (DRDAs) and other participating agencies has to be taken up side by side. Only then we can harness the true potential of cyber extension.

3.4. The methods for cyber extension

The World Wide Web can help the extension world wide in the following ways:

1. Providing interaction among research scientists, extension workers, farmers and other rural people through e-mail.

2. Providing up-to-date news and information services, such as market prices and weather conditions.
3. A question and answer service where experts respond to queries on specialized subjects.
4. Creation and maintenance of Statistical Databases on critical agricultural and rural development parameters that can be queried on demand.
5. Providing the details of Poverty Alleviation Schemes on the Internet.
6. Providing status of various Government Programmes and details about their implementation mechanism on demand basis.
7. Hosting web sites by major institutions participating in agricultural extension, putting latest packages of practices (with more situation specific packages), for various agro-eco regions. These institutions, particularly the Project Directorates may also place the diagnostic and pre-emptive farm practices for the major crops particularly the commercial crops, well in advance of the concerned crop season. This can help the extension workers to access latest information on IPM (Integrated Pest Management), INM (Integrated Nutrients Management) and other such practices for high value important commercial crops. The institutions will also be able to get direct customer feedback for their packages.
8. Launching online rural development and extension journals, newsletters etc. (with or without print version).
9. Providing internet access at district and block level agriculture and rural development offices. This service may also be open for rural communities on

Precision agriculture conjures up images of farmers overcoming the elements with computerized machinery that is precisely controlled via satellites and local sensors and using planning software that accurately predicts crop development. This image has been called the future of agriculture.

Precision agriculture has three components: capture of data at an appropriate scale and frequency, interpretation and analysis of that data, and implementation of management response at an appropriate scale and time. A key difference between conventional management and precision agriculture is the application of modern information technologies to provide process, and analyze multi-source data of high spatial and temporal resolution for decision making and operations in the management of crop production. Advances in the technologies will be an evolutionary process and they will continue to be adapted for agricultural decision making.

Precision agriculture is best considered a suite of technologies rather than a single technology. Farmers whose operations have numerous characteristics - different soil types, crops, weather, pest complexes, and marketing arrangements etc. The high-tech tools of precision agriculture incorporate the use of soil sensors, variable rate applicators, Geographical Information Systems.

There are many beneficial elements to precison farming: (1) Crop production increased in low yielding areas, (2) Agrochemical cost reduced due to site-specific treatment, (3) Risk of environmental pollution from agro-chemicals reduced due to site-specific application, (4) Field and management information and accuracy increased due to high-end technology and equipment, (5) Overall yield increase and cost reduction.

3.5.2. Geographical information systems

The technique Geographical Information Systems is a combination of information age tools including mapping, navigation and control. The mapping is based on a visual data base or geographical information system. Field navigation looks to the Global Positioning System. And systems control represents the sensing and control over intelligent implements and power units.

For the farming newcomer to Geographical Information Systems, GIS is not simply "pretty maps". The pretty map is the intermediate expression provided by a GIS. It is the result of accurate collection and maintenance then manipulation, analysis and synthesis of spatially arranged data and information. The synthesized map provides new perspectives of the landscape.

The popular expression of all this computer equipment and software for the benefit of production agriculture is part of precision site-specific farming systems. The good news is that producers will gain new insight to the spatial organization of their physical resources. The bad news is the inventory of the agricultural land resource and its condition is well in hand by those who are external to agricultural system.

3.5.3. Weather information

Weather forecasting, modeling, and research are advancing rapidly with the advent of high performance computing and communications systems. Computer model guidance that meteorologists use in the creation of forecasts. The models are physical, mathematical representations of the atmosphere, which are initialized with a detailed set of observed data and set in motion to predict future atmospheric states. Use of computer generated model guidance by meteorologists has steadily increased during the past 20-30 years as the models improved and their output became more sophisticated.

3.5.4. Market information

The useful agricultural information is an essential for farmers to increase their farm yields. Information such as price details of seeds, fertilizers, pesticides and availability of these products gives the farmer to take decision in choosing right seed, fertilizer and pesticide required for the better cropping. The vital information which flows from the agricultural policy maker's desk, such as fixation of procurement price, procurement targets, policy relating to exports etc.

3.5.5. Model for Site Specific Information Systems (SSIBs) in India (Bhaskar, 2000)

India has different agro-climatic zones spread over different parts of the states. The information collection, analyzing, and disseminating to these different needs of farmers from one place is very difficult. And, each state is unique to its regional language. Disseminating information to language specific and situation specific information is very difficult from one central server. The information dissemination should be in locale-specific language and agro-climatic zone relation farming information. Keeping in all these considerations to derive a model for the Site Specific Information Base (SSIB) Centers in India. The SSIBs are divided into four categories on the basis of their functions. They are (1) Central SSIB, (2) Regional SSIBs (3)village booths (4)research stations

3.5.5(i) Central SSIB

The Central SSIB is Central hub of information and resources at National level. This information center acts as central communication link between all the regional SSIBs. The Central SSIB would maintain national level information such as marketing details, different farming practices, pesticide information, weather information etc. And this information is pushed to regional centers at specified times and as and when any new information added to this SSIB. The Central SSIB will play a vital role in designing and maintaining the software required for the all regional SSIBs. A uniform designing of information dessemination methods is also taken up by the Central SSIBs. The Central SSIB monitor implementation of hardware, software, and network configurations required at Regional SSIBs, Village Booths.

The Central SSIB is required to be equipped with best available servers, based on Pentium III with 256 MB Ram or more RAM, 9 x 5 GB extendable Hard disk space and a CD-ROM drive. Dual processor is added to one of the server for better performance and dividing work load. The strong networking operating system, which has multiple functionalit's build in for both networking and internet web hosting such as Microsoft Windows NT 4.0. A strong Relational Database Management System (RDBMS) software also required to buildup database information. RDBMS software like Oracle 8.0 or Oracle 8i supports for handling large database information and which is easily supports for Internet Dynamic Publishing. Among its many data-warehousing enhancements apart from other RDBMs, Oracle 8i offers important new features to ese the workload of data warehouse administration and supports internet computing.

The servers has to be configured as Web server, database server, mail server and proxy server. One of the server has to be installed with internet information server 4.0 for web publishing. The other servers are configured as database server, mail server and proxy server. The 64 kbps bandwidth VSAT connection or a leased line is required to configure as internet host at Central SSIB, and is also used to established as a gateway WAN link to connecting into global network. This gives the Regional SSIBs to down load any information placed at Central SSIB or vis-à-vis.

3.5.5(ii) Regional SSIBs

The Regional SSIBs are the main information resource centers for the disseminating the information to the farmers on different farming practices, pesticides information, marketing details etc. which are specific to their climatic conditions. The regional SSIBS are identified in different states number to five on the basis of the agro-climatic conditions of the regions and local speaking languages. The Regional SSIBS disseminate the information to the 2 to 3 states depending of the specific agro-climatic conditions and covers primary languages of their states. The village booths are directly accessed to the information placed at these Regional SSIBs through internet. The research stations situated within these agro-climatic region by Government owned, private owned research station, and any other voluntary research stations are linked to this station to push the information of their research to update at this SSIBs. At Regional SSIBs, the information will be handled and formatted into usable format and transferred into databases. In turn Regional SSIBs pushes the processed information to CentralSSIBs for master backup of the information. The hardware and software required for Regional SSIBs are more or less similar to the Central SSIBs such as servers with a configuration of Pentium III with 256 MB RAM or more RAM, 9 x 5 GB extendable Hard disk space, and a CD-ROM drive with a Dual processor. The software required for these centers are Microsoft Windows NT 4.0 as networking operating system and Internet Information Server 4.0 as web publishing software, Oracle 8.0/Oracle 81 RDBS software, messaging software etc. The servers are to configured as web server, main server, database server and proxy server. Multi-port routers are required to establish wan connection to Internet connectivity. The 128 kbps bandwidth VSAT connection or leased line is required to configure as internet host at Regional SSIBs, and is also used to established as a gateway WAN link to connecting into internet.

3.5.5(iii) Village booths

The Village Booths are serving as information resource centers for the farmers in their villages. The Village Booths are directly accessed to the Regional SSIBs for the regional specific information using dial-up connection. The dial-up connections either supported by VSNL, private service provider or available NIC WAN links. In this booths, the information related to that regional crop practices, pesticide information, agri-business company details and their products, weather forecasts, diseases control details, marketing details etc. Apart from this, the farmers can seek any available information on the internet for better farming and any other information he desires. To operate computer at Village booth, a person has to be selected from the village itself and to be trained to operate computer. The village booth operator is the main linkage between the farmers and information gateway center.

The hardware and software required at Village Booths are a computer, printer and a UPS power backup system. A modem and a telephone line is required for dial-up connectivity to connect the Regional SSIBs to retrieve the information, send queries, grievances to the Regional SSIBs.

3.5.5(iv) Research stations

The Research Stations operating in each agro-climatic zone by Government departments, private people, and any voluntary organizations are linked to the Regional SSIBs to send their research information. The information would be processed at Regional SSIBs and formats into a database for permanent record. The information also placed on web, that can be access by the Village Booths. The hardware and software required is similar to Village booths. The existing hardware and software can also used for this purpose. The minimum training will be given to the staff at research station to upload the information.

3.5.5(v) The technology used

The internet technology will be used to create content information required by the central SSIB, Regional SSIBs. The technology which is used in Internet is based on Hyper Text Markup Language (HTML) and dynamic publishing using CGI scripting. The information has been compiled and stored in the form of databases. The databases information on pesticide details, market details, agribusiness companies information, price details of seeds, fertilizer etc.

4. Some success stories

4.1. Cyber marketing

Marketing agricultural products over the internet is perhaps the biggest boon, the internet could give to the farmers. It has made it possible for the farmers to directly market his produce on the net to a global market. This has cut off the middle men in the business and has effectively increased the profits of the farmers. Though this form of marketing is yet to begin in India, there have been a few instances of online trading in agricultural products.

For instance in Britain, a farmer, Richard Counsell runs an on line organic meat business. He created a web site using free programme available with a computer magazine. Now he receives an average of ninety pounds of orders each day. AMUL plans to open AMUL ice cream cyber stores in 100 cities. It has cyber cities in 125 cities and fetches an average of rupees 300 per visit. All this directly benefits the farmers as AMUL is a cooperative venture. The increased profit that is obtained due to the cutting off of middle men reaches the farmers directly.

Similarly APEDA, International Commodity Exchange for Pepper and Bombay Oilseeds and Oils Exchange started online training and marketing.

In a village in Madhya Pradesh, a farmer was able to sell his cow through the village GYANDOOT, which is the rural internet kiosk.

Use of the internet for the extension personnel and subject matter specialist

The Extension Personnel with access to various Universities around the globe can clarify doubts and access more information an a particular matter.

The Karnataka Government launched K-GANGA (Karnataka Global Advisory Networking Group on Agriculture) to give direction to agriculture in Karnataka with special use to bio-technologists in India. Scientists can log on to this network and get the latest developments in Bio-technology research in any part of the world. Similarly Extension Personnel and scientists alike can benefit from the virtual access to books that various library sites in the West provide.

4.2. Warna Wired Village Project

In 1960, Tahasaheb Khore propagated the idea of cooperatives in Warna Nagar, a cluster of 70 villages in Maharastra (Rajee and Takalkae, 1999). Among the 8 sub-cooperatives working under this are Warna Dairy Development Society, Warna Cooperative Banml, Warna Foods, Warna Women's Cooperative Society etc. from each village 200-300 farmers are registered as cooperative members. The Wired Village Project was initiated in April 1998, with NIC, Government of Maharastra and the Cooperatives contributing on a 50:40:10 basis. This project has been initiated to serve the information needs of the farmers on different crop cultivation practices, pest and disease control, marketing information, diary and sugarcane processing information etc. right up to the village level.

The central server is located at the Tahasaheb Kore Institute of Engineering in Warna Nagar. Currently 46 computers booths are functioning in Kholapur and it is reported that an average of 20-25 farmers visit the booths everyday.

4.3. The information village project (Swaminathan, 1993)

The information village project of the MS Swaminathan Research is aimed at bringing the benefits of modern information and communication technologies to rural families in Pondicherry. A Value Addition Centre, which is the hub of the information network, has been established in Villianur village and four information shops have been established in different villages.

Following the interdisciplinary Dialogue, a consortium of interested organizations was formed to concretize the proposals in the form of specific projects. The first meeting of the consortium was held in June 1992. The following organizations were represented at the meeting: Department of Space, Government of India; Council of Scientific and Industrial Research, New Delhi; Indian Council of Agricultural Research, New Delhi; CMC Limited, New Delhi and Hyderabad; and the National Bank for Agriculture and Rural Development. In addition, individual agricultural and information specialists attended.

The members of the Consortium agreed that the entire project for the establishment of a computer-aided extension system and information villages could become a component of a larger project for the establishment of a "Small Farmers' Agri-business Consortium" (SFAC), initiated by the Government of India. This was considered the best way of supporting a project which has as its aim increase in skill-based rural employment in both farm and off-farm sectors, with information technology and information related services. The aim of SFAC is to take the benefits of modern agri-business to resource-poor farming families. SFAC plans to spread knowledge-intensive technologies which are also ecologically sound. As part of launching the project, the Consortium recommended preparation of feasibility studies in the following districts or administrative units of India:

1. Dharmapuri (Tamil Nadu)
2. Pondicherry (Union Territory of Pondicherry)

3. Midnapore (West Bengal)
4. Ranchi (Bihar)
5. Garhwal (Uttar Pradesh)
6. Rajasthan Canal Command Area - West Bank (Rajasthan)

These locations were chosen so as to provide diversity in existing farm practices, and to reflect varying agro-climatic regions of India. The mix of income-generating activities under SFAC in each of these locations varies in each case. Thus, the lessons learnt from these pilot information villages will have a large extrapolation domain.

The Consortium also advised running an orientation programme for members of the feasibility study and project design teams. The Indian National Scientific Documentation Centre (INSDOC), representating the Council of Scientific and Industrial Research on the Consortium , undertook the organisation of the orientation programme.

The major goal is to asses the impact of location and time specific information on the productivity, profitiability, stability and sustainability of major farming systems in the area. Prof.T.Viswanathan, Director, INSDOC, guided and coordinate the orientation course. The information village is envisaged primarily as a computer-based information access center. Depending on the infrastructure available and the information requirements, these computer systems may have different configurations at different levels of sophistication. The participants reviewed the various aspects regarding the architecture of the report, selection of conveners and co-conveners for each project formulation team, work plan and budget.

4.3.1 Preparation of pilot projects

After detailed discussions it was decided to collect the following information

1. District profile
2. Village selection
3. Village profile
4. Thrust areas
5. Farm related
6. Non-farm related
7. Information needs
8. Farm related
9. Non-farm related
10. Primary information disseminators
11. Information resources centres
12. Appropriate forms of services
13. Design of information shops
14. Linkages with Agricultural and Rural Universities, ICAR and CSIR institutions, the National Remote Sensing Agency and the Meteorological Services
15. Work plan and time schedule
16. Budget estimate (To specify low-budget activities and high-budget activities)
17. Management Plan (mainly includes the modus operandi) Local people, particularly women, should be involved
18. Evaluation and assessment
19. Replication and scaling up

4.3.2 Guidelines and Recommendations for the Collection of Information for the Architecture of the Report

1. District profile

For the preparation of the project report, it is necessary that a complete district profile is available in a computerized format. For this purpose, a common format needs to be designed as a first step to collect the information relating to the district which may then be put into a computerized data base, NIC will be responsible for this activity. Information required for the preparation of district profile is to be obtained from secondary sources like Government Departments, NABARD, NIC, etc. A network of maps at the district level will be required.

2. Village selection

Since the project relates to the information village, selection of appropriate villages for the development of a prototype is of utmost importance. For this purpose, it has been decided that initially twenty villages will be surveyed in each district based on the district profiles already available. Project Formulation Team (PFT) members will visit all the twenty villages in about 3 weeks time. Out of these, four villages with almost similar parameters will be selected for the project. Out of these, two will be recommended for the actual implementation of the project and two for comparison purposes. At every stage, the appropriate agencies, eg., nodal officers of the state Governmens, will be consulted. Actual decision regarding the villages may be taken at the level of the Small Farmers' Agri-business Consortium (SFAC).

3. Village profile

Individual village profiles will be prepared based on Participatory Rural Appraisal (PRA) techniques. One/two faculty members will conduct two days' orientation/training programme on PRA in one of the four selected villages for each PFT. Each PRA programme group will consist of PFT members, five other participants involved in the project such as Development Officers, Assistant Collectors, District Planning Officers, functionaries of NGOs, University/KVK teachers, and about 10 villagers. The main idea behind this programme will be to orient the PFT members, officials and the villagers towards the information village concept. Remote sensing data, wherever available, will be used extensively in constructing the village profiles.

4. Selection of thrust areas

Based on the village profile, the thrust areas for the project will be identified. These areas may be put under three broad categories.

1. Farm related
2. Non-farm related
3. Quality of life indicators, life sanitation, drinking water, primary health care and primary education

5. Identification of information needs

Information villages should be developed on the basis of the real needs of the community and should be object-oriented. For this purpose, it is necessary to identify the actual needs and the felt needs. It may also be necessary to identify expressed and non-expresses needs. Assessment of needs where the users are likely to pay is also required. All such needs may be categorized as:

1. Farm related
2. Non-farm related
3. Techno-infrastructure

The information may be collected from various sources through means such as concsultation and discussion with various groups of people, including people at the lowest level in economic terms, small surveys, observations, etc.

6. Identification of primary information disseminators

Every village has its own method of information dissemination and the key information disseminators like shopkeepers, teachers, extension workers, friends, etc. have to be identified.

7. Identification of information resources centres

Nearest information resources centres for the, village, such as universities, institutes, libraries, extension centres, government departments, etc., have to be identified. The Krishi Vigyan Kendras are expected to act as first-level information resources centres. The available data from remote sensing technology should be collected and utilized with ground truth studies.

8. Identification and design of appropriate forms of services

Based on the information gathered, appropriate forms of services are to be planned and designed. Such value added services should be based on the needs and the acceptability of the villagers.

9. Design of information shop

The envisaged information shop will be computer based. The design of the shop should be made keeping in view the information needs and appropriate services required. The configuration in the information shop may range from a stand-alone PC/XT to a 486-based multimedia system with CD-ROM and data communication facilities. The shop may also include video players, TV monitors, etc., and help villages to monitor their agricultural assets and environment with the help of remote sensing studies.

10. Integrated information system

In the information villages, both traditional (like fold media, demonstrations) and recent (computer-aided extension, space applications) information technologies will be blended in a suitable manner. The aim is neither to worship new technologies nor to discard old and time-tested methods. Rather, the goal of the information village project is to achieve an appropriate blend of information methods based on the preferences of the villagers themselves. The ultimate test of this programme is its impact on maximizing farm management efficiency at the production and post-harvest phases, as reflected by a reduction in expenditure and improvement in net farm income. To farmers, "harvesting is believing" and hence the economic impact of the new information spread in the village will determine the sustainability ad replicability of such an intensive knowledge and skill transfer programme.

11. The Structure of Information Network

Each village, depending upon its size, will have one or more information shops, which will be managed by educated unemployed/school teachers/students/women of the village. These managers of information shops will act as information seekers for the village and satisfy the information demands of the village. Being modeled along the lines of pan shops, information shops convey the idea of villagers going down to the shop for purchasing information. The owner of the shop, being interested in making profit, selects the best site to locate the shop and pays attention to the quality and display of the products and the quantum of sales. Information seekers will obtain what they need from among a set of information resources centres using an appropriate communication medium. In order to meet the various information needs of the villagers, the concept of resource centre has been introduced. The resources centre essentially acts as a single-point source for all types of information products. The information resources centre will be fed by a set of information producers. It is proposed that the information network should satisfy all the information needs of the villagers and the information will be repackaged in such a way as to be most useful to the villagers. The specific content of the information package will be identified using the Partipatory Rural Appraisal Methodology. The nautre of the information package as well as mode of communication will vary across the country.

It is the primary responsibility of the information value adders to ensure that the information products are ideally suited for consumption in the rural areas. They would repackage the appropriate technological and scientific results in a form and language that is suitable for dissemination among villagers. A representative list of the media proposed to be used for supporting the information flow is given below. Folk media, print media, postal, telephone, data networks, radio and TV, video, interactive multimedia and demonstrations.

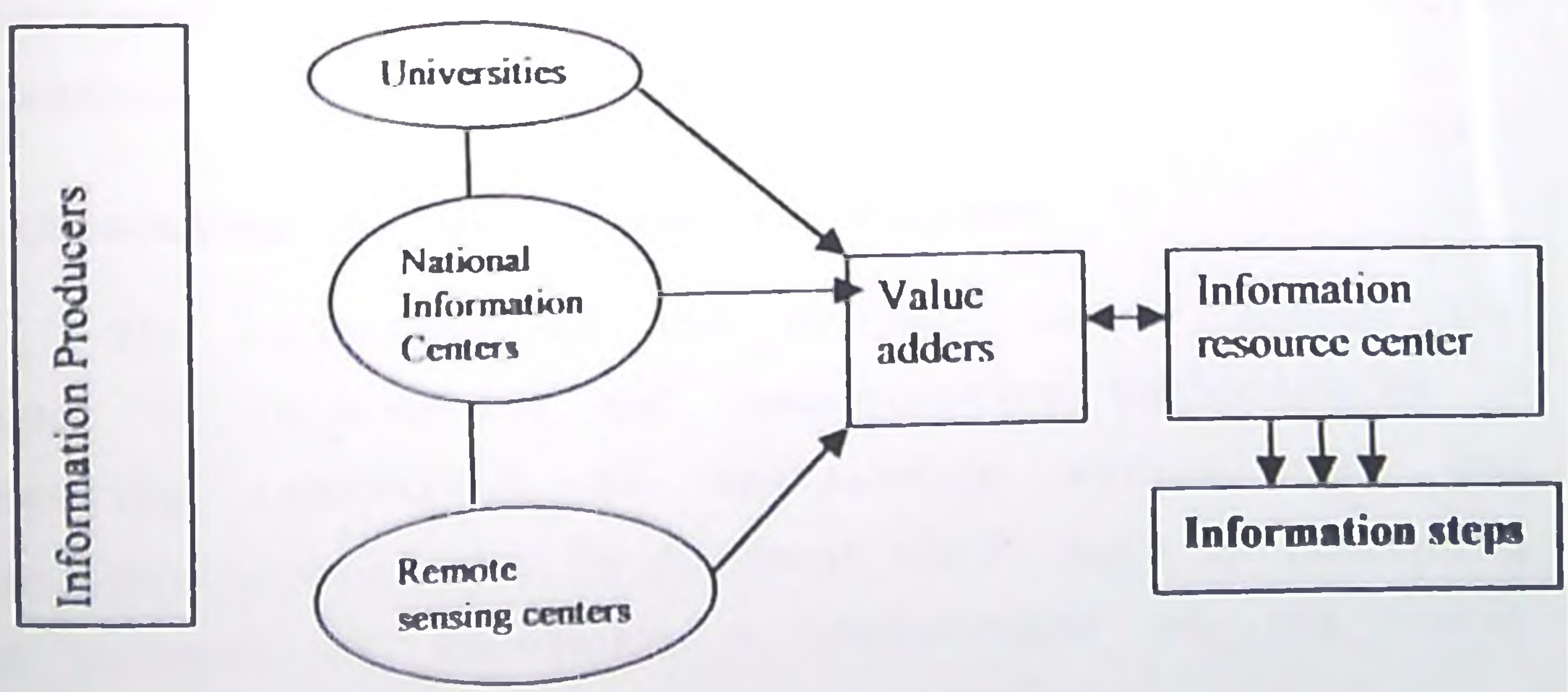

Fig. 2. Structure of Information network

In particular, for health and nutrition information, the presently planned international low earth orbit satellite information network may be utilised.

The major information producers on the network are:

1. Farm men and women
2. Remote sensing and meteorological centres
3. National information centres
4. Research laboratories and universities
5. Industries
6. Government departments and institutions
7. Non-governmental organization
8. Financial institutions and markets

It is recognized that farmwomen and men act as an important source of relevant information. The information network will enable flow of information and interaction among the selected information villages. It is also envisaged that at a later point of time in the project, the information produced by the villagers will be repackaged suitably and fed to the research laboratories to enable relevant research efforts.

12.Objectives of the Information village

The objective of the project is to assess the impact of information and communication technologies in fostering transition to sustainable agricultural and rural development and to document their role in promoting the process of knowledge - empowerment of the rural families.

13. The specific objectives of the project are

- The set up of six village information shops that enable rural families access a basket of modern information and communication technologies.

- To train educated youth, especially women, in rural areas in operating information shops.
- To train the rural youth in the organised and maintenance of a system that generates locally relevant information from generic information.
- To maintenance, update and disseminate information on entitlements to rural families using an appropriate blend of modern and existing channels of communication.
- To measure the impact of information shops and ICT through organization of surveys, participatory rapid appraisal, and other appropriate methods of data gathering; and
- To build models of information dissemination and exchange in rural areas that uses advanced information and communication technologies.

Information Village Project: A Case Study of the Pondicherry Project

The project is located in the Pondicherry region in South India. A Value Addition Center (VAC) has been established at Villianur and is functional since February 1998.

The project is be located in the Union Territory of Pondicherry in south India for the following reasons:

- The existing infrastructure of roads, markets and hospitals in the rural areas in this region is not deficient. Access to modern telecommunications infrastructure is the major deficiency.
- The existence of local institutions of governance in this region has greater continuity in the last 40 years compared to many other regions of India.

- The bio-village project, an innovative, technology based poverty alleviation programme has been ongoing in several villages since 1991, and has already created awareness among the rural families about the opportunities created by new technologies to secure a better livelihood.

The proposed project is located in villianur commune of the region. The block has been selected based on the access of rural families to infrastructure and market. Greater the access to infrastructure, higher are the chances of novel component of infrastructure, such as telecom, becoming useful in a short time. The locations of shops in various hamlets have been will be identified based on infrastructure and primary or secondary school access.

14. Technology

The strategy is to create a wireless network (VHF) in the local area, which connects to a fixed telephone line through which access to internet is available. There will be four information shops at the village level which will be linked to the value-addition centre located at Villianur (The sites for the first three shops are: Managalam, Kizhur, Pillayarkuppam).

In each shop the following equipments is being made available:

1. Remote Duplex Station
2. Telephone interface card
3. Walkie-Talkie with dial-pad
4. Personal computer (with standard MM kit)
5. Printer

At the value-addition center at Villianur, telephones with dial-up access to Internet have been provided (dial-up service with TCP/IP provided by VSNL). The village centers can provide voice/data communication facility among themselves as well as to the external regions through telephones kept at Villianur. The basic wireless equipment has been supplied by MOTOROLA-India with minor add-ons suggested by the project staff. It acts as the hub of the communication network in the project. Four Village Information Shops have been set up at Kozhur, Mangalam and Embalam and Veerampatinam.

15. Value Addition Center

The premise is that value addition by professionals to networked information is an important steps in enabling rural families have access to it. A small office in Villianur services as a Value Addition Center. Villianur is a market centre for many hamlets that surround it and is also an administrative node and a road junction. villianur has been selected based on the access of rural families to infrastructure and markets. Project staff at VAC scan the WWW for useful contacts and technology. Data gathering and value addition to data are carred out here and information is transformed to suit local queries or needs. This is also an exchange point for a variety of locale specific information on health, transport, public events, subsidies, prices etc. Information on developmental programmes (entitlements, credit, inputs etc.) and markets is maintained here. The Center has two PCs, a scanner and a printer, a telephone line for long distance calling facility. From here e-mail can be sent on-line while e-male to other villages can be received at Villianur and forwarded

16. Databases: A number of locally relevant databases in Tamil have been created to meet the felt needs of the rural families on families below poverty line; public welfare schemes or entitlements to the rural population.

17. Village Information Shops

Four information shops have been established at Kizhur, Embalam, Mangalam and Veerampatinam and are linked to VAC. Meetings were held with various groups within the community in each village to identify volunteers who would operate the Information shop and to identify the shop's location. The shops provide information related to health, credit, input price and availability, transport, market information, meteorological information, information for pest surveillance and agronomic practices, data on enttitlements to rural families.

Each shop has a Pentium PC with multimedia. The PC can be connected to the wireless network through a modern and a specially designed interface.Each shop also has a board to display bulletins received on e-mail from the Value Addition Centre. The shop also enables a visitor to make voice call within the region. A circulating library of educational CD-ROMs is maintained by Value Addition Centers for use in the shops.

In Kizhur volunteers were chosen by the general body of the council, which also nominated a 23 member group of 14 men and 9 women to guide the shop's operations. They have been trained on basic operations of PC, handling e-mail and use of HTML.

In Embalam all volunteers are women. Each of them spends half-a-day at the shop and takes turns to attend work.

In Veerampatinam, where majority is fisher families, the village has its own panchayat, which has allotted space in its own office for the center to function from. Three volunteers, 2 women and 1 man have been identified and trained in handling PCs and data communication. The shops are open on all working days from 9 am to 6 pm.

18. Impact of the Information Village Project

Local Database have been created

- On public welfare schemes or entitlements to the rural population. This is available in Tamil in a multimedia format and covers the large welfare schemes.
- A database containing names of the heads of families, which have been officially classified as living below poverty line. The poverty line is defined as gross family annual income of Rs.12,000.
- Multimedia titles, Encyclopaedia Britannica 98 and Encarta 97 are available to school children.

There has been visible impact of the project on the farmers in the project and nearby villages.

- A farmer with a plot of 2 acres in Embalam has started cultivating a hybrid variety of paddy, first time in six years, as he was able to obtain information on price of seeds and its availability from the shop at the right time.

- A women labourer in Embalam could negotiate better for wages, which was partly paid in kind in grain. Knowledge of grain prices enabled her to make sure she got the right quantity of grain as wages. Fourteen farmers in Kizhur had their sugarcane crops ravaged in previous 2 years due to red rot disease resulting in losses. This year before planting they established contact with an entomologist through the shop who prescribed preventive measures.

4.4. National Diary Development Board.

IT based machines are being used at milk collection centers, and in cooperatives to measure butter/fat content of milk, test the quality of milk, and promptly make payment to the farmers. It has resulted in the removal of incentives to cut the milk by adding water, reduced time for payments from 10 days to less than five minutes, and instilled confidence in farmers in the cooperative set up. All of these factors have helped the milk market to expand.

4.5. A CMC pilot project

A CMC pilot project has installed a Computerized Universal Postal System and a Centralized Accounting and Reporting System in three post offices in Andhra Pradesh. The technology is designed for rural environments. The systems handle multifunction within a postal office, reduce errors and waiting time, and provide transparent transactions.

4.6. Honey bee network

Information and Communication Technologies (ICT) can help empower the knowledge rich but economically poor people. Under the "Honey-Bee" knowledge network (of the Indian Institute of Management,IIM, Ahmedabad) used to augment grassroots inventors and overcome language, literacy and localism a large number of grass root inventions have been identified and documented as short multimedia presentations. Future plans include creating a database of such innovations and making them accessible via a wide area network.

4.7. Indian Space Research Organization

One way video, two way audio teleconferencing interactive networks have been used for education and training by Indian Space Research Organization. The major application of the network in rural development was for training extension staff from various departments of the stage governments. In addition, a large number of women, Panchayati Raj elected officials, primary school teachers, and child development workers spread over large distances have been trained.

4.8. The Andra Pradesh State Wide Area Network (APSWAN), aims to link the state government's Secretariat with 23 Disrict Headquarters, serving as the backbone for "multimedia-services" (voice, video and data) that would be used for improved co-ordination between state headquarters and district offices in managing various regulatory, developmental, and hazard mitigation programs of the state government. Mandals will be served by this two-way communication, and electronic commerce applications will be developed. The AP Value Added Network Service project hopes to deliver a variety of public services through a large network of information kiosks.

4.9. Agroclimatic Planning and Information Bank: (Businessline, 2001)

Envisages an electronic network. The information from University of Agrl. Sciences, Bangalore, Dharwar, Karnataka Department of Agriculture, Horticulture and other private agencies is made available on the network. The data is offered in Kannada for the users. Thus a farmer can decide whether to go in for a particular crop or when to sell his produce and where?

4.10 MANAGE (Businessline, 2001)

In Andhra Pradesh MANAGE had selected successful mutually aided co-operative thift and credit societies (MACTCS) to provide internet connectivity in 10 villagers in Rajendra nagar.

5. Governmental approach

Government is aware of a high growth rate is Information technology industry and has therefore decided to use information technology as major vehicle for allround socio-economic development in the country and thus as a byproduct facilitate creation of a strong domestic IT markets. Government intends to use IT as a major instrument to provide new opportunities to those segments of society who do not see opportunities to improve their quality of life and tend to reconcile to their fate.

Some major application

5.1. Electronic governance

(i) computerization of land records all over the country with computerized land/property documents to be made available.

(ii) Payment of bills/taxes

(iii) computerization of information related to court cases particularly the ones related to land/property disputes and extensive use of computers in courts at all levels in the country for office automation and judicial application.

(iv) All government regulations, notifications and forms of various services at all levels of government up to municipal local government agencies to be made available to people on internet.

5.2. Agriculture

It PLAN submitted by NIC formulated central sector scheme to strengthen IT both in the Department and its attached/subordinate office at a project cost of Rs.25 crores.

Agricultural Research Information System IARISNET) of Indian Council of Agricultural Research (ICAR) is equipped with about 80 NICNET via deal up lines for internet services. ARISNET envisages to link 4 Deemed Universities (IARI, IVRI, NDRI and CIFE) one Central Agricultural University 85 ICAR institutes/Directorates, 28 stage agricultural universities 107 agricultural university colleges 261 Krishi Vigyan Kendras and about 850 agricultural research stations located through out the country.

5.3. Information Kerala Mission (Anon, 2000)

Information Kerala Mission is an attempt to place Kerala in the map of rising knowledge societies. It is a massive project for computerizing the local self-governments and linking them to District Planning Officers and state planning board through a computer network to improve transparency, responsiveness and efficiency in administration. It prepares software packages with the help of centre for digital and imaging technology (CDit).

Softwares are

* Sulekha - details about peoples plant projects
* Sevana - to link the local self governments collecting data, issuing certificates
* Sanjitha - Encyclopedea of different rules, laws, govt. notifications prepared in a CD

5.4. Kunnathukal Krishibhavan

With the emergence of Panchayati Raj and Peoples Plan, the Krishi Bhavan proposed to be computerized Kunnathukal Krishibhavan is the first Krishibhavan to be computerised. The software package known as 'Haritham' developed with the help of ER & DC, Kelton. The package contains different modules.

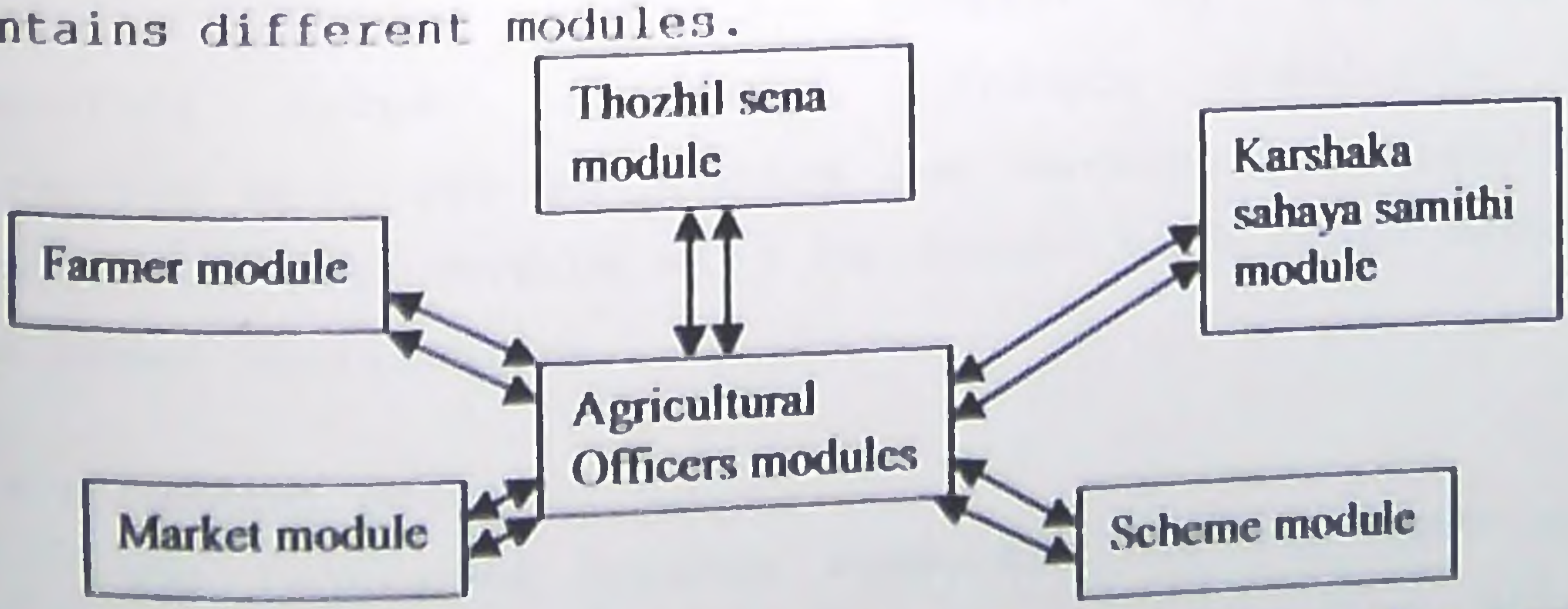

Fig. 3. Data flow of agricultural activities under each officer

5.4.1. Agriculture officer module

Interacts with Karshaka Sena Samithy, Farmers, Thozhil Sena and market outlets to provide assistance needed at all levels to ensure proper and synchronized functioning of all activities leading to improved yields, maximum employment opportunities and best prices for the products.

He reports on the progress of various projects/schemes undertaken to the Assistant Director (Agriculture) including manpower details in his office, found allotments, income expenditures etc.

5.4.2. Karshaka Sahaya Samithi module

This samithi is formed with the purpose of monitoring various activities involving the Farmers and Thozil Sena members to ensure smooth operations. In addition to this they provide financial assistance through financing institutes like Co-op. Banks, Commercial banks etc.

5.4.3. Farmer module

The personal details, hand holding details, type of land, irrigation details, content of cultivation, important crops cultivated, produce available for marketing etc. are maintained for various purposes. The content of this module will be linked with other modules for cross verification.

5.4.4. Market module

The inputs of various agencies like HORTICROP etc. are kept and new agencies enrolled to ensure best prices for the produce.

5.4.5. Scheme module

Various schemes as provided by the state and central Governments are channeled through the Agriuclture Officer for implementation by each Karshaka Sahaya Samithi under his guidance.

5.4.6. Thozil sena module

The members with the Thozil Sena are employed through the Karshaka Sahaya Samathi. All details on members are stored as master files in this module.

In addition package of practices recommendation details also are stored and made available to farmers.

6. Software available

- Design and development of different softwares are carried out
- GISTNIC Sandesh
- Lekha-G
- Other media based services

The information contained include the demographic information, social information, business and industrial statistics foreign trade information, banking and finance related information, agriculture statistics, universities information etc.

- Software on plant protection. First developed at NAARM Hyderabad
- Software on handscaping. They are

  Autocad-2000
  Microstation 95
  Microstation-J
  3-D studio
  Maya - Latest one

- Software on organic farming

7. Cybernetics

Cybernetics provides a powerful approach in comprehending a complex system in which a number of elements and subsystems interact themselves (Ghosal, 1998). The input output relationship is a key in cybernetics. cybernetics science of control and communications.

Features of cybernetic system

(a) Definition of system vis-à-vis problem

A system relevant to a specific problem is defined in terms of elements, their mutual relations and their relations with outside environment.

(ii) Input output mechanism

Input output mechanism determines how inputs are transformed into output.

(iii) Feedback, feed forward relations, sometimes expect of tomorrow depends on the output produced today which again depends on today's input. This is a feedback phenomenon.

(iv) Variety, Ashby's Law of variety behaves us to chalk out various distinctive phenomena of a system interms of declarative statements quantitative knowledge etc.

Cybernetics is a view to tackle rural development problems. The crux of the view is that we cannot tackle a small problem is a village in isolation, we have to look into a larger system to comprehend a small problem.

8. Constraints of Cyber Extension

In a technologically poor and economically challenged nation like India the introduction of a technology like that of Cyber Extension is bound to have a number of constraints.

1. Initial cost of the Infrastructure: The cost of establishing Information Villages, which involves computer, costly severs and other expensive equipment is a severe strain on the project. The existing information villages are funded by Foreign Agencies. It is not possible to expect the government or foreign agencies to meet the expenses of establishing such networks throught out the country. Hence, a self sustaining model for the establishing the information villages must be initiated with participation of the local village panchayaths, both monetarily and in terms of providing infrastructure.

2. Cost of upgrading the set-up: a bigger constraint is that of keeping pace with the first changing developments in the computer software and hardware. This requires constant replacement and up gradation which means more costs to be incurred.

3. Literacy: the low level of literacy that plagues India is a major deterrent in the implementation of any new technology let alone cyber technology. For this a lot of interactive software is available which makes use of verbal commands or touch screen technology but nevertheless, the lack of literacy is a major constraint.

4. Computer literacy: the psychological block against computers, arising due to a feeling of it being a technicians domain has resulted in a reluctance on the part of even educated people to get aquatinted with computers.

5. Poor net ability: in India only 0.2% of the population is net enabled which is a very poor figure when compared to other technologically developed countries.

6. Cyber Extension cannot replace the Real Extension: the farmers of our country are of the 'seeing is believing' and 'harvesting is believing' kind and hence though cyber extension can aid to extension worker it feasibility as a long term reliable change agent is suspect and is dependent on how far the farmers can perceive 'virtual' is 'real'.

9. Potential advantages of cyber extension

1. Cyber extension will save money, time, and effort. Scientists will prepare electronic version of the message themselves. These versions don't have to be printed and posted. This will save money and time. Cyber messages will save money and time. Cyber messages can be updated online and that too would save money.

2. Cyber extension will save time, cut steps from the extension processes. In the context of agriculture the zonal workshops and training to subject matter specialists can be eliminated altogether. The scientists can directly post the information on the internet, which will be directly available to the

extension functionaries at the district, sub division, block and village level. All the concerned will get the information immediately and queries/clarification will also be added equally fast, without involving a chain of extension machinery.

3. Cyber extension will be information rich and interactive. It appeals to he curious extension workers and analytical farmers. It will allow them to search and locate the information, they need quickly. The extension worker can talk to the concerned scientists for more information on the subject, where ever the scientists may be.

4. Cyber extension will offer instant international reach. Online networks have created an instant global village. Cyber extension will eliminate the time and distance barrier that get in the way of knowing the latest information on nay particular problem from any part of the world. One can reach any University, National/State level training and research stations and other institutions and discuss his/her problems with best experts in the field.

5. Cyber extension will continuously available. One of the key attributes of an online information service is that it is available all the times in a year. If you have connectivity, you can get information, what ever and from where ever it is available.

10. CONCLUSION

The cyber extension thus can be used as a complement in conjunction with existing extension and rural development mechanism. The cyber extension naturally, cannot and will not eliminate all the problems of the existing programmes and schemes. And in most cases, cyber extension will not even replace the traditional extension. Instead, it will both add to and subtract from today's extension methodology. It will add more interactivity. It will add speed. It will add two-way communication. It will add to wider age and also more in-depth messaging. It will widen the scope of extension; it will also improve quality. It will subtract costs, reduce time. It will reduce dependency on so many actors in the chain of extension system, and frankly it will change the whole method of extension in coming decade. The continuing rapid development of telecommunications and computer-based information technology (IT) is probably the biggest factor for change in extension, one which will facilitate and reinforce other ch

Important Agri-information web sites

1. www.usda.org - provides access to current and world agricultural rural development data. It is the result of the cooperative arrangement between the United States Department of Agriculture and Cornell University.

2. www.fao.org: access to AGRIS, FAOSTAT databases, discussion lists, publications and media library etc.

3. www.worldbank.org: offers information on agricultural world trends and the Bank's stand on several agricultural projects in many countries.

4. www.cabi.org: provides informaiton, publishing and scientific services world wide on agriculture, forests and management of natural resources.

5. www.cgiar.org: provides information on CGIAR Research centres, members and partners and inter center initiatives.

6. www.agriculturalinformation.com: provides consultancy services which are India centered. It provides a free e-mail news letter to those who have registered with it.

7. www.nic.in: provides information about ICAR.

8. www.kau.edu: website of KAU

Virtual libraries

9. www.nal.usda.gov: National Agricultural Library, provides access to resources and gateways to its associated institutions. One can find links to NAL's online public catalogue and journal articles database; and links to other online agricultural resources.

Agricultural Search Engines

1. Agrisurfer
2. Agrisurf
3. Agfind
4. Agr.ca

Electronic journals

1. www.joe.org
2. www.agecon.uga
3. www.progressivefarmer.com

Educational Portals

ETH Education Portal

http://education.eth.net

Shiksha

http://www.shiksha.com

Educational Institutions Resources Bank

http://www.indiaedu.com

Health Education and Information Portal

http://www.e-healthindica.com

E-Gurucool

http://www.egurucool.com

AP Educational Portal

http://www.apeducation.com

IT Portals

India's online IT Market Place

http://www.itnation.com

India's first IT Portal

http://www.computerlelo.com

E.Commerce Portal and Guide

http://www.ipundit.com

Miscellaneous

Human Resource Development

http://www.humanlinks.com

The Complete Indian Web Portal

http://www.indiaatlas.com

Indian Technology Portal

http://www.itspace.com

Technology Portal of India

http://www.zdnetindia.com

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2. Assam Agricultural University Jorhat	vc@aau.ren.nic.in anm@aau.ren.nic.in
3. Bidhan Chandra Krishi Vishwa Vidyalaya, Mohanpur, West Bengal	root@bckv.wb.nic.in
4. Birsa Agricultural University, Kanke, Ranchi, Bihar	root@bau.bih.nic.in
5. CCS Haryana Agricultural University, Hissar, Haryana	root@hau.pnp.nic.in root@hau.hry.nic.in
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http://www.matrix.msu.edu

http://www.informasses.nic.in

DISCUSSION

1. What will be the role of agricultural officers/AEO in future?

   Cyber extension cannot eliminate the problem of existing programmes. Whatever the materials we provide in the net can only be accessed by the farmers. Agricultural Officer has a major/top role in technological verification. Cyber extension is like a 'readymade dress' we have to alter it according to our own need. So it is the duty of AO/AEO is to do the altering part. Whatever necessary for the farmers have to be accessed other things have to be culled out from the vast information. Only thing is that with the help of cyber extension farmers will be able to access the information within no time.

2. What is kiosk?

   Kiosk are structures build to install computers for commonman to operate.

3. What is the role of university in this context?

   University can change the syllabus, include courses on powerpoint, visual basics etc. so that the depending on outsiders for developing multimedia packages can be reduced.

4. What do you meant by cybernetics?

   Cybernetics is a powerful approach in comprehending a complex system in which a number of elements and subsystems interact themselves.

ABSTRACT

Improved communication and information access are directly related to social and economic development. Access to quick reliable and credible information is a crucial requirement for sustainable agricultural development. New information and communication technologies are generating possibilities to solve problems of rural poverty, inequality and giving opportunities to bridge the gap between the information rich and the information poor.

Modern communication technologies when applied to rural areas can help to improve communication and dessiminate knowledge (Vijayalayan, 2000).

Cyber Extension may be defined as the extension over the cyber space. This will be the major form of technology dissemination in the near future. The pilot project of Warna Wired Villages in Kolhapur district in Maharashtra (Raju and Anil Taklkar, 1999). Info villages in Pondicheri (Sharma, 2000). "Soochanalayas" in Dhar district in Madhya Pradesh (Lakshminarayana, 2001) have successfully demonstrated the acceptability and usage of Cyber Extension at village level.

In an economically challenged nation like India "Cyber extension" is bound to have some constraints. Eventhough the future holds a tremendous potential for the extension system using advanced technologies with computers to communicate innovative information. The next decade of extensin could be one of its best becoming more advanced in information communication by which can be an agril force in the 21st century.

INTELLECTUAL PROPERTY RIGHTS ON BIOLOGICAL DIVERSITY

by

Sanal Kumar P.

2000-21-15

SEMINAR REPORT

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DEPARTMENT OF PLANT BREEDING AND GENETICS
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DECLARATION

I, **Sanal Kumar P.** (2000 - 21 - 15) here by declare that this seminar report entitled Intellectual Property Rights On Biological Diversity has been prepared by me independently, after going through the various references cited herein and that I have not copied or adopted from any of the fellow students or previous seminar reports.

Sanal Kumar P.

(2000-21-15)

Vellanikkara

15.11.2001

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1. Introduction

Following the emergence of strong global and national intellectual property regimes, the subject of intellectual property rights (IPRs) and their protection has become a central issue in economic development scientific and technological development, protection of traditional knowledge and scientific and economic co-operation between industrialized and developing countries. **Intellectual Property Rights**, as the term suggests, are meant to be rights to ideas and information, which are used in new invention or processes. These rights enables the holder to exclude imitators from marketing such inventions or processes for a specified time; in exchange, the holder is required to disclose the formula or idea behind the product or process. The effect of IPRs is therefore monopoly over commercial exploitation of the idea or information, for a limited period. The stated purpose of IPRs is to stimulate innovations, by offering higher monetary returns than the market otherwise might provide (Kothari, 1999).

The practice of defining intellectual property started in the Italian City State. It has been reported that the 1st patent was granted to Filippo Brunelleschi in the Republic of Florence in 1421 (Mahanti, 2001). Brunelleschi was given a three-year monopoly for his invention concerning special hoisting gear used on barges. An ordinance relating to patents was first enacted in a Venetian law of 1474. From the Italian City States the practice spread to other Western European countries. In England, during the region of Elizabeth (1533-1603), her minister Lord Burghley (1520-98), granted a series of patents with a view to encouraging foreign inventors to import their inventions and work on them in England. It was also intended to stimulate inventions by domestic producers.

In India, the basic elements of intellectual property rights were first introduced by enacting the Act on Protecting of Invention in 1856. This Act, which was based on the British Patent Law of 1852, was the origin of patent legislation in India. In 1967, The Indian Patents Act Bill was introduced in Parliament and the Act came into force on 20th April 1972. The houses of the Indian Parliament passed the patent amendment bill in 1999. Till today in India, patents are not granted to living organisms, except microorganisms.

In 1930, the U.S. Plant Patent Act was passed, which gave IPRs to asexually reproduced plant varieties. Several other countries subsequently extend such or other forms of protection to plant varieties, until in 1962, an International Convention for the Protection of New Varieties of Plants was signed. Most signatories were industrialized countries, who had also formed a Union for the Protection of New Varieties of Plants (UPOV). This treaty came into force in 1968 and has been revised in 1972 and 1991. Only about 20 industrialized countries are the members of this convention (Vasudeva, 2000).

The basic right conferred on the plant breeder by the UPOV convention in its 1972 and 1978 versions was "exclusive commercial rights" (for sale and marketing of the propagating material of new variety). The 1991 version of UPOV has shifted the exclusive right from "commercial right" to "exploitation right" that is more akin to patents right. The rights of the plant breeder under the 1991 version extend to 'production or reproduction, conditioning for propagation, offering for sale, selling or other marketing, importing or exporting and stocking for any of these purposes'. The Act provides countries with the option of restricting farmers 'Plant back' rights, i.e., the 1991 UPOV Act impose restrictions on 'seed savers'.

Under the new rules of the GATT which took effect, January 1, 1995, all member countries must bring their national IPR laws into conformity with certain provisions of new agreement on Trade Related Intellectual Property Rights (TRIPs). This agreement obliges member governments to provide for 'the protection of plant varieties either by patents or by an effective *Sui genesis* system (UPOV in commonly accepted *Sui genesis* form of protection) or by any combination there off (TRIPs Article 27)'. Simultaneously governments are given the option to exclude from patentability "plants and animals other than microorganisms" and the "essentially biological processes for the production of plants or animals other than non-biological and microbiological processes". The agreement on TRIPs under the auspices of the WTO came into force from January 1, 1995.

2. The components of IPRs in the TRIPs agreement

- Copy rights and related rights;
- Trade marks;
- Geographical indication;
- Patents;
- Industrial designs;
- Layout designs (topographies) of integrated circuits;
- Protection of undisclosed information, and
- Control of anti-competitive practices in contractual licenses

(Gupta, 1998)

2.1 Industrial design

Industrial design refers to the creative activity of achieving a formal or ornamental appearance for items produced industrially

- A design must be applied to utilitarian articles in order to be protected
- The protection is lost unless industrial design is registered by the applicant before publication or public use
- Industrial design protection endures generally for a short period (10-15 years)

(Mahanti, 2001b)

2.2 Layout-Designs (Topographies) of integrated circuits

TRIPs Agreement provides that Members shall consider unlawful the unauthorized

- reproducing,
- importing,
- selling, or
- otherwise distributing for commercial purposes, a protected layout design

(Leesti, 1998)

2.3 Protection of undisclosed information

Article 39 of TRIPs as 'trade secrets'

Def Art 39 2(a) "Secret in the sense that it is not, as a body or in the precise configuration and assembly of its components, generally known among or readily accessible to persons within the circles that normally deal with the kind of information in question".

Examples of disclosing

- breach of contract
- inducement to breach
- acquisition of undisclosed information by third parties who know or were grossly negligent in failing to know, that practices contrary to honest commercial practices were involved in the acquisition (Kumar, 1998)

2.4 Control of anti-competitive practices in contractual licenses

Section 8 of TRIPs recognises some licensing practices and conditions pertaining to IPR, which restrain competition, may have adverse effect on trade and may impede the transfer and dissemination of technology. Examples exclusive grand-back conditions, conditions preventing challenges to validity and coercive package licensing (IPR, 1999)

2.5 Copy rights and related rights

Copyright law deals with intellectual creation. Broadly speaking, it provides to authors and other creators of the works of the mind (eg., literature, art, music) various rights to authorise or prohibit use of their works. They are allowed to control the use of their works for a certain period.

Rights relating to copyrights, which protect performers, sound recording (or 'phonogram') producers and broadcasters are referred as related rights. Copy right last for the life of the author plus 50 years after his/her death.

Regarding related rights

- 50 years: Performers and producers of phonogram
- 20 years: Broadcasting organisations

(Tiwari, 1998)

2.6 Trademarks

A trademark can be briefly described as a word, name, device, label, signature, and letter or numerical or any combination thereof, used by a manufacturer or trader to identify his goods from those of other manufacturers or traders. For seven years (Queries, 1998)

2.7 Patents

Most of the countries give legal protection to invention through patents. However, in a few countries the protection to inventions may also be given by means other than patents. "A patent is a property right granted by the state to a patentee, excluding others, for a limited period, from using the patented invention without the proper authorization of the owner of the patented invention" (Mahanti, 2001a). An invention without a patent is not necessarily a property right. The TRIPs Agreement States, in Article 27, that: "Patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application."

Further, patents must be available and patent rights enjoyable "without discrimination as to the place of invention, field of technology and whether products are imported or locally produced." This requirement is subject to provisions dealing with:

- exclusions from patentability
- transitional delays for developing country members to extend product patent protection
- transitional provisions for pharmaceutical and agricultural chemical products
- members may exclude from patenability invention in accordance with

Article 27.2:

"To protect *Ordre public* or morality including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by public law, and

Article 27.3:

1) diagnostic, therapeutic and surgical methods for the treatment of humans or animals,

2) plants and animals other than microorganisms, and essentially biological processes for production of plants or animals other than non-biological and microbiological processes.

Finally, Article 27.3(b), as mentioned earlier, requires members to provide for the protection of plant varieties either by patents or by an effective *sui genesis* system or by a combination thereof. India opted to have a *sui genesis* system for the protection.

What is non-patentable in India

- Frivolous claims contrary to well-established natural laws

- Anything contrary to low or morality or injurious to public health
- More arrangement or rearrangement on duplication of known devices, each functioning independently of one another in a known way
- A method or process of testing applicable during the process of manufacture for rendering the machine, apparatus or other equipment more efficient or for the improvement or restoration of the existing machine, apparatus or other equipment or for the improvement or control of manufacture
- A method of agriculture of horticulture
- Invention related to atomic energy
- Computer software
- Aesthetic creation
- Discoveries, scientific theories, mathematical methods, schemes, roles or methods for performing mental acts playing games or doing business
- Presentations of information
- Methods of treating humans or animals through surgery or therapeutical diagnosis
- Animals and plants, and biological methods or rearing/growing them (however, microorganisms are patentable)
- Products made by chemical synthesis - foods, medicines

(Mahanti, 2001a)

2.7 (a) Plant Variety Protection & Plant Breeder's Rights

According to the TRIPs Agreement, while "plants and animals other than micro-organisms" may be excluded from patentability (Article 27.3), the member countries shall provide "for the protection of plant varieties by patents or by an effective *Sui genesis* system or by any combination there of". The most well-known and internationally recognized *Sui genesis* system for the protection of plant varieties in the system of Plant Breeders Rights recognized an International Convention for the Protection of New Varieties of Plants and forming a union UPOV. This was established in 1961, but came into force in 1968 and has been revised in 1972, 1978 and 1991. The basic right conferred on the plant breeder by the UPOV conventional in its 1972 and 1978 versions was "exclusive commercial" rights (for sale and marketing of the propagating material of new variety). The 1991 version of UPOV has shifted the exclusive right from "commercial right" to "exploitation right" that is more a – kin to patents right. The rights of the plant breeder under the 1991 version extend to "production or reproduction, conditioning for propagation, offering for sale, selling or other marketing importing or exporting and stocking for any of these purposes".

A variety is defined as "a plant group within a single botanical taxon of the lowest known rank which:

- ✓ is defined by the expression of characteristics which result from a given genotype or combination of genotypes
- ✓ these characteristics distinguish the variety from other plant groups
- ✓ is considered a unit, and
- ✓ meets the granting criteria – *Novel, Distinct, Uniform, Stable* (NDUS)"

(Adcock and Llewelyn, 2001)

The definitions of NDUS as per UPOV

☞ **Distinctness** Article 6 of UPOV

"whatever may be the origin, artificial or natural, of the initial variation from which it has resulted, the variety must be ***clearly distinguishable by one or more important characteristics*** *from any other variety whose existence is a matter of common knowledge at the time when protection is applied for ..... "*

☞ **Uniform and stability** Article 6 of UPOV

"a new variety must be ***sufficiently homogeneous****, having regard to the particular features of its sexual reproduction or vegetative propagation"*

"the variety must be ***stable in its essential characteristics****, that it must remain true to its description after repeated reproduction or propagation or where the breeder has defined a particular cycle of reproduction or multiplication, at the end of each cycle"*

☞ **Novelty** Article 13 of UPOV

"the variety shall be ***designated by a denomination*** *destined to be its genetic designation ..... "*

(Gill *et al.*, 1996)

2.7 (b) PBR - the Indian version

Since the Indian Patents Act 1970 excluded agriculture and horticulture from patentability, it needs to put into place a *Sui generis* system by evolving a legislation plant variety protection (PVP). The Indian Plant Varieties Act includes elements of both the UPOV Acts (earlier 1978 and revised 1991 Act) with some new features. The original "Protection of Plant Varieties and Farmer's Rights Bill 1999" based on UPOV model, was introduced in Lok Sabha on December 12, 1999.

- Re-use of farm-saved seeds is provided as farmer's rights rather than as an exemption or as a privilege
- Community rights are honoured by the provision of benefit-sharing
- National Gene Fund and sanctions of schemes are proposed as intruments in this regard
- Transgenics are included in the definition of 'variety'
- Extent varieties are protected, till 15 years after their notification under seed Act
- The bill, at the very outset, prohibits the protection of varieties deleterious to human and animal health and environment (e.g. terminator)

The 30 member JPC under the chairmanship of Mr. Sahib Singh Verma has redrafted the Bill to make an exclusive provision on farmer's rights while seeking to establish plant varieties suggestions:

- Re define 'breeder'
- Elaborate 'Farmers Rights' preferably as a separate chapter

- Include a provision of extending the duration of protection for public interest

- Specify if multilines, composites and land races constitute a variety

- Designate the repository of propagating material.

On Sept. 2, both the houses of parliament have approved the bill.

Protection of 'essentially derived varieties"

The clause "restricted the marketing of a newly developed variety if it is genetically similar to a protected source variety and demands authorisation from the breeder who has protected it".

The concept of Farmers' right is defined by FAO commission on Plant Genetic Resources for Food and Agriculture as "rights arising from the past, present and future contributions of farmers on conserving, improving and making available plant genetic resources, particularly those in the context of origin and diversity".

Highlights of Indian PVPFR Act, 1999

- Criteria for registration for new varieties – Novel, Distinct, Uniform and Stable
- Breeder to furnish geographical location from where the parent material has been taken for developing new variety
- The duration of protection is 15 years for annual crops and 18 years for trees and vines
- Use of any variety registered under the act can be used for conducting experiments or research and using it as an initial source for creating other varieties with prior authorization of the varietal protection holder
- Farmer who has bred or developed a new variety to be entitled for protection as a breeder of a variety
- Bonafide researcher has the free access to the genetic materials

☞ Farmer has the right to save, sow, re-sow, exchange, share or sell their farm produce of a protected variety, with exception that he will not be entitled to sell branded seed of a protected variety

Table 1. Comparison of Indian PVA with the UPOV 1978 and 19991 Acts

Features	UPOV 1978	UPOV 1991	Indian PVA
Breeder's scope	Production & marketing of propagating material	Production, marketing, export, important stocking of propagating material	Production, marketing, export, import and stocking of propagating material
Extent of coverage	Minimum of 24 species	Minimum of 15 species	All species
Protection period	15 years	20 years	15 years
Exception of right	Farmers privilege in practice	Farmers privilege optional and under conditions	Farmers right specially recognized
Compulsory licensing	Not defined	Not defined	In case of public interest, defined as reasonable, availability of seeds and supply of export marketing

(Ghosh *et al.*, 2001)

2.7 (c) Biological diversity - The web of life

Biological diversity - or biodiversity - is the term given to the variety of life on Earth and the natural patterns it forms. The biodiversity we see today is the fruit of billions of years of evolution, shaped by natural processes and, increasingly, by the influence of human. It forms the 'web-of life' of which we are an integral part and upon which we so fully depend.

India, endowed with rich diversity in its flora and fauna, is considered to be one of the top 10 mega-diversity centres of the world (Sagar, 1998). Being a sub continent, it encompasses 15 different agro climatic zones, 10 vegetation zones, 25 biotic provinces and 426 biomes. Almost all the shades of climates, for the hottest Thar Desert to Artic environment in Himalayas, occur in India. In nature of diversity in environmental regimes have enabled India to harbor over 1,36,000 species of living organisms, constituting about 5% or the known species of the world (Chellam, 2001). As many as 167 species of crops, 320 species of wild crop relatives, 47000 wild species of plants and thousands of varieties of several hundred crop species (Kothari, 2001).

Convention on Biological Diversity

While concern for the environment is constant in history, heightened concern about environmental destruction and loss of species and ecosystems in the seventies led to concerned action. There were many steps that led to the United Nations process to the development of CBD.

- **The declaration of the United Nations conference on the Human Environment, 1972 Stockholm (Stockholm Declaration)**
  - Resolved to establish United Nations Environment Programme (UNEP)
  - Protecting wet lands and regulating the International trade in endangered species
  - Controls use of toxic chemicals and pollution

- **UN working group on Indigenous Population, 1982**

  - Setting standards at global level with respect to the rights and concern of indigenous people

  - Increases awareness of the issues and the potential importance of their role in the conservation and sustainable management of global resources

- **The World Character for Nature, 1982**

"Mankind is apart of nature, and life depends on the uninterrupted functioning of natural systems which ensure the supply of energy and nutrients, civilization is rooted in nature"......

"Every life form is unique, warranting respect regardless of its worth to man, and, to accord other organisms such recognitions, man must be guided by a moral code of action, man can alter nature and exhaust natural resources by his action or its consequences and, therefore, must fully recognize the urgency of maintaining the stability and quality of nature and of conserving natural resources ..."

- **Report of World Commission on Environment and Development, 1987 (Brudland Commission) OUR COMMON FUTURE**

"Humanity has the ability to make development sustainable-to ensure that it meets needs of the present without compromising the ability of future generations to meet their own needs"

- **EARTH SUMMIT, 1992, *Rio de Janeiro, Brazil***

In 1992, the largest ever meeting of world leaders took place at the United Nations Conference on Environment and Development in Rio de Janeiro, Brazil. An historic set of agreements was signed at the 'Earth Summit' including two binding agreements, the Convention of Climate Change and the Convention on Biological Diversity, the first global agreement on the conservation and sustainable use of biological diversity. Over 150 governments signed the document at the Rio conference, and since then more than 175 countries have ratified the agreement.

The convention has three main goals

- ✓ The conservation of biodiversity
- ✓ Sustainable use of the components of biodiversity, and
- ✓ Sharing the benefits arising from the commercial and other utilisation of genetic resources in a fair and equitable way.

For reviewing the implementation of the convention, Conference of Parties (COP) was established through Article 23(1)

- Considering reports submitted by any subsidiary body
- Reviewing scientific, technical and technological advices on biological diversity
- Consider and adopt, as required, protocols
- Consider amendments to any protocol, their recommended adoption to the parties
- Establish subsidiary bodies, particularly to provide scientific and technical advice, necessary for implementation of the convention
- Consider and undertake additional action that may be required for the achievement of the purposes of the convention

With Article 25 a subsidiary body, Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) was established to provide COP and its subsidiary bodies with timely advices relating to the implementation of the CBD. It shall be multidisciplinary.

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- Provides scientific and technical assessments of the status of biological

- Identify innovative, efficient technologies relating to the conservation and sustainable use of biological diversity and advice on the ways and means of promoting development and/or transferring such technologies
- Provides advice on scientific programme and international co-operation in research and development related to conservation and sustainable use of biological diversity

2.7 (d) Indian biodiversity

The protection and safety of Indian biodiversity as a whole and agro-biodiversity in particular was posting entirely a new challenge and also opening up new opportunities. The Indian gene centre has centres of origin and diversity of more than 20 major agri-horticultural crops. The country has very rich elements of endemics in its flora. It has estimated that about 35% of the higher plant flora in endemic to India. Out of the 18 Hotspots of biodiversity identified in the world, India has two, one at Eastern Himalayan. The other at Western Ghats, containing 3,500 and 4,600 endemic species of higher plants respectively.

The conservation of biodiversity has been woven into the constitution through Article 48-A one of the Directive Principles of state policy: "The state shall endeavor to protect and improve the environment and to safe guard the forest and wild life of our country". One of the Fundamental Duties of the citizen under Article 51-A in to "protect and improve the natural environment including forests, lakes, rivers and wildlife, and to have compassion for living creatures". The ICAR had been vigilant and farsighted about the issues relating to PGR even in its early phases. A plant Introduction section was started in the Division of Botany, IARI, New Delhi during 1946. The section was elevated as a full-fledged Division of Plant Introduction in 1961 which in turn was upgraded to the National Bureau of Plant Introduction in 1976 and rechristened the NBPGR. The Bureau has 5 divisions and 10 regional stations located in different agro-ecological zones in the country.The NBPGR is the nodal organization of the Indian National Plant Gene Resources System for exchange, collection, plant quarantine and for conservation and utilization of Plant Genetic Resources and maintain linkages with over 30 National active Germplasm Sites (NAGS).

In February 1994, India ratified the CBD. Realizing that there is no comprehensive legislation dealing with biodiversity to India, and following up on its obligation under the UN's CBD, the Govt. of India has introduced the Biological Diversity Bill 2000 into Parliament. Currently being examined by a committee of MPs.

A new national process promises to point towards a resolution to conserve the natural habitats and biodiversity that co-exist with us and help us take a small step towards securing the country's biodiversity. This is the National Biodiversity strategy and Action Plan (NBSAP), being formulated by the Ministry of Environment and Forest with execution by hundreds of NGOs, official agencies, community groups etc.

2.7 (d1) Biological Diversity Bill, 2000

- ✓ It prohibits the transfer of Indian genetic material outside the country, without approval of the Indian government

- ✓ It stipulates that patents or other IPR over such materials or other related knowledge can only be taken after seeking permission in advance

- ✓ It provides for levying of appropriate fees and royalties on such transfers and IPR

- ✓ It regulates access to such material by Indian nationals also, to stop over-exploitation

- ✓ It provides for the sharing of benefits of various kinds, including transfer of technology, monetary returns, joint R & D venture capital funds and joint IPR ownership

- ✓ it provides measures for habitat and species protection, Environmental Impact Assessments (EIAs) of projecis which could harm biodiversity, integration of biodiversity into all sectoral plans, programmes and policies

- ✓ It give local communities say in the use of resources and knowledge within their jurisdiction and to charge fees from parties who want to use these resources and knowledge, provides for the protection of indigenous knowledge this appropriate legislation or administrative steps such as registration and local, state and national levels

- ✓ It stipulates that risks associated with use of GMOs, will be controlled through appropriate means

✓ It provides for the designation of institutions as repositories of biological resources

2.7 (d2)The Kani - TBGRI arrangement (benefit-sharing)

The Kani tribals in Thiruvananthapuram district, Kerala, claim that *one can live for days together without food, and still be able to perform vigorous physical work, by eating a few fruits of a local herb* ***Aarogya paccha (Tricopus zeylanicus)*** *every day*. The scientists of TBGRI conducted detailed investigations on the use of plant. Study of leaves of the plant revealed it had anti-stress, anti-hepatotoxic and immunodulatory / immunorestorative properties. Eventually, the drug 'Jeevani' was formulated, given license to manufacture the drug to Arya Vaidya Pharmacy, Coimbatore (AVP) in 1995, for a period of 7 years for a fee of Rs.10 lakhs. TBGRI decided that the Kani tribals would receive 50% of the license fee, as well as 50% of the royalty obtained by TBGRI on sale of drug. In Nov 1997, registered a trust called Kerala Kani Samudaya Kshema Trust

- Welfare and development activities for Kanis
- Preparation of biodiversity register to document the knowledge base of the Kanis
- Promote sustainable use and conservation of biological resources

TBGRI and AVP, believe that there are means to sustainably harvest the plant in the forest area, that are not being sufficiently explored. This and other issues of benefit-sharing and equity will need to be resolved, if this novel initiative is to become a model for the country.

(Anuradha, 2001)

2.8 IPR vs Biodiversity convention (CBD)

The convention on Biological Diversity (CBD) 1992 and the Agreement on Trade-Related Intellectual Property Rights (TRIPs) 1993, as a part of the WTO, are in force and are legally binding instruments on the parties thereto (CBD ratified by over 170 countries and TRIPs binding with over 132 countries).

The main objective of the TRIPs Agreement is to recognize and protect monopolistic and private IPRs held mainly by MNCs, the CBD aims to conserve, sustainable use, and equitably share the benefits of biological resources arising out of such use, in which developing countries are the main holders. The TRIPs Agreement looks at individual rights while the CBD aims to encourage recognition of collective rights of communities.

2.8 (a)Mandate of the CBD

Article 1 of the convention provides for

"The conservation of biological diversity, the sustainable use of its components and the fair and equitable share of the benefits arising out of the utilisation of genetic resources, including appropriate access to genetic resources and appropriate access to genetic resources and appropriate transfer to relevant technologies, taking into account all rights over those resources and to technology, and by appropriate funding".

The preamble proclaims, among other things, *"States have sovereign rights over biological resources (Article 3 and 15.1) and they are responsible for the conservation of their biological diversity and for using their biological resources in sustainable manner"*.

In furtherance of this sovereign right, Article 15.1 provides that the *"authority to determine access to genetic resources rests with the national governments and in subject to national legislation"*. This makes genetic resources subject to ownership of the state

On the other hand, Article 15.2 requires that *"Each contracting Part shall endeavor to create conditions to 'facilitate access to genetic resources for environmentally* *sound uses by other contracting parties and not to impose restrictions that run counter to the objectives of this convention*".

The access to genetic resources has been subjected to the obligations laid down in Article 16.1, which provides: "*Each contracting party, recognising that technology includes biotechnology and the both access to land transfer of technology among contracting parties are essential elements for the attainment of the objectives of this convention, undertaken subject to the provision of this Article to provide and or facilitate access for and transfer to other contracting parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.*"

Further, Article 22 provides that the CBD "*shall not affect the rights and obligations of any contracting party deriving from any existing international agreement except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity*".

2.8 (b)Mandate of TRIPs

Article 8.1 of TRIPs authorises its members in formulating or amending their national laws and regulations to "*adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological developments*"

Article 27.3(b) of TRIPs: Patentable Subject Matter

"*Members may also exclude from patentability: plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, members shall provide for the protection of plant varieties either by patents or by an effective Sui genesis system or by any combination thereof. The provision of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement.*"

2.8(c) The fundamental conflicts between TRIPs and CBD

- TRIPs does not allow for the exercise of national sovereignty over biodiversity (because it obliges countries to enact IPRs on plant varieties)

- TRIPs does not allow countries to seek a share of benefits obtained from patented biodiversity (there is no provision requiring patentees to disclose the country of origin of any biological materials, therefore no claims can effectively be made from the countries of origin)

- TRIPs does not require patentees to fulfill access obligations towards genetic resources (it therefore condones and facilitates biopiracy)

- TRIPs over rules (and legally comprises the development of) CBD Act 8(j) because patent claims can be worded to embrace and expand on indigenous knowledge without recognition of or compensation for it. Turmeric, Neem and Basmati from the Indian subcontinent are well known cases of this. Also, UPOV's type of Plant Variety Protection (PVP) certificates is being granted on traditional plant varieties from developing countries.

2.9 Protection of geographical denominations

Various terms have been adopted to define a geographical denomination. For purpose of the presentation, the following terms would be relevant.

Indication of source means: *"a geographical indication perceived by the public as indicating the origin of goods or services (eg. Made in India)."*

Appellation of origin means: *"The geographical name of a country, region or locality, which serves to designate a product originating therein, the quality and characteristics of which are due exclusively or essentially to the geographical environment, including natural and human factors".*

'Geographical Indication' means: *"Indications which identify a good as originating in the territory of a country, or a region or locality in that territory, where a given quality, reputation or other characterttics of the good in essentially attributable to its, geographical origin".*

TRIPs Agreement contains a section devoted to the protection of 'geographical indications'. The TRIPs provision regarding geographical indications are found in section 3 of Part II of the Agreement, and consists of three articles. Article 22 concerns the protection of geographical indications in general. Article 23 set forth 'Additional Protection for Geographical Indication for Wines and Spirits". Article 24 concern exceptions to the requirements of the prior two articles and sets forth commitments to a process of international negotiation regarding protection of geographical indication.

Article 22.1 defines "a geographical indication to mean" an indication which identifies a product as originating in the territory of a country, or a region or locality in that territory, where a given quality, reputation or characteristic of the good is essentially attributable to its geographical origin".

2.9(a) The Geographical Indications of Goods (Registration and Protection) Act 1999

India has many products both natural and man made which have been produced for many years and these products are known for their special geographical locations eg. Darjeeling tea, Basmati rice, Alphonso mango, Chanderi Sarees, Kanchipuram Silks etc. It was also a requirement under TRIPs that member countries should have their own legislation for protecting geographical indications. The Parliament enacted the Act entitled "The Geographic Indications of Goods (Registration and Protection) Act 1999". This received the assent of the President of India on the 30th December 1999.

Def: *Geographical indications, in relation to goods, means an indication which identifies such goods as agricultural goods, natural goods or manufactured goods as originating, or manufactured in the territory of a country, or a region or locality in that territory, where a given quality, reputation or other characteristics of such goods is essentially attributable to its geographical origin and in case where such goods are manufactured goods one of the activities of either the production or of processing or preparation of the goods concerned takes place in such territory, region or locality, as the case may be.*

Duration of Registration of a GI shall be for a period of 10 years but may be renewed from time to time. At the TRIPs committee meeting, India called for negotiations on GI, and for the expense on the higher level of protection (currently given only to wines and spirits) to be extended to other products. GI Act passed notified on Dec. 30, 1999. Single product Darjeeling Tea has been registered. Govt. is moving to register 'Basmati' as GI specific to only varieties (traditional or improved) grown in sub-continent.

3. Bio-piracy

Although India ratified the CBD in 1994, successive governments have been dragging their feet on formulating the necessary follow-up legislation. India's biological wealth is unparalleled in the world and every one agrees that there is a dive need for a law that will protect biodiversity and guarantee sovereign rights over the patterns of its utilization. More important, the low will enable the Government to fight cases of international bio-piracy and theft of knowledge such as has happened to the patenting of basmati, turmeric and neem.

3.1 Basmati patent

In late 1997, an American company Rice Tech Inc., was granted a patent by US Patent Office to call the aromatic rice grown outside Indian 'Basmati'.

US 5663484 *"Basmati rice lines and grains"* September 2, 1997. Royal Rice Tech Inc.

In abstract, 'the invention relates to novel rice lines and to plants and grains of these lines'.

Patent seeks to provide a rice plant that provides rice grain with aromatic properties and grain dimensions similar to those of basmati but is suitable for cultivation over a wide geographic area, e.g. in the western hemisphere. It also seeks to provide a grain which has certain desirable characteristics such as reduction in chalkiness.

Claim 1-14-direct to certain rice plants and corresponding seeds, progeny and grain there from, while 15-17, are directed to rice grains having certain defined properties.

Claims 18-20 and directed to methods of selecting rice plant for breeding. It claims for semi-dwarf varieties and photo insensitive and high yielding.

3.1(a) Historical background

Basmati rice means the "queen of fragrance or the perfumed one". This type of rice has been grown in the foothills of the Himalayas for thousands of years. Its perfumed, nut-like flavor and aroma can be attributed to the fact that the grain is aged to decrease its moisture content. Basmati, a long-grained rice with a fine texture is the costliest rice in the world and been favored by emperors and praised by poets for hundreds of years.

3.1(b) Chronological developments in Basmati patent

December, 1995 - Rice Tec filed an application for grant of PBR under the UPOV on Basmati rice

September 2, 1997 - Rice Tec was granted patent US5663484 entitled "Basmati rice lines and grains"

March 5, 1998 - RFSTE, an NGO, petitioned the Supreme court of India to direct the Indian Government to challenge the patent given to Rice Tec for basmati rice in an UD court or move the Dispute Settlement Body of the WTO

June, 1998 - Rice Tec registering new trade marks, Texmati and Kasmati, in the UK

June, 1998 - Establissements Haudecoeur La Courneure, a French Foods company, seeks to register two new trade marks - Riz Long Basmati and Riz Long Basmati Riz Du Monde (Frenchmati)

July 21, 1998 - ICRISAT gives proof of basmati's Indian origin

- Word basmati has its origin in Sanskrit words *Vaas* (fragrance) and *Matup* (possessing)

- In works of Susruta, great Indian pioneer in medicine and surgery

2,500 years ago mentioned a white scented rice with long grains

(Sugandhika)

Aug 10, 1998	- Robin D Andrews, CEO of Rice Tec said that Basmati is a generic term and that the type of rice is not confined to a specific region.
Aug 11, 1998	- Agricultural scientists went against the contention of the Rice Tec saying that Basmati is not a generic name as it is Indian and its geographical distribution is confined to NW India with "typical quality characteristics".
Oct 13, 1998	- The rice industry of Europe protested against US company Rice Tec Inc. being allowed to use its trademark "Texmati" in Europe as it confuses consumers of basmati.
	- The North European Rice Millers Association (NERMA) supports India's stand that basmati is a geographic appellation and it cannot be used by companies in other countries in any Trademark without infringing Indian Rights
	- India protested to the French authorities against giving a French company right to use 'Basmati' in its trade marks
April 22, 2000	- Non-Governmental Organizations (NGOs) (Centre for Food Safety, International NGO Research Foundation for Science, Technology and Ecology, Indian NGO - Dr Vandana Shiva) filed legal petition in the US, seeking trade protection for Basmati rice of the Indian sub-continent
June 26, 2000	- Indian Government file a patent Re-examination petition in the USPTO and challenge the decision in a US court of law, through APEDA (Agricultural and Processed Food Products Export Development Authority)

Sep 25, 2000	- Indian objections field challenging 3 claims (15-17) clearly paid off. Rice Tec withdraws claims 15-17 and stated that it will also not press for claim 4.
Oct 17, 2000	- Rice tech withdraws registration of 'Kasmati' as a trademark in the UK for basmati rice
May 2001	- 11 claims - 1, 2, 3, 5, 6, 7, 10, 14, 18, 19 and 20 withdrawn. 5 out of 20 - 8, 9, 11, 12, 13 related to 3 novel rice lines (Bas 867, RT 1117, RT 1121) - specific plant varietal breeding efforts.
Aug 3, 2001	- USPTO examiner in Notice of Intent of issue re-examination certificate recommended the change in title to "Ricelines Bas 867, RT 1117 and RT 1121"

"What is now utmost important is to ensure that no rice grown anywhere in the world, except in the Asian sub-content, is described as 'Basmati' or as any of its variations such as Texmati Kasmati - which indeed are illegitimate version of the original name" (Businessline, 2001)

3.2 Turmeric Patent

On December 28, 1993, K. Das and Harihar P. Cholly of the University of Mississippi Medical centre, Mississippi, US filed a patient for *"Use of turmeric in wound healing"* at the USPTO. Initially the specification contained information on the prior knowledge of the various uses of turmeric and it also acknowledged that the the prior knowledge of the various uses of turmeric and it also acknowledged that the pharmaco-kinetics involving the safety toxicity dosages and biological properties of turmeric are well known. It also said the main object of the invention in the use of turmeric powder at the site of injury by topical application and/or oral intake. The USPTO, in 1995, granted the patent claim (US 5401504) revising its earlier ruling that had held the invention not novel.

CSIR challenged it, providing 32 references from ancient texts to show prior knowledge on the use of turmeric as a powder in October 1996. The USPTO reexamined the claim, maintained that the invention is not novel and revoked the patent within 15 months.

3.3 Bitter gourd (Karela) patent

- A patent US 5900240 was granted to Cromak Research Inc., New Jersey, on May 4, 1999.

Abstract- "Edible compositions for anti-diabetic properties". It comprised mixtures of at least two Indian herbs selected from a group consisting of Jamun, bittergourd or egg plant/brinjal and gurmar as anti-diabetes agents for their proposed use in reducing sugar.

The government is yet to take a decision on contesting patents obtained by the US firm. Their use in the treatment of diabetes is documented in the authoritative treatises such as "Wealth of India", "Compendium of Indian Medicinal Plants" and the "Treatise on Indian Medicinal Plants" and the "Treatise on Indian Medicinal Plants" (Vasudeva, 2000)

3.4 Neem patent

The patent was filed by USDA and W.R. Grace (MNC) on Dec. 12, 1990. On 14th Sept 1994, the European Patent Office granted a patent or a particular method for controlling fungi on plants which comprised contacting the fungi with a neem oil formulation.

A patent challenge was filed on June 5, 1995 by Research Foundation for Science, Technology and Ecology.

The detailed cross examination proved beyond doubt to the opposition Division Bench chaired by D. Tzschoppe that the patent was based on pirated knowledge an on May 10, 2000, the patent was 'revoked'.

Conclusion

➲ Indian action

We need protection not only for the IPRs but also against the depredation of MNCs trying to make a killing out of our own age-old knowledge. As protection for intellectual property is not in the WTO's area, "its IP leg should be sawn off", argue Ramanujam and Sangeetha, 2001.

India and other developing countries have emphasised in various communication to the WTO that the rights of holders of traditional knowledge to share benefits arising out of innovation on the basis of their knowledge and the biological resources nurtured by them, should be recognized.

They have also recommended that applications for patents should mandatory disclose the source of origin of the biological resource and knowledge pertaining to it, so as to facilitate benefit sharing with the originators of the knowledge and resource.

➲ Recommendations relating to International Regime

- In the interest of biodiversity and to avoid conflict with IPRs, countries should recognize and affirm in law the priority of the CBD over the WTO/TRIPs in the areas of biological resources and traditional knowledge systems. For this purpose, Articles 16.5 and 22 of the CBD must be clarified.

- Governments should be provided the option to excluse all life forms and related knowledge from IPR systems, and for this purpose Article 27.3(b) of the TRIPs requires a fresh look for possible amendments.

- The collective rights of indigenous and local communities to freely use, exchange and develop biodiversity should be recognized as a *priori* rights and be placed over and above private IPRs.

- TRIPs should require mandatory specification that norms of disclosure pertaining to an IPR application should reveal the country of origin and the community which provided the knowledge about the resources pertaining to the patentable subject matter, as well as the proof of consent of such country.

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ABSTRACT

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The subject of Intellectual Property Rights (IPRs) and their protection has become a central issue in economic, scientific and technological development, protection of traditional knowledge and scientific and economic co-operation between industrialized and developing countries with the emergence of strong global and national intellectual property regimes. Intellectual Property Rights, as the term suggests, are meant to the rights to ideas and informations, which are used in new inventions and processes.

Some effective forms of IPRs are copy rights, trade marks, industrial designs,lay out designs of integrated circuits, patents and geographical indications. Under World Trade Organisation (WTO), The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) provides protection to plant varieties either through patents or an effective *sui generis* system or a combination thereoff. The main objectives of Convention on Biological Diversity (CBD) of United Nations Conference of Environmental Development (UNCED) are conservation and sustainable use of Biodiversity and sharing of benefits from its utilisation.

The world-wide expansion of IPR regimes has serious implications on social, ecological and economic sustainability of biological diversity and agriculture, particularly with the farmers rights. India being a signatory of WTO and CBD had enacted legislations like The Patent Amendment Act (1999), Geographical Indications of Goods Act (1999), Biological Diversity Bill (2000) for protection IPRs in the country. Plant Variety Protection and Farmers Rights Bill (1999), provide protection to new plant varieties, Breeders Rights and Farmers Rights. The inception of TRIPs aid MNCs in collecting germplasms from Third World Countries and get them modified and patented to obtain massive monopoly profits. The glaring example is Basmati rice patent obtained by Rice Tec, a Texas based seed company which modified the Basmati germplasms and claimed patents on these lines. The patenting of Neem products and their properties by USDA and W.R.Grace, a US company is under big controversy. However, Turmeric patent for healing wounds got set-aside after a big tussle with US medical school by India .

For sustainable development, a proper balance has to be struck between IPRs and CBD which satisfies the goals of the CBD in priority basis.

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TECHNOLOGY ASSESSMENT AND VALIDATION THROUGH FARMER PARTICIPATORY RESEARCH

By

SWAPNA.T.R.

(2000-11-09)

M.Sc.(Ag) Extension

SEMINAR REPORT

(PRESENTED ON 18-08-2001 FOR THE PARTIAL REQUIREMENT OF THE COURSE

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DEPARTMENT OF AGRICULTURAL EXTENSION

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KERALA AGRICULTURAL UNIVERSITY

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THRISSUR

DECLARATION

I, Swapna.T.R. (2000-11-09) hereby declare that this seminar entitled" Technology Assessment And Validation Through Farmer Participatory Research" has been prepared by me independently after going through the various references cited here. I have not copied from any of my fellow students or their seminar reports.

Swapna 5/11

Vellanikkara

5/ 11 /2001

SWAPNA.T.R.

(2000-11-09)

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"Go to the people
Live among them
Learn from others
Serve them
Love them
Plan with them
Start with what they know
Build on what they have"

1. INTRODUCTION

Quiet recently agricultural research and extension have been under tremendous criticism and pressure. Hence debates on sustainable agriculture have generated wide spread acceptance of the importance of close collaboration of farmers, researchers and extensionists (Biggs, 1989; Scoones and Thompson 1994;Chambers et al., 1989;Van veldhuizen et al., 1997). From late 1970's this basic principle has given rise to many participatory approaches in agricultural development.

Participatory approaches aim at integrating the farmers' ideas and opinions in technology generation and transfer. Participation through the inclusion of farmers can be a more effective way to achieve the goal of the extension programme, which has been formulated by politicians and extension officers (Van den Ban and Hawkins, 1996). In our rural democratic set up participation gives the ordinary villager a means of voicing his opinions and showing by his efforts that he is able to take responsibilities in planning, organizing, implementing and evaluating the development.

In India Farmer Participatory Research (FPR) in it's narrow sense can be traced back to the experiments on cultivators' field. However systematic work began in involving the farmers only in the mid 1980's with donor supported farming system-research-extension Projects in a network of SAU in eastern India (John, 1991).

Indian Council of Agricultural Research (ICAR, 1995) and NATP cell have commented that the farmers adopt only 25-30 per cent of the generated technologies.

There are four major players in the "technology generation and adoption game: researchers, extensionists, farmers and policy makers. Quite often they blame each other for the plight of agricultural sector in the country. There is no use in just blaming each other, as the ultimate sufferers are the poor farmers of the nation.

To have a better understanding of the research and development evolution, the three models viz. Transfer of Technology (TOT), Farming System Development and Participatory Research.

2. Transfer of technology (TOT)

Transfer of technology (TOT) calls for the delivery of research results from scientists to extensionists who in turn would transfer the information to the farmer. The dominant mode of agricultural development might be characterized as 'top-down', research station based with a commodity or disciplinary focus, predicted on scientists, ability to identify relevant problems and generate widely-usable technologies; the ability of extension staff to transfer the results of research (technology) to farmers. (Chambers and Jiggin, 1986). This "TOT" mode has been powerful in production environments which are relatively homogenous (in agronomic as well as socio-economic terms) in which conditions in most farmers field are comparable to those on research stations, and in which farmers have access to resources which allow them to aspire to the management levels found in research stations.

3. FARMING SYSTEM DEVELOPOMENT

This system approach makes an effort to close the gap between the research system agenda and the resource poor farmers' needs. But, has also been unidirectional transmission of information's. The control of the decision-making remains in the hands of the "experts".

4. PARTICIPATORY APPROACH

Farmers' indigenous knowledge, their experience in doing research and their capacity to share information are crucial assets. These include a close interaction among researchers, field workers and farming population.

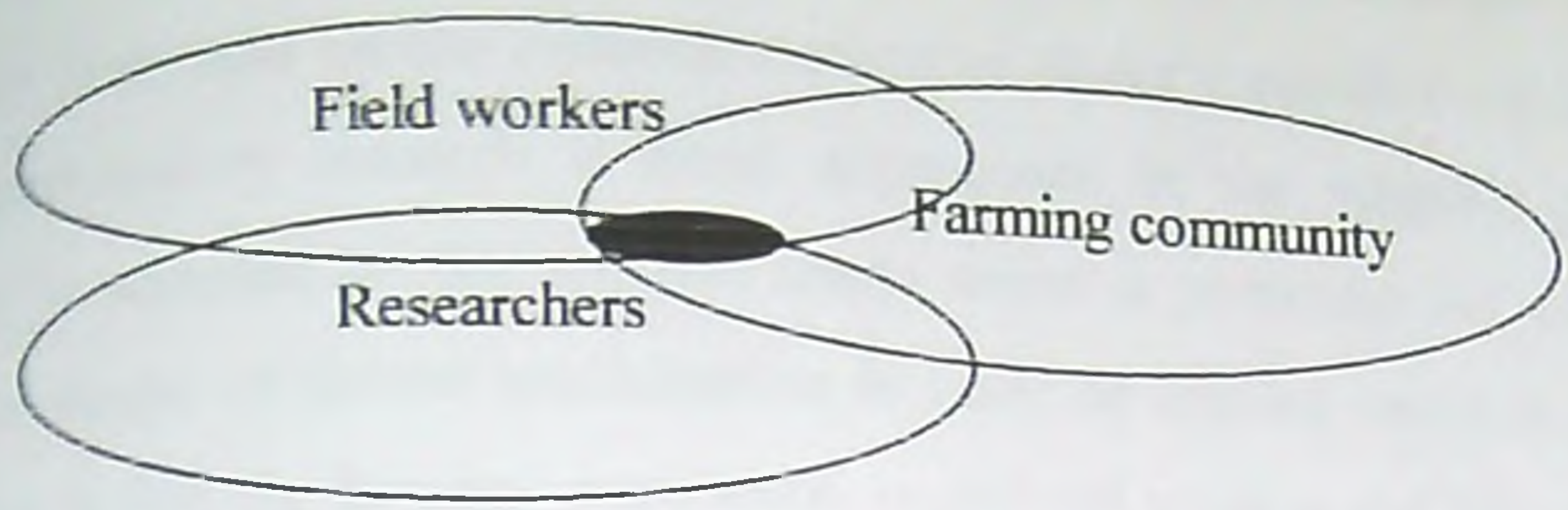


Fig : 1 Research and Extension Linkage

The Johl committee of ICAR in its report emphasized the need for developing appropriate research programmes through farmer participation in order to account for complexities of required knowledge involved and the ecology as well as the social environment in which the farmers work (ICAR, 1995).

5. TYPES OF RESEARCH

5.1 Basic Research

5.2 Applied Research

5.3 Adaptive Research

5.3.1 Characteristics of Adaptive Research

- To tailor appropriate user driven and area driven technologies.
- To identify farmers' problems and matching technologies.
- To assess technology under farmers' conditions.
- Essentially a problem solving research
- Flexibility in concept and methodologies.

Denning (1992), opined that the process of agricultural technology generation, adaptation and adoption covers the entire spectrum of interacting activities that result in technical change in agriculture.

The role of farmer participation is more in adaptive research, less in applied research and very limited in basic research. In agreement with this most of the scientists and research managers hold the view that basic, strategic and applied research are best done on the research stations or under controlled conditions, while on-farm participatory research is more appropriate in the adaptive phase, when technology is adjusted to the specific needs under a particular set of conditions. Though the scope of farmer participation in basic or applied research is seemingly less, the fact is that the farmers' experience, traditional wisdom and knowledge on the local farm characteristics and problems can provide definite directions for basic research (Sikana, 1994). The attempts to define specific problem areas or type of technologies, which are more or les appropriate for Farmer Participatory Research (FPR) have been inconclusive (Martin and Sherrington, 1996).

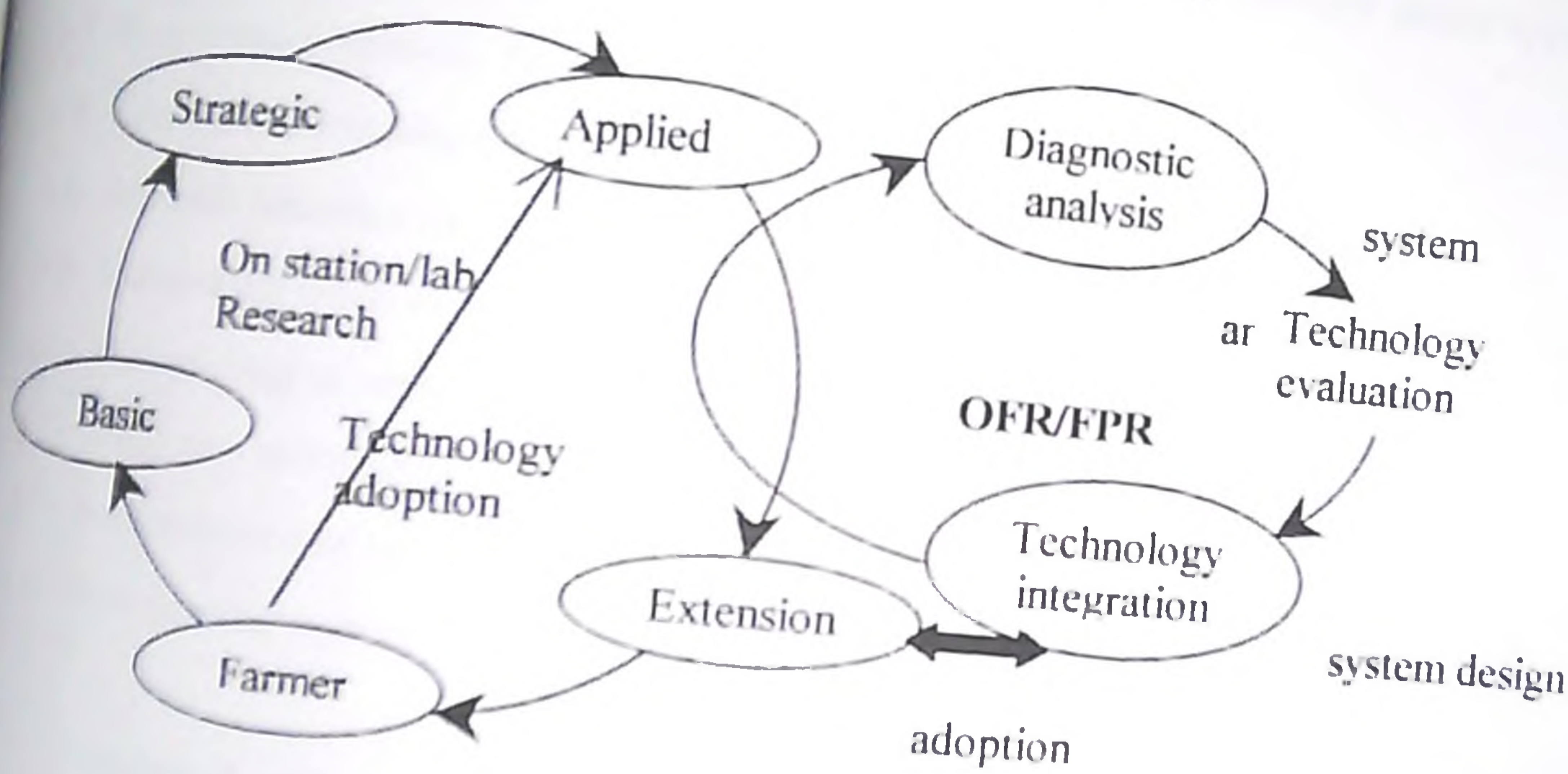


Fig:2 A Research continuum from technology generation to adoption.

RESEARCH AND ADOPTION PROCESS

Basic/fundamental research	Strategic/mission oriented r esearch	Applied research	Adaptive	Extension
Scientific research	Technology generation		Technology inte- gration OFR	Technology diffusion
Up stream research	Mid stream research		Down stream research	

6. Limitations of conventional research

6.1 Traditional agricultural research system is passive.

i.e., Research is carried out according to the priorities, needs of the researchers etc.

6.2 Felt needs of target farmers are often not considered.

6.3 Farmers comment, "We know better than the scientists."

6.4 Integration of researcher, farmer and extension system ate very poor.

6.5 Inadequate focus on local problems.

6.6 Excessive emphasis on uniformity of experts and resulting in straight jacket approach in research (ICAR, 1988).

6.7 Poor contact between farmer and scientists.

6.8 Researchers consider themselves as scientists, not technology developers.

6.9 Research becomes more scientific oriented than solution to farmers' problem.

6.10 Farmers are often viewed as mere technology users.

6.11 Mismatching of research environment and farmers' environment.

6.12 Many new technologies are resource oriented.

6.13 Predominance of unidisciplinary and reductionists research approach.

6.14 Poor farming system perspective in research.

Hildebrand and Poey (1985) said, "The conventional research system gives an estimate of what would happen if farmers were to control variables as the researcher does. It does not however, furnish an estimate of results, if farmers were actually to use the new technology."

7. Knowledge-Practice Gap in the adoption of technology

Quite often, there exists a wide gap between quantum of technology generated and being adopted by the stakeholder.

The commonly alleged causes for the observed gap are:

7.1 Inadequate/ineffective extension.

7.2 Inadequate input supplies.

7.3 Inadequate credit supply.

7.4 Inadequate market infrastructure.

7.5 Farmers, lethargy/indifferences and;

7.6 Intrinsic and extrinsic characters of technology.

7.6 Intrinsic and extrinsic characters of technology.

"Intrinsic" refers to the content of the innovation or technology and "Extrinsic" denotes the "context" in which the technology is to be used. An extrinsic characteristic of technology includes its relative advantage, compatibility, complexity, sophistication, triability and predictability. Hence attributes of technology are directly related to the rate of adoption.

8. Research and Extension:

8.1 Some dominant beliefs and modes from a period of 1950 to 2000.

Long back, itself farmers were not adopting many of the technologies developed by scientists. From a period from 1950 to 1960, the explanation given for non-adoption was farmers' ignorance. Prescription given is extension education. From 1970 to 1980, farm level constraints were given as the reason for non-adoption and hence prescription given was removal of constraints by supplying them with loan inputs etc.

From 1990's onwards Inappropriate technology is found as the reason for the non adoption and there by initiated the third generation of extension method i.e., farmer participation.

9. ON-FARM RESEARCH

Agricultural research is outlined as on farm station and on-farm based on the site of execution (Garrity,1992). Farmers with no scientific training are always doing informal adaptive research and to ignore and note use this valuable source of knowledge is a serious flaw in any formal research programme as asserted by Heinemann and Biggs (1985).

OFR provides the context for collaboration between farmers and researchers. The aim of the scientists in on farm trial is to "validate their own perspectives or actions" and is often described as: extractive and disempowering" (Chambers, 1992).

Plunckneet *et al.*, 1987, pointed out in a recent review on Farming Systems concept that a major misconception today is that Farming Systems Research (FSR) is synonymous with on farm research (OFR). The fundamental goal of OFR is to evaluate and refine or develop client oriented need based research under bio physical and socio economic conditions of resource poor farmers.

Denning's model (1988), the process of Agricultural Technology generation, Adaptation and Adoption covers the entire spectrum of interacting activities that result in technical change con agriculture. Recognition of farmers' inventiveness is an important point of departure of research. Information feedback from the farmers' activities to the various phases of formal research is also very important.

9.1 TYPES OF ON-FARM EXPERIMENT

Based on the sequence of experimentation which takes the researcher from uncertainty about factor responses under local conditions to full confidence that a new practice is superior substitute for farmers' current practice, the on farm experiments can be classified as (i) Exploratory trials (ii) Determinative trials (iii) Verification trials.

9.1.1 Exploratory Trials

This experiment is usually a continuation of diagnosis to measure the importance of problems or to identify the response to factors featuring in possible solutions in the local environment. Example: The effectiveness of a weedicide.

It is mainly conducted on small plots, replicated over locations. Even though the researcher and farmer jointly manage it is a farmer-managed experiment. Several designs like surveys, fields, field observation, secondary data etc., are used.

9.1.2 Determinative trials.

Determinative trials adapt known technical relationships to local conditions are used to identify appropriate levels of a factor and make choices between alternative types of input.

9.1.3 Verification experiments.

Verification experiments reflect a high level of confidence on the part of the researcher that of new technology is technically feasible and effective local and are often straight comparison of new technology and current farmer practice. It is done on large plots, fully a farmer managed practice, but jointly implemented by the researchers, extension workers and farmers. Replications are made over various locations.

Verification experiments are classified into two:

9.1.3.1 On-farm trials

9.1.3.2 Verification trials

On-farm trials are conducted on small plots. Number of treatments is more than two.

Verification trials are conducted on large plots with only two treatments because risk is minimum. Here already established practices are compared.

9.2 COMPONENTS OF ON-FARM RESEARCH

9.2.1 Operational Research Project (ORP)

9.2.2 Participatory Technology Development (PTD)

9.2.3 Technology Assessment and Refinement (TAR)

9.2.4 Farmer Participatory Research (FPR)

9.2.1 Operational Research Project (ORP)

ORP is the application of specific methods, tools and techniques to operations of system for optimum solution to the problem.

9.2.2 Participatory Technology Development (PTD)

In 1988, a review of more than two hundred cases of experiences with participatory agricultural development led to the formulation of a framework for action that came to be known as Participatory Technology Development (Van Veldhuizen et al., 1997)

PTD refers to the approaches that aim at strengthening local capacities to experiment and innovate. PTD is the process of combining the indigenous knowledge and research capabilities of the local farming communities with that of research and development institutions in an attractive way in order to identify generate, test and apply new techniques and practices and to strengthen the existing experimental technology management capacities of the farmers (Rao, 1996).

9.2.3 Technology Assessment and Refinement (TAR)

Any set of operations is regarded as valid technology only after it is systematically tested for its effectiveness and consistency. It has to be scientifically tested, evaluated and refined, under prescribed conditions, before it is declared as a proven technology suitable to designated regions. By the time a technology emerges from the research system, it is systematically and adequately assessed, modified and validated (Dwarakinath and Samanta, 2000). The site-specific assessment and refinement could be made by Farmer Participatory Research and such technologies would be accepted by the farmers (Johnkutty et al., 2000).

9.2.4 Farmer Participatory Research (FPR)

The development workers and policy makers pursued different development models from time to time. Participatory approach model emphasized that communities are expected to set their own priorities and standards which may be unique to their problem situations. This approach focuses on human and economic concern (Singh, 1999).

For hundreds of years farmers have done their own research and thereby integrating technology from different sources and continuing to adapt on their farms, they still do today (Roling, 1989). FPR provides greater scope for better communication and partnership between the technocrats and the farmers (Johnkutty et al., 2001).

FPR approaches have been found to improve cost effectiveness of responsiveness. They draw antecedence from social sciences and farm management economics." They are motivated by a concern that conventional qualitative and neutral research methods tend to preserve social inequality"(Farrington and Martin,1988).

A large number of proponents of FPR strongly believe that alternative or improved technologies can be developed only by involving farmers in the whole process of agricultural technology development and dissemination. This requires major changes in attitudes, approaches and role of researchers and extensionists (Chambers and Ghidayal,1985; Chamber Pacey and Thrupp,1989) and invite farmers to set the research or extension agenda. Development of this approach has focused strongly on participation of farmers and inclusion of indigenous knowledge and farmer experimentation in the research process.

10. FARMERS AS RESEARCHERS.

Amanor (1990) has reported that

i) Farmers continuously conduct their own trials partially adopt technologies to their specific circumstances and spread innovations through their networks.

ii) There are significant differences between farmers' and research stations experiments and their criteria for assessment.

iii) Farmer experimentation is more able to accommodate changing circumstances and diversity than those of research scientists.

iv) Farmer's own analysis of farming systems offers important insights, different from that of scientists.

Participatory research is a three-dimensional field research involving technology improvement where potential farmers' innovativeness is recognized, refined and adapted to local conditions (Johnkutty et al. 2001).

FPR was developed to involve farmers more closely in on-farm research. Recognition of farmers' indigenous technical know-how (ITK) led to focus on the farmer as an innovator and experimenter leading to interest in collaborative and collegiate relations between farmers and researchers (Venkattakumar and Sripal, 1999)

In most of the small farm production systems, informal trials and experimentation by farmers themselves are common features of their traditional practices to identify acceptable, location-specific management techniques from blanket recommendation (Biggs,1980; Biggs and Clay,1981,Chambers,1983).

The concept of farmer participation into the diagnostic and prioritization phases of on-farm research It is a meaningful and practical approach (Norman, 1980).

11. THE CORE SEQUENCE

On the basis of present information there would appear to be a core sequence of activities, which are helpful in starting FPR. These are

- Community based dialogue
- Community based analysis
- Community based inventory
- Community based assessment

In the FPR perspective, farmer based research and development aims deliberately at the micro situation and at specificity (Bunch,1982).

12. FARMER PARTICIPATORY RESEARCH

CONCEPT

"Research must begin and end with the farmer"(Rhoades and Booth, 1982)

DEFINITION

It is an approach of adaptive research conducted on farmers field under their management in view and with their active participation, through verification experiment.

TARGET

Small production systems, complex, diverse and risk prone (CDR) agriculture and socio economically disadvantaged farmers.

CDR agriculture is characterized by farm holdings comprising of sloping lands with a variety of a conditions of soils, slope, shape and water supply with energy and nutrient linkage with common property resources etc.

12.1 THE STREAMS OF FPR

That portion of research spectrum within the scope of on farm experimentation may be considered as composed of four major streams of activity (Waters-Bayer, 1989). These are

i) Researcher implemented: Use standard experimental lay out and are designed, managed and implemented by the researcher on farmers field. Example: On-farm fertilizer/variety trials.

ii) Farmer implemented: Experiments are designed and managed by the researcher but implemented by the farmer. The information and ideas of the co-operating farmers can be incorporated in treatment design and management practices. Example: Cropping Pattern trial with a uniform set of management practices.

According to Rhoades (1989), while developing a technology one needs to consider not only the farmer but also the entire "users" of the technology.

iii) Framer participatory experiments place the farmer in control at all stages of the process. The researcher plays an advisory role but does not control or standardise the test factors or management decisions.

iv) Farmers' indigenous or informal experiments are trial conducted independently with out the collaboration of any kind with researchers or experiments. The idea for the trial may arise from other farmer or by his informal contact with research or extension.

It is argued that first two types of experiments belong to the category of 'TOT' mode and later two belonged to the Farmer First model (Chambers et al., 1989). The relevant paradigm is a blend of experimentation among the several streams to optimise the rate of problem solving (Denning, 1992).

		WHO IMPLEMENTS	
		Researcher	Farmer
WHO DESIGNS	Researcher	RDRI	RDFI
	Farmer	FDRI	FDRI
Farmer Participatory Research		***(RD + FD) FI***	

Where do the farmers stand now?

Robert Rhoades (1989) in a historical review of forty years of agricultural research and development characteristics four overlapping periods of steadily shifting emphases; these are

i) Production stage (1950-1975): In this stage, the pioneering disciplines were breeding and genetics and farmers were seen as recipients of technology.

ii) Economic stage (1975-1985): In this stage Farming Systems Research (FSR) was pioneered by economists and agronomists and farmers were seen as source of information for technology design.

iii) Ecological stage (1985-1995): In this stage anthropology agro ecology and geography are pioneers and farmers contribute their indigenous knowledge and are seen both as victims and cause of unsustainable development.

iv) Institutional stage (1995 onwards): Here the pioneering disciplines will be management specialists, psychologists, organizational sociologists, political scientists, training specialists and educators in which farmers will be full collaborators in research and extension and in which alliances will be developed between different institutions.

12.2 CHARACTERISTICS OF FARMER PARTICIPATORY RESEARCH

- Scientist- Farmer Participatory
- Understanding of complex farming systems
- Farmers' resources- biophysical, socio economic and cultural
- Farmers' decision-making
- farmers' goals
- Whole farm approach
- Farmers' indigenous knowledge
- Problem solving
- Location specific
- Feed forward-assessment-feedback

12.3 Achieving Farmer Participation

FAO's Agricultural Extension manual offers the following recommendation on how farmer participation can be achieved.

- Farmers are more willing to participate in activities, which meet their felt needs and priorities, which can be determined through a quick need assessment. The needs of all people should be taken into consideration, not just those who are accessible and cooperative.

- If farmers are encouraged to express their needs and provide some input into the structure of a project/ programme, they should not be ignored. Farmers' ideas must be taken into account to sustain their involvement.

- Farmers are more likely to participate if actual benefits are directly tied to participation.

- Farmers, especially those with low incomes, are more likely to participate and remain involved if the benefits are material, direct and immediate. One of the best ways of getting farmers' interest is through the use of convincing and realistic demonstrations and trial.

The basic hypothesis behind FPR is that the research process should start by understanding in detail the ecological and socio-economic content which governs farmers decision making and by drawing on the farmers, own indigenous knowledge to search for new solutions, instead depending primarily or exclusively on scientists' knowledge. This approach feeds back information to the larger research process, and then technology development and diffusion can be one in which a few technological packages are disseminated over a large area instead, a wide variety of "basket of choices" used to be developed for different micro environments.

12.4 Modes of Farmer Participatory Research (Biggs, 1989)

There are four generic types of farmer participation

- ***Contractual***

Scientists/ extensionists enter into contract with farmers. Farmer provides land or services. Professionals make little or no effort to seek his or her views. Professionals designed and professional implemented experiments such as experiment on cultivators field is a good example of contractual participation is not as explicit objective.

- *Consultative*

Scientists/ extensionists consult farmers about their problems and then develop the solutions. It is professional designed and professional implemented trials. Farmers' inputs are actively sought at diagnostic phase to define farming system and diagnose priority problems and subsequently in the evaluation of proposed solutions. Professional design experiments to test various solutions or to better understand identified problems.

- *Collaborative*

Scientists/ Extensionists and farmers collaborate as ~~patterns~~ artners in the research process. Professionals actively draw on farmers, knowledge and experimentation in solving problems confronting the farming community. It is professional/ farmer designed and farmer implemented experimentation. Farmer contributes actively in ideation and implementation at ever stages of technology development and dissemination.

- *Collegiate*

Scientists/ Extensionists strive to strengthen farmers' informal research and development system in rural areas. It could take two forms-encouraging farmer designed and farmer implemented experiments for prioritized problems or farmer designed and professional implemented experiments to unravel the underlying logic of the indigenous knowledge system. The emphasis is placed on enhancing the ability of farmers to carry out their experimentation systematically as well as to request information and services from the research and extension system.

3. FARMER-BACK-TO-FARMER MODEL (Rhoades and Booth, 1982)

Rural communities have a reservoir of expertise in management of complex agro-eco systems and their associated agricultural live stock and aquatic systems. (Farrington and Martin, 1988). Yet this widely available knowledge resource is rarely tapped by resources starved national agricultural research and development system. Recognizing this fact, farmer back to farmer model was developed by Rhoades and Booth (1982). This model holds that successful agricultural research and development must begin and end with the farmers. Applied agricultural research cannot happen in isolation in an experimental station out of touch with farmers' condition. In practice, this means obtaining information about, achieving an understanding of the farmers' perception of the problem and finally accepting the farmers' evaluation of the solution.

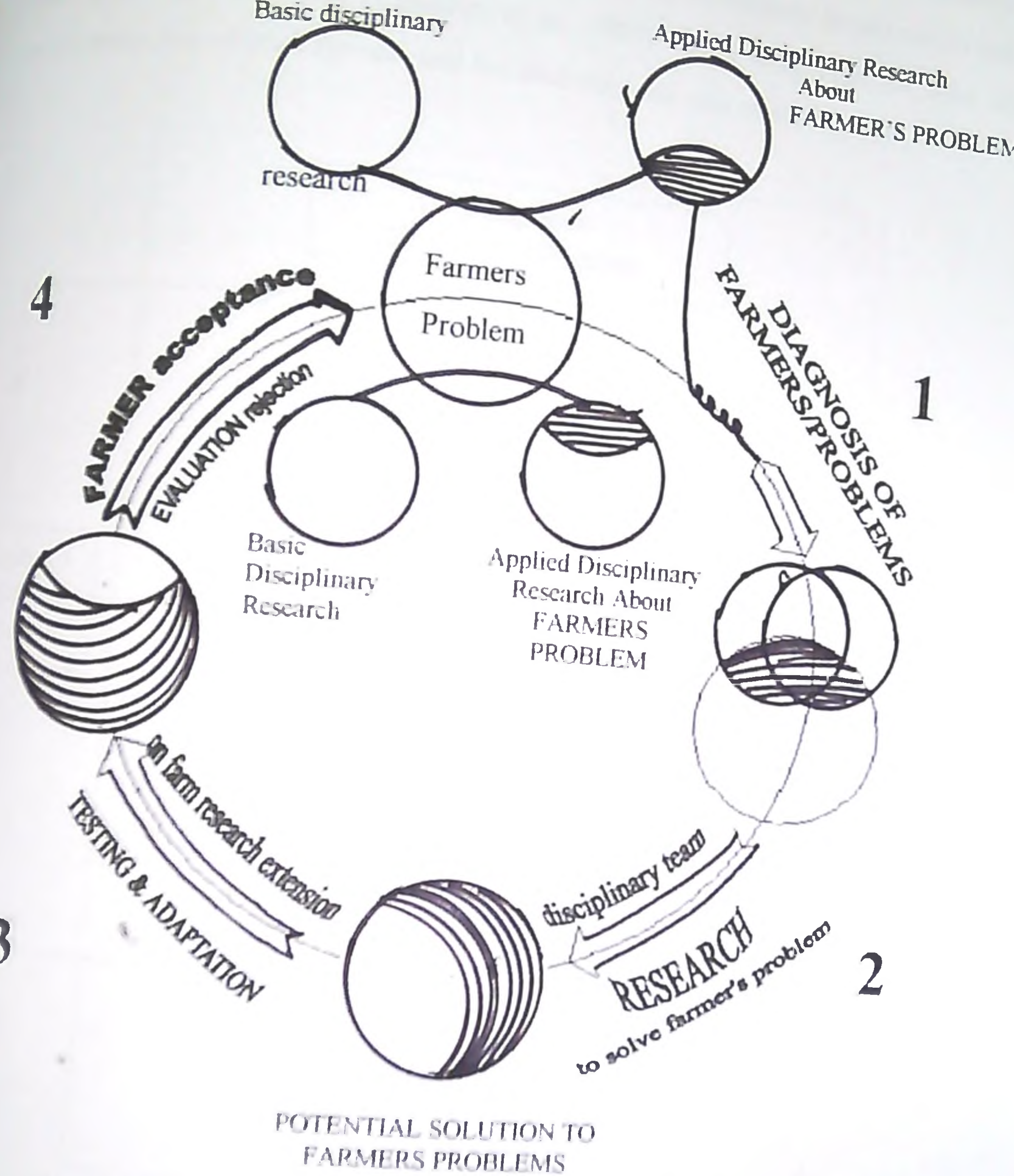
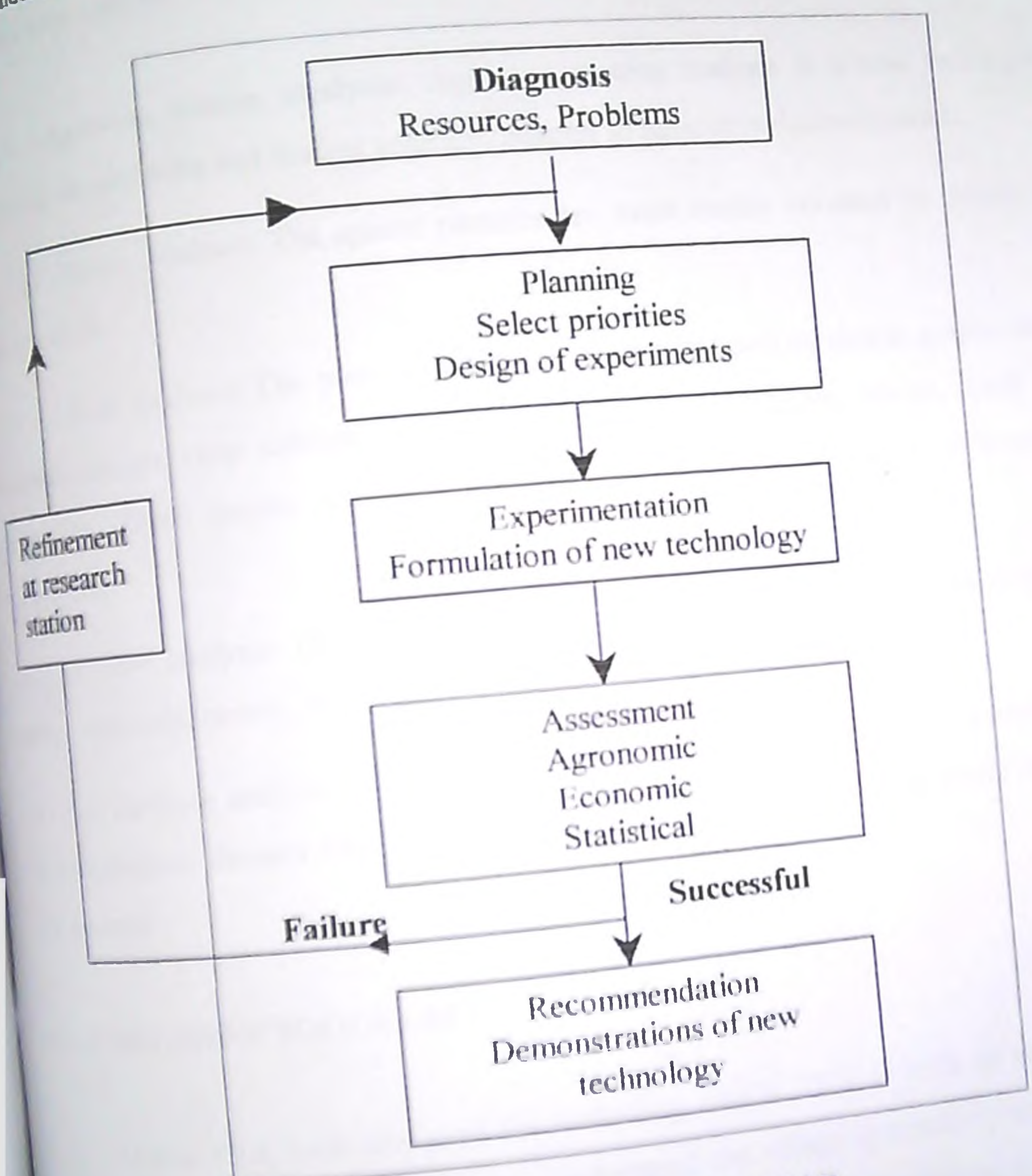


Fig:3

In this, the top circle, labeled farmers' problem represents the totality of the farmers' practices and problems related to technology area. Starting with the philosophy that the farmers' circumstance is the springboard of the research; the model then logically consists of a series of task-oriented goals aimed towards achieving acceptable technological solution to farmers' specific problems. These goals are linked in a circular form by a number of activities. It should be kept in mind that activities may overlap in time and frequent recycling of research through earlier stages may be necessary to develop an acceptable technology. The philosophy of farmer back to farmer model and its remake, farmer first model by (Chamber *et al*, 1989) which were right for their times revealed strong bias of small farmers and focused only one part of food system.



Modified Model of CIMMYT (1985)

14. OPERATIONAL STAGES OF FARMER PARTICIPATORY RESEARCH (FPR)

14.1 DIAGNOSIS

This involves collection and analysis of information, which is conducted by the multi-disciplinary team of scientists in collaboration with farmers of the selected target groups.

The methods used for initial diagnosis should be low cost with a rapid turn around time. The following steps are involved in initial diagnosis.

The agro-eco system analysis is made using the four patterns namely space analysis, time analysis, flow analysis and decision analysis.

14.1.1. **Agro-eco system analysis:** Agro-eco system analysis is a new technique of analyzing the problems and finding solutions related to agricultural development.

14.1.1.1 *Space analysis*: The spatial patterns are most readily revealed by simple maps and transects.

14.1.1.2 *Time analysis*: The pattern in time are best expressed by simple graphs to study seasonal changes, crop calendars, cropping pattern and sequences, labour, credit peaks, prices etc. These graphs can also be used to study various agro meteorological parameters.

14.1.1.3 *Flow analysis*: One can observe the pattern of flows and transformation of energy, materials, money, information etc. in a given agro-eco system.

14.1.1.4. Decision analysis: Decisions ranging from those of national agricultural policy to the individual farmers day to day choices, occur at all levels in the hierarchy of agri-eco-systems.

14.1.2 METHODS/ TOOLS USED

Mainly PRA tools are used for collecting data's. PRA is both an attitude and a methodology. It helps the outsiders to understand the village systems, dynamics, politics by using various techniques as well as by methods of direct observation and discussion (Singh,1999).

PRA describes a growing family of approaches sand methods to enable local people to share enhance and analyse their knowledge of life and conditions to plan and act.

The basic purpose of PRA in agriculture is to

i) Use farmers' criteria, choices and understand the local environment with clear local priorities

ii) To learn farmers' indigenous technologies.

iii) To achieve for triangulation, using different methods and involving various people to check and recheck the findings.

iv) To develop self-critical analysis and direct contact with local needs and communities.

Events	Tools/ Methods used	Remarks/ Improvisation
Identification of village	Participatory discussion with Panchayat at different officers, village officers and agricultural officers.	- - - - - - -
Perusal and analysis of secondary sources of data		
Understanding geographic lay outs micro-farming practices etc. and preparation of transect map.	Transect walk	Mapping with sketch pens on papers: modeling on the floor and triangulation -farmers
Historical background of the village changes and trends.	Time line	Participatory group discussion of elderly people.
Time line of crops grown	Time line	Participatory group discussion of elderly people
Preparation of village map including resource map	Mapping and modeling	Mapping with sketch pen on paper; modeling on the floor (by farmers) and triangulation.
Preparation of land use map	Mapping and modeling	Mapping with sketch pen on paper; modeling on the floor (by Farmers) and triangulation.
Rainfall pattern	Mapping	Mapping with sketch pen on paper; modeling on the floor (by farmers) and triangulation

...sonal crop calendar	Mapping	Mapping with sketch pen on paper; modeling on the floor (by farmers) and triangulation
...pping pattern	Mapping	Mapping with sketch pen on paper; modeling on the floor (by farmers) and triangulation
...ocument of ITK	Group discussion	----------
...entification of problems	Focused group interview, brainstorming.	---------
...ioritization of problems	Focused group interview, matrix ranking.	Ranking by Farmers
...oblem cause relationship.	Problem cause relationship diagram (Problem tree).	Diagram by Farmers.
...entification of intervention points, nature and details of interventions and family involvement in each intervention.	Participatory group discussion and focused group interview.	Farmers decided the nature of intervention and treatments; the core team facilitated.

14.2 Stage II Planning

The planning process brings together two information streams: the understanding of the target group farming system gained in initial diagnosis and technical information from research by specialists. It is the stage at which available technical knowledge about the identified farmers' problems is collected and listed in an organised way.

14.2.1 Problem prioritization should be explored in sequence. This is done based on certain criteria.

14.2.1.1 Extent of the problem

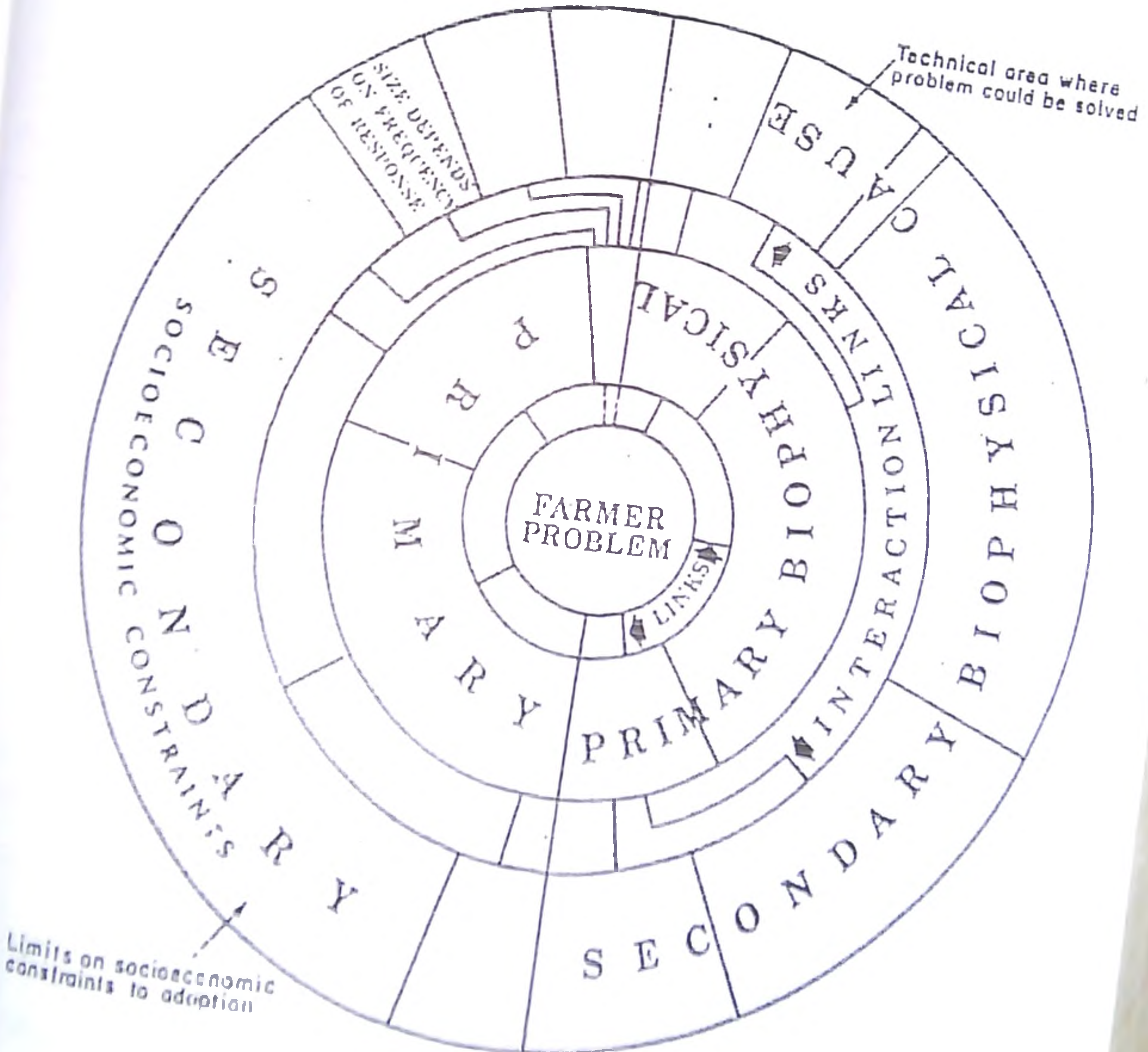
14.2.1.2 Severity

14.2.1.3 Importance

14.2.1.4 Frequency

Problem should be adequately and the researcher must be certain of the cause of problem. In the final step of the planning stage, the team brings understanding of local farmers' circumstances and their farming system to bear on each specified technical solutions, by a screening process.

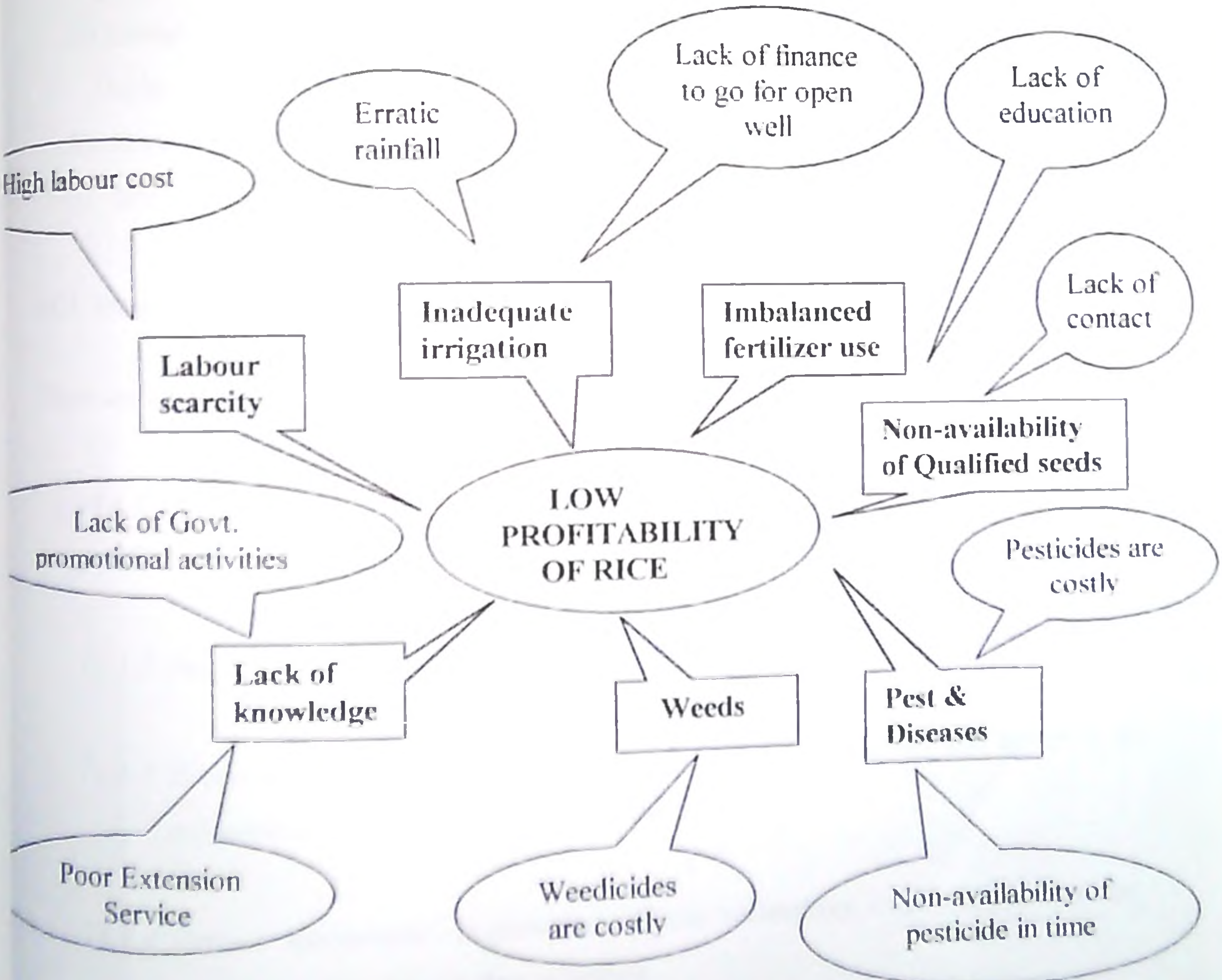
Fig: 4 PROBLEM-CAUSE DIAGRAM



For any problem there are two causes-Biophysical and Socio economic cause. These two causes are interrelated. For both biophysical and socio-economic cause, there are primary, secondary, Tertiary..........causes.

These primary, secondary, tertiary causes of each major cause are again interlinked with in each other. More aver again these primary, secondary, tertiary causes of both biophysical and socio economic causes are again interlinked between each other.

Fig:5 DIAGRAM OF PROBLEM CAUSE



14.3 Identification of intervention points

Identify the intervention points from the problem cause diagram. Intervention points are shown by a "star"(*) mark. Intervention points are those points where there is a need of further study and research, to find solution to the problem.

14.3 Stage III EXPERIMENTATION

A) Selection of site and farmer: Community help in site and farmer selection is always useful.

B) Choice of farmers' practice: Special care is required to identify appropriate farmers' practice so that the comparison with new technology [practice would be made in an objective manner.

C) The experimental sequence which takes the researcher from uncertainty about factor responses under local conditions to full confidence that a new practice is a superior substitute for farmers' current practices.

D) Design of experiments: Whether On farm trial (OFT) or Verification trial (VT) is to be conducted.

E) Management of On Farm experiments: Team members as well as the participating farmers' should be clearly aware of their roles in the programme well in advance.

14.4 Stage IV. TECHNOLOGY ASSESSMENT

There are four types of assessment that comes in technology assessment.

14.4.1 Agronomic assessment: To understand the interaction between source of variation and treatment response.

14.4.2 Statistical assessment: Treatment comparison is made with quantitative data.

14.4.3 Economic assessment: If the returns from new technology are higher it is economically viable and is suited for the farmers.

14.4.4 Farmer assessment: Superiority of one technology over another can be assessed well by farmer than scientists.

Example: Assessment of self propelled transplanter in single cropped terraced uplands during first crop season-VT and skill training.

Technical observations

Particulars	Manual transplanting	Mechanical transplanting
▶Seedlings/ hill	7.25	3.58
▶Spacing (cm)	Random	23.8 x 10
▶Seedling hill density/Sq.M	28.53	40.61
▶Age of seedling (days)	24-28	20
▶Depth of water in the field	4-6	2-4
▶Depth of planting	Deep	Optimum

AGRONOMIC PARAMETERS OF THE TRANASPLANTER

- ▶ Foot and hand reach - Medium comfortable
- ▶ Sitting posture and comfort - Medium
- ▶ Visibility of operator - Poor
- ▶ Noise and vibration - Low
- ▶ Hazards to operators - Low
- ▶ Loading mat nursery - Medium difficulty

FARMERS' REACTION

- ▶ Quality of work, time and money saving, optimum spacing - High
- ▶ Ease of handling, drudgery, scope for use, risk - Medium
- ▶ Availability, complexity, skill requirement - High

FEEDBACK

- ▶ Require training in mat nursery, operation and maintenance of machine
- ▶ Standardise mat preparation technology- manuring plant protection, mat strips.
- ▶ Transplanted for tall varieties and normal water conditions in thee field
- ▶ Custom higher facilities, subsidies and group action

The primary use of on farm results including those from the experiments is to make or move towards farmers' recommendations.

If the technology is found to be successful it is given for recommendations and if it is a failure, it is given back for refinement and then goes to the planning stage and there by continuing the cycle.

CONCLUSION

To overcome the present shortcomings such as inadequate research interaction, non-availability of appropriate technology to suit farmers' conditions and involving farmers at all stages, it would be useful to develop a systems approach to extension and research. This is nothing new to us, as various aspects of the systems approach are in operation, but the same is not being done in an organised manner in different organizations. The systems approach facilitates not only a better understanding of the existing farming situations as basis for their improvement, but also the development of technologies relevant to farmers' needs. The systems approach is essential not only to ensure highly effective linkages between extension and research but also in bringing together farmers, extensionists and researcher's under local farming conditions.

Listening to users is better because..............................

Users know much
About what works and what does not
Users ultimately decide
What to use and what to discard

Probe into the users' situation
Understand the users' perspective
To prevent users from being losers
In the technology generation / adoption game

Virginia n sandoval

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What is here called the "core sequence" is described in various forms in the following papers submitted to the ILEIA workshop: Fernandez.," Methodologies for participatory technology Transformation". Gubbels.op.cit., Jager.A.,"towards self-experimenting village Groups".Suriya Smutkupt of Khon Kaen University,Thailand described a similar sequence.

DISCUSSION

Q1. What is the difference between Farmer Participatory Research and Participatory Technology development?

PTD is the process of combining the indigenous knowledge and research capabilities of the local farming communities with that of research and development institutions in an attractive way in order to identify generate, test and apply new techniques and practices and to strengthen the existing experimental technology management capacities of the farmers.

It is an approach of adaptive research conducted on farmers field under their management in view and with their active participation, through verification experiment.

Q2. Could you suggest any example where a technology has failed?

Concurrent mixing of cowpea seeds and rice was a technology, which was recently developed by Kerala Agricultural University. But it failed because scientists didn't mention which variety or what type of cowpea farmer has to use. The main aim of this new technology was that when the rice is at the flowering stage the cowpea will be at full maturity time and then the cowpea will be self incorporated in the field and there by the nitrogen content of soil is increased and thus chemical fertilizers can be reduced. But when the farmers tried it they have to spend extra labour charge to pull out the cowpea seedlings.

Q3. What is the difference between on farm trial and on farm testing?

On farm testing is the type of test where scientists are conducting the experiment on the farmers field after finding out a new technology.

On-farm trials are conducted on small plots. Number of treatments is more than two. Here we are comparing more than two treatments of which may be new or not proven technology. Hence risk is more.

Q4. What do you mean by intrinsic characters and extrinsic characters of technology?

"Intrinsic" refers to the content of the innovation or technology and "Extrinsic" denotes the "context" in which the technology is to be used. Extrinsic characteristics of technology includes its relative advantage, compatibility, complexity, sophistication, trialability and predictability. Hence attributes of technology is directly related to the rate of adoption.

ABSTRACT

Farm research has yielded many innovative technologies, but most of them are not reaching the farmers rapidly in an **"adaptive and adoptable manner."** Moreover, agricultural research and extension have been under tremendous criticism and pressure, as many comment that only 30% of the generated technology is being adopted by the Indian farmers. Hence the relevance of **appropriate technologies**.

The specific interventions of technology assessment and refinement, in several recent projects have evoked encouraging response for **appropriate technologies** to enhance the productivity of distinct agro-eco systems. Technologies have to be location specific, need based and compatible to the socio economic and cultural milieu of specific rural communities. Farmer Participatory Research (FPR) could make the site-specific assessment and the farmers would accept refinement and such technologies.

FPR provides greater scope for better communication and partnership between the technocrats and the farmers. Farmer Participatory approach consists of a series of task-oriented steps aimed at achieving the acceptable technical solutions to the problems. It is quite often alleged that several agricultural researches are of mere academic interest, thereby sidelining social commitment.

To overcome the present shortcomings, it would be useful to develop a system approach to research and extension which would help in understanding the existing farming systems and in the development of appropriate technologies suited to farmers' needs. Since FPR assures complete farmer participation, location specificity and felt needs, the assessed and refined technologies would be acceptable to the farmers. Most of such technologies can have extrapolation domains.

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RURAL UNEMPLOYMENT: A CASE STUDY IN PALAKKAD DISTRICT

By

Pratheesh.V.S

(2000-11-01)

SEMINAR REPORT

Submitted in the partial fulfillment of the course

Econ. 651 Seminar

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE OF HORTICULTURE
KERALA AGRICULTURAL UNIVERSITY
VELLANIKKARA, THRISSUR

DECLARATION

I, Pratheesh.V.S (2000-11-01) hereby declare that this seminar report entitled **"Rural Unemployment- A Case Study in Palakkad District"** has been prepared by me independently after going through the various references cited, without copying from any of my senior students seminar reports.

Vellanikkara,

Date:25-08-01

Pratheesh.V.S

(2000-11-01)

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1. INTRODUCTION

One of the striking feature of Indian economy in recent years is the increasing rate of unemployment. Employment is considered to be a social, political, economical and ethical necessity whereas unemployment is a social evil. The process of planned economic development aims at giving employment to everyone, besides achieving other socio economic goals. A large number of unemployed persons become a potential source of danger to the political stability, as they are prone to be attracted to subversive elements in the society. Besides, there is a close relation between unemployment and poverty.

Indian scenario

Unemployment among Indians is closely related to the increasing population, modernization of agriculture and casualisation of agriculture labour. In a country like India open employment is not a true indicator of the gravity of the unemployment where it is characterized by a large amount of underemployment in rural areas, which amounts for the 90% of total unemployed (India One stop, 2001). Although India has an outstanding record of about half a century in developmental planning, the problem of unemployment grown in size and complexity. All the five year plans which were aimed to decrease the problem not only failed to achieve the objective of full employment but also the percentage of unemployment increased during successive plans. According to the Center for Monitoring Indian Economy, 1992, In India the educated unemployment is also having an increasing trend. The main reason for the educated unemployment is found to be the sharp decline in jobs. I.e. The average growth of job seekers has risen from 2.3% in 1980's to 2.5% in 1990's. While the employment in the organized sector fallen from 2.1% to 0.8%. In other words 6.72 lakh people tried to get jobs in organized sector every year but only 29,500 succeeded and so India added just under two million young people to the educated unemployed (Jha, 2001).

Kerala Scenario

Kerala has the worst record of unemployment in the country, with less than 4% of the population Kerala accounts for more than 16% of the total unemployed in the country (Thamaramangalam, 2000). If we analyze the nature and composition of unemployment we can see a perfect dominance of educated unemployment. But unlike Indian situation in Kerala the unemployment among non-educated people is also high. Another important feature is the relatively high proportion of male casual labourers (45.1% in rural and 27.4% in urban) compared to the Indian average (32.1% and 14.6%), which also increases the unemployment.

2. DEFINITIONS

Employment:

Persons engaged in any gainful activity are considered employed. Gainful activity is the activity pursued by persons for pay, profit or family gain or in other words the activity, which adds value to the national product. (National Sample Survey Organization, 1987)

A state of being engaged in productive work. A person who worked at least for one hour but less than four hours is considered to have employed for half a day. If he worked for four hours or more during a day he is considered employed for the whole day (Jain, 1983)

Unemployment:

Keynes,(1936) regarded unemployment as a situation where there was not enough work for those willing to work at the prevailing wage rate.

Persons who, owing to lack of work had not worked but either sought work thorough the employment exchanges, intermediaries, friends or relatives or by making applications to prospective employers and expressed their willingness or availability for work under the prevailing conditions of work and remuneration. (National Sample Survey Organization, 1987)

Under employment:

Ahuja, (1973) defined under employment as simply the difference between the availability and requirement of labour

It is simply the difference between availability and requirement of labour. A person is considered underemployed if he is employed during the preceding year for a period less than 300 days. (Sanker, 1985)

Disguised unemployment:

It is that amount of population in agriculture, which can be removed from it without leading to any reduction in out put. (Roserstein Rodan, 1957)

Joan Robinson (1936) coined the term and disguised unemployment and she defined it as the adoption of inferior jobs by the workers laid off from their normal jobs due to lack of effective demand during depressions

Fully Employed:

A person employed in the preceding year for 300 days or more he can be considered as fully employed. (Sanker, 1985)

Person worked for >300 days per year

Near Fully Employed:

Person worked for 271 - 300 days per year

Moderately under employed:

Person worked for 181 -270 days per year

Severely under employed:

Person worked for 91- 180 days per year

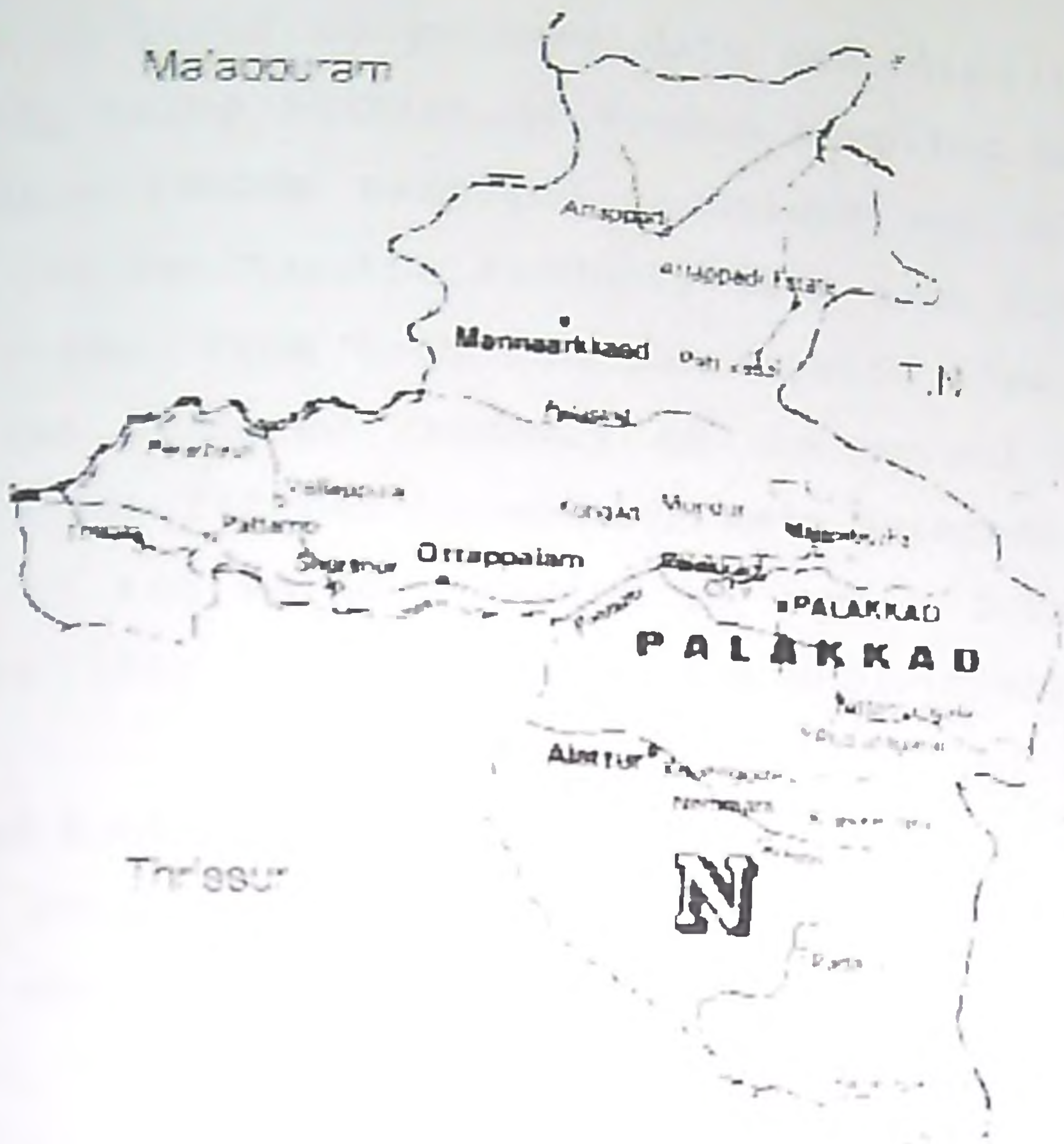
Very severely under employed:

Person worked for <90 days per year

Labour force:

National Sample Survey Organization, (1987) defined labour force as persons categorized as working (or employed) and categorized as seeking or available for work (unemployed).

3. AREA OF THE STUDY



The area under study is Palakkad district of Kerala state, which is the second largest district of the state. It comprises of 5 taluks viz. Alathur, chittur, Ottappalam, Mannarkkad and Palakkad. More than 92% of the total population of the district lives in rural areas. It constitute more than 9% of the total main workers in Kerala and more than 8% of the total job seekers in the state. Another peculiar character of the district is that, it has lowest literacy rate of about81.3% whereas the state average is about 92%

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4. METHODOLOGY:

Sample design:

Study is based on primary data generated through a sample study using multistage random sampling technique. A three-stage random sampling technique was adopted by selecting two panchayaths randomly from each five taluks as first stage. From each ten panchayaths thus selected one ward was selected randomly as the second stage. In the third stage fifteen households were selected randomly from each of ten wards selected to have a total of one hundred and fifty households from the whole district.

Measures of Socio economic Status:

1. Labour force ratio: It is defined as the tota labour force expressed as percentage of total population (sankar, 1985)
2. Labour force participation ratio: is the percentage of working labour force to the potential labour force (sankar, 1985)
3. Occupational status: It is the status pursued by each person for pay, profit or family gain or in other words, the activity which adds value to the national product. However execution of household chores and social commitments are not included in this (NSSO, 1987).
4. Main Occupation: This is the occupation in which more than 50 per cent of one's total working man-days per year is engaged.
5. Subsidiary occupation: It is the occupation in which one is engaged on a subsidiary basis for less than 50 per cent of his total working man-days per year for obtaining income.

5. RESULTS

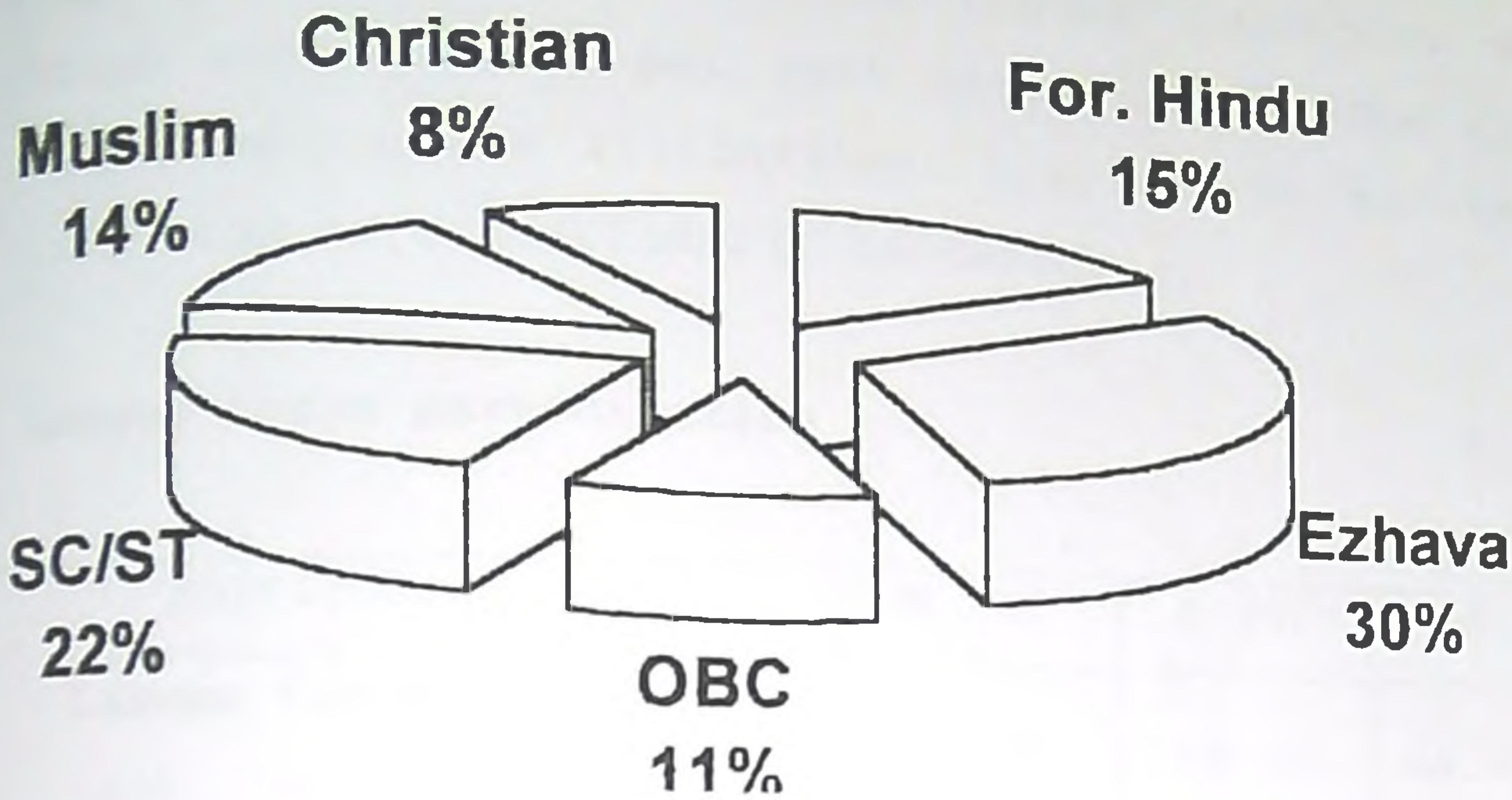
1. Distribution of working population

The workers were distributed in to 11 different categories according to the nature of main activity viz. Cultivators, Agricultural Labourers, Live stock / fishing, People engaged in Household industries Manufacturing/processing, People involved in Construction works, Trade & Commerce Transport / Storage, Mining and quarrying and Others categories of work.

Particulars	Palakkad (%)	Kerala (%)
Cultivators	13.28	13.63
Agricultural Labour	47.26	28.22
Live stock / fishing	3.33	9.95
Household industry	2.67	2.68
Manufacturing/processing	7.48	11.02
Construction	2.16	3.74
Trade & Commerce	8.69	10.91
Transport / Storage	4.29	5.16
Mining and quarrying	0.65	1.09
Others	9.99	13.60

From the above table it becomes clear that out of the total main workers 47.26% is agricultural labourers followed by cultivator to an extent of 13.28%. Corresponding figure of the state is 28.22% and 13.63% respectively. In other words we see that in the study area more than 50% of working population is constituted by agricultural labourers and cultivators.

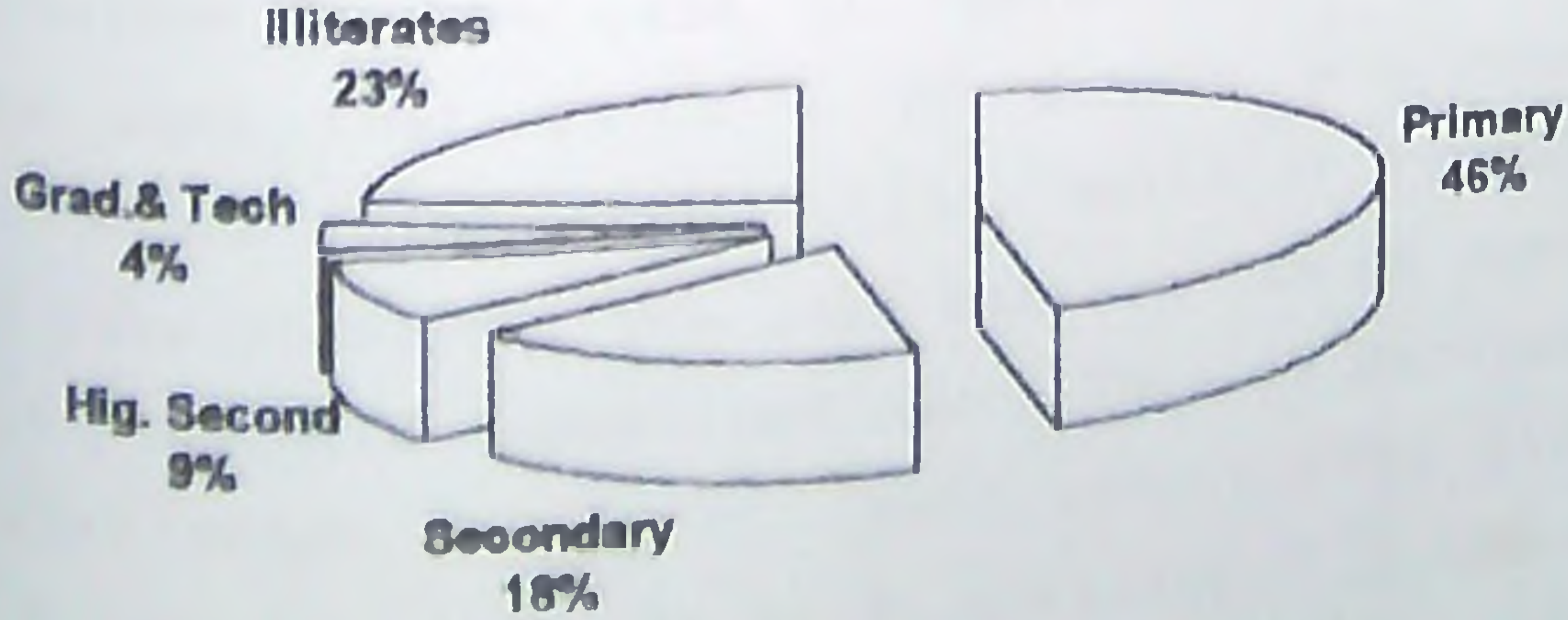
2. **Community wise distribution of sample households**



The above pie chart shows that about 30% of the total people belong to the Ezhava community and 22% belong to SC/ST. Forward Hindus constitute about 15% and Muslims about 14%. Christians are comparatively less i.e. only 8% of the total.

3. **Literacy/ educational level**

Educational Status



It can be seen that 46% of the population has only primary education and 18% has got only secondary education, while persons having higher education and graduation are 9 and 4 per cent respectively. The rest 23% of the people are illiterates. i.e. we can see that the study area is educationally backward.

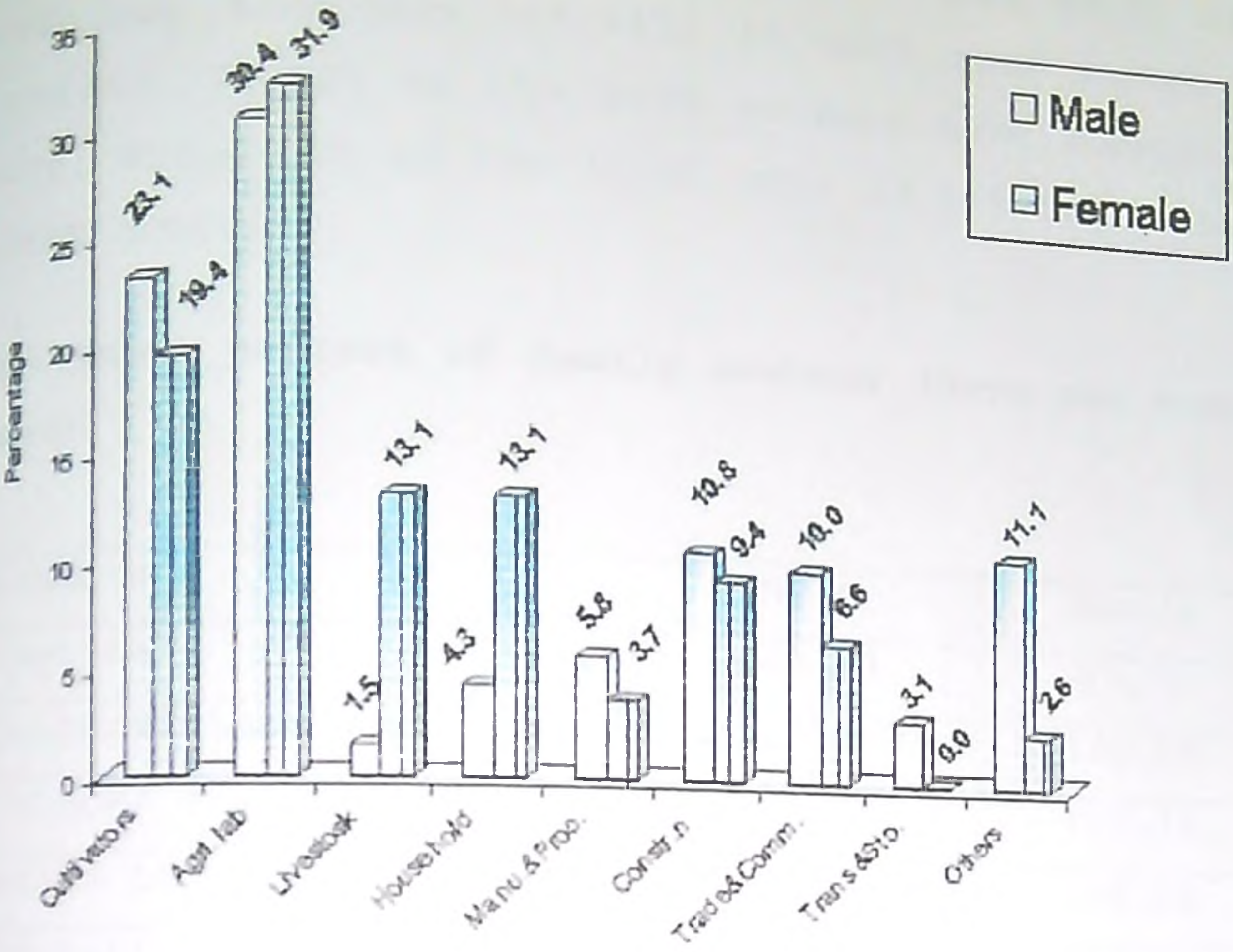
4. Labour force participation

Particulars	M (%)	F (%)	Avg
Labour force ratio (pot. lab/tot.pop)	70.68	58.95	64.67
Labour force participation (Wor.lab/pot.lab)	92.20	77.33	85.26

Out of the total 64.67% form the potential labour force. This includes people within the age limit of 15-60 years except students, disabled etc. It can be seen that 85.26% of total labour force has some kind of work. While 92.2% of male population is working only 77.33% of females are working

5. Distribution of working population

It can be see that the percent of cultivators are more in the case of male than females. But in case is just reverse in the case of agricultural labourers. It can be seen that 13.09 % of female are engaged in livestock and related activities, while it is only 1.54% in the case of males. The same pattern can be seen in the case of household industries also. This is because of the fact that woman can spent their excess time along with their household work in this activity. In the case of

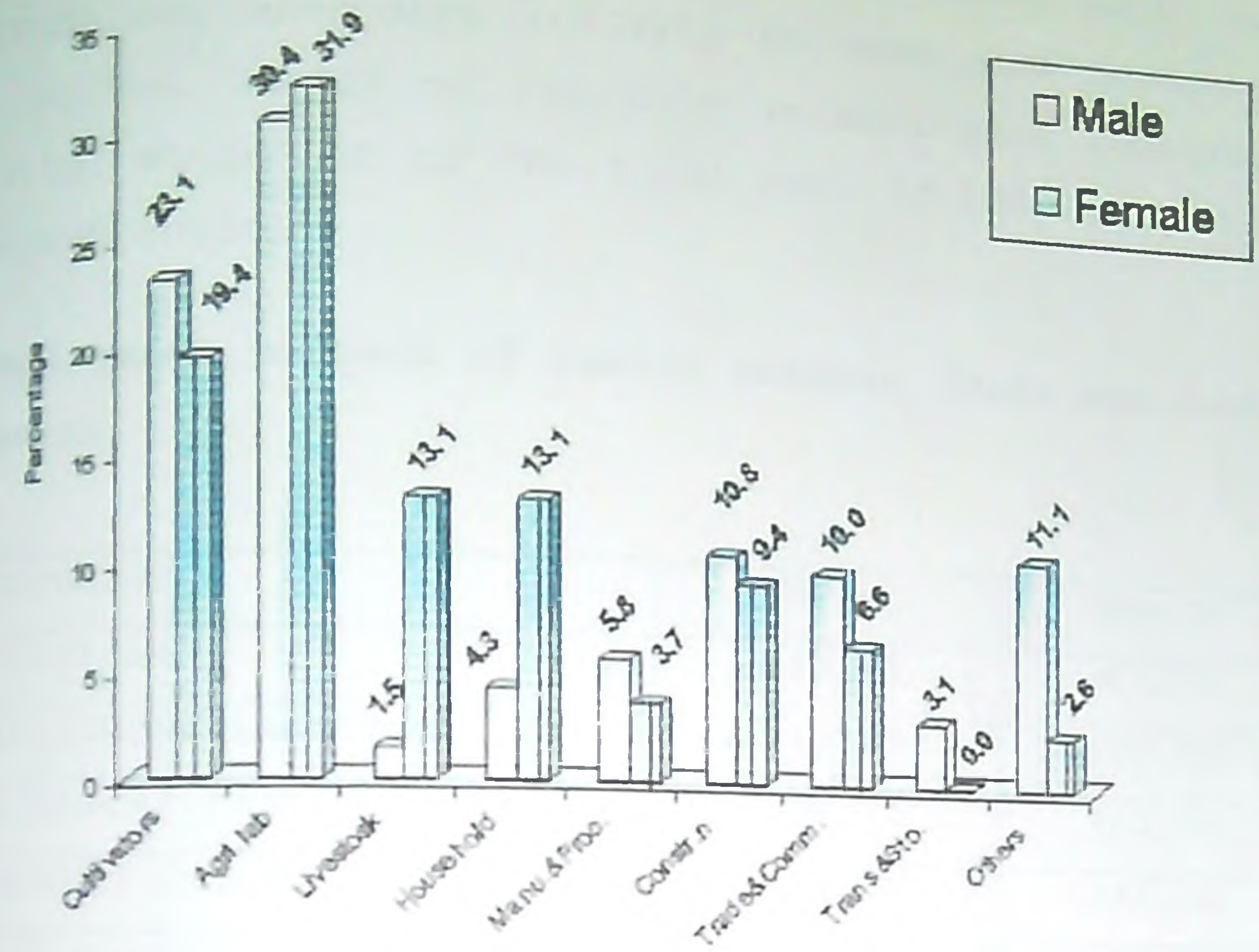


People engaged in Trade and Commerce 10% of male are engaged whereas female participation is only 2.62%

6. Participation of working labour force in Secondary activities

Particulars	M (%)	F (%)	Total
Total no. of workers	260	191	451
No. of workers having any type of sec. activity	200	113	313
Percentage of main workers having sec. activity	76.92	59.16	69.40

Here we can see that 69.4% of the workers have one or other type of secondary activity. This is because most of the workers who are not cultivators have a piece of land and they raise some crop, which gave them some additional income. Another reason is that during off-



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7. Employment pattern of family members (days per worker per year)

Particulars	Male	Female
Cultivators	140.23	87.73
Agricultural Labourers	143.33	142.52
Live stock/ fishing	138.75	122.16
Household industry	254.09	244.04
Manufacturing / processing.	256.27	252.71
Construction	217.11	198.13
Trade & Commerce	298.04	294.80
Transport/Storage	286.75	-
Others	290.79	277.15

It can be seen that on an average the male cultivators are engaged for 140.23 days in a year whereas female for 87.73 days only. But in the case of agricultural labourers male and female are engaged in work more or less equally, i.e. 143.33 and 142.52 days respectively. The livestock activity offers 138.75 days for men and 122.16 for women. Both men and women in construction activity have about 200 days of work nearly. This may be the reason why agricultural labourers tend to move from their occupation to construction.

8. Unemployment pattern of sample households

Particulars	M	F	Total
Potential labour force	282	247	529
Working labour force	260	191	451
Unemployed labour force	22 (28.20)	56 (71.80)	78 (100)

From the table we can see that out of the total unemployed majority (71.8%) were females while only a small portion (28.2%) are males.

9. Under employment pattern in Days per worker per year (300 - No of days employed)

Particulars	Male	Female
Cultivators	159.77	212.27
Agricultural Labourers	156.67	157.48
Live stock/ fishing	161.25	177.28
Household industry	45.91	55.96
Manufacturing/processing.	43.73	47.29
Construction	82.89	101.87
Trade & Commerce	1.96	5.20
Transport/Storage.	13.25	-
Others	9.21	22.85

Here under employment per worker in man-days are obtained by subtracting the average number of employment per year from 300. It can be seen that underemployment is maximum among female cultivators (212.27). Among agricultural labourers the underemployed man-days are close to each other in the case of male and female (156.67 and 157.48 respectively). High underemployment among cultivators and agricultural labourers is mainly due to the seasonal nature of agriculture. The underemployed man-days were more than 160 in the case of farmers who have livestock as the primary occupation, because most of the farms had only one or two animals, which mostly require half a day labour. Underemployment is also higher in construction workers (82.89 and 101.87 for male and female). This is also due to the seasonal nature of the weather conditions.

10. Pattern of employment and unemployment

Particulars	Male	Female	Total
Fully Employed	27 (9.57)*	2 (0.08)	29 (5.48)
Near Fully Employed	35 (12.41)	16 (6.48)	51 (9.46)
Moderately Underemployed	72 (25.53)	62 (25.10)	134 (25.33)
Severely Underemployed	112 (39.72)	74 (29.96)	186 (35.16)
Very severely Underemployed	14 (4.96)	37 (14.98)	51 (9.64)
Unemployed	22 (7.80)	56 (22.67)	78 (14.74)
Total	282 (100)	247 (100)	529 (100)

* Figures in parenthesis show percentages to total

The table shows that only 5.45% was fully employed and 14.74% was unemployed. It can also be seen that females are more unemployed than males. 9.63% of potential labourers were near fully employed, 38.16% ware severely unemployed and 9.64% were very severely unemployed.

11. Education and unemployment

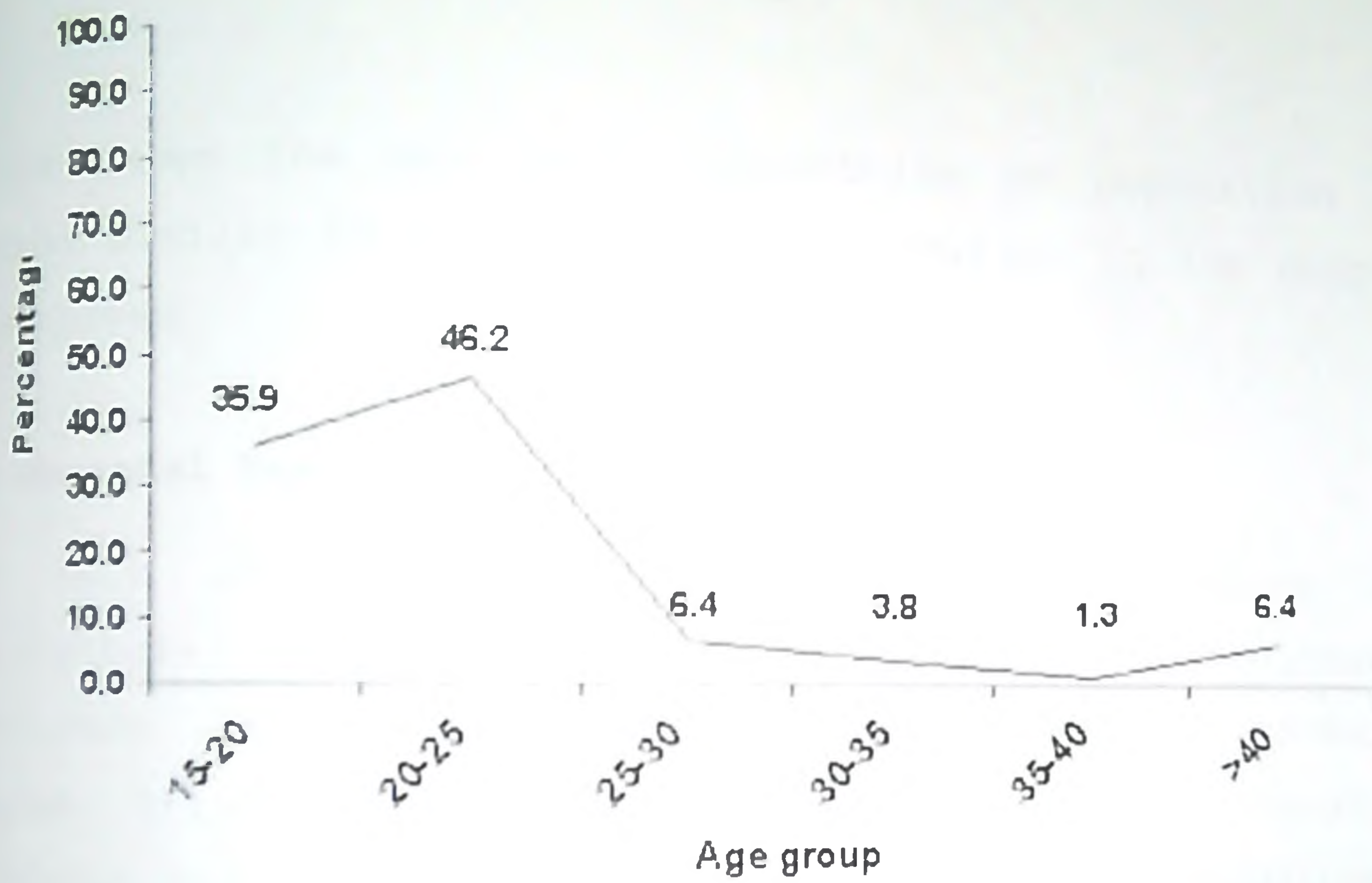
Particulars	Male	Female	Average
Secondary	17.65	24.0	20.83
Higher Secondary	7.89	50.0	28.95
Tech & Graduation	40	53.3	46.65
Total	21.85	42.43	32.14

Out of the total educated people 32.14% were unemployed and it is much higher in females than in males. The relatively low mobility of female labour is the main reason for that. Here we can see that as level of education increases the unemployment increases. About 46.67% of the graduates and technically qualified people ware unemployed, because as education increases there is search for high status jobs.

12. Gender and Unemployment

From the above graph we can see that on an average 72% of the total unemployed were females and the rest 28% only were males.

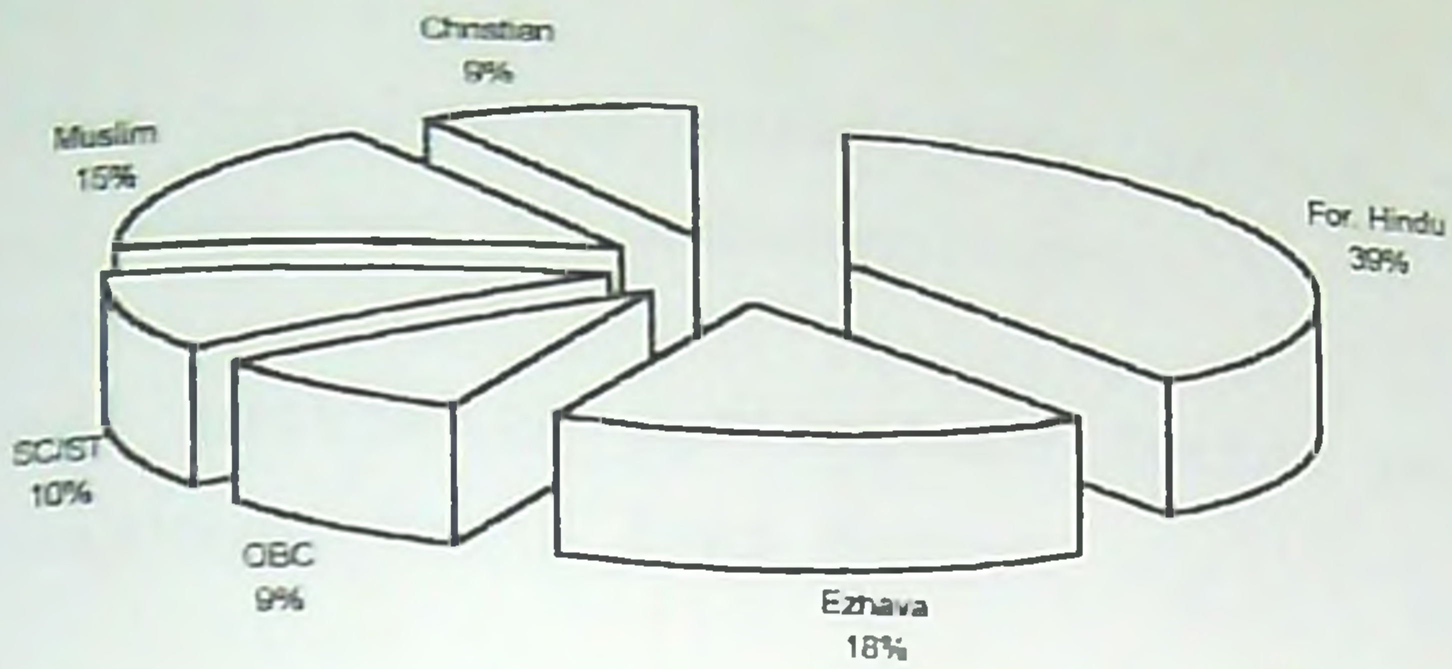
13. Age and unemployment



From this graph we can see that unemployment is seen maximum among youngsters of age group 15-20 and 20-25. This is because of the fact that up to the year of about 25 people are waiting for the best opportunity to come and after these period they want themselves to be settled anywhere and so the percentage of unemployment decreases after these age period.

14. Caste and Unemployment

The analysis showed that 38.46 % of the total unemployed were belonging to the forward Hindu caste and 8.97% are Christians. Ezhava who constituted about 30 % of the total people of the area constituted only 18% of unemployed people. The case same with SC/ST also. In all



other cases the per cent composition of population is almost similar to the per cent composition in the people unemployed.

15. Seasonal Unemployment

This is mainly due to the seasonal nature of agriculture. It mostly affects cultivators, agricultural labourers and those in the construction work. Kanni, Thulam, Vrischikam, Dhanu (mid-September to mid-January) & Edavam and Midhunam (mid-May to mid-July) agricultural labourers got an average of 15-18 days employment per month and others are lean periods and they got only 6-7 days employment per month Construction industry is also affected by the seasonal factors during the month Medam, Edavam, Midhunam & Karkidakam (mid-April to mid- august) due to water scarcity in early period and later due to heavy rain.

6. FINDINGS

- The real problem in rural area is not one of the unemployment but of underemployment
- Seasonal nature of agriculture forced people to be underemployed for a long period
- The high wage rate which prevails in Kerala reduced the demand for labour
- The underemployment is highest among female cultivators and lowest in males of Trade and Commerce.
- The study also provided a clue to the waste of labour resource in agriculture and the extent of industrialization necessary to divert this waste to production activity

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8. DISCUSSION

Q. Have you included the area of 'Attappady' in the sample area?

A. It was not taken as the sample area because it will affect the average data for the district.

Q. Is there any difference between disguised unemployment and underemployment?

A. Yes. Disguised unemployment means the population, which can be removed, from the labour population without leading to any reduction in out put. While in simple terms underemployment means the number of days a person loses when he is willing to do work but there is scarcity for jobs.

Q. What are the main reasons for the unemployment problems?

A. There can be a number of reasons. In the case of India it is mainly due to the increasing amount of population. Another reason is that the drastic reduction in jobs during the last years. Yet another reason may be the casualisation of Agriculture labour etc.

Q. What are the remedial measures you can suggest to tide over this problem?

A. The most successful method I can suggest is that to become a job provider rather than a job seeker. In the coming years getting a job is going to be a dream and so we have to make our own source for job. As other methods we can say that decreasing the population growth rate, increasing public job

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A. The most successful method I can suggest is that to become a job provider rather than a job seeker. In the coming years getting a job is going to be a dream and so we have to make our own source for job. As other methods we can say that decreasing the population growth rate, increasing public job opportunities etc, but this may not be considered as practically possible.

Q. What is the reason for increased unemployment with education?

A. As education increases the chance for getting new jobs are more. So educated people will wait for the best opportunity to come, i.e. as education increases there is search for high status jobs.

Q. What is the current rate of Unemployment in Kerala and in India?

A. In India the unemployment rate is about 3.5% and in the case of Kerala it is about 16%

9. ABSTRACT

One of the striking features of Indian economy in recent years is the increasing rate of unemployment. Unemployment in India is closely related to the high population, modernization of agriculture and casualisation of agriculture labour. Open unemployment is not a true indicator of the gravity of the unemployment problem in a country like India, characterized by large underemployment in rural areas, which accounts for the 90 per cent of the total unemployed. According to the census 2001 figures released, 72.2 per cent of the total (1.027 billion) lives in the rural areas. The addition of population in the last decade was 68 million in urban and 113 million in rural areas. According to Dev, (2000) Indian employment data can be divided in to principal and subsidiary employment and the study revealed that for women the growth in subsidiary employment is higher than the growth in primary employment.

One of the most worrying signs of Kerala's economic crisis lies in the constant rise of unemployment. In fact, in Kerala the largest percentage of unemployment is among the educated population. Kerala has the worst record of unemployment in the country. With less than 4 per cent of the population, Kerala accounts for more than 16 per cent of the total unemployed.

In Palakkad district, the main problem is not of unemployment but of underemployment and the main reason for this is considered to be the seasonal nature of Agriculture (Pradeep, 1998). In this study efforts are made for analyzing the pattern and level of unemployment in Palakkad district with the help of primary data collected by the method of multistage random sampling.

CAPITAL FORMATION IN FARM HOUSEHOLDS OF KERALA

By

RANI, G
2000-11-27

SEMINAR REPORT

Submitted in partial fulfillment for the requirement of the course no.Ag.Econ.651, Seminar.

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE OF HORTICULTURE
VELLANIKKARA

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DECLARATION

I, RANI,G (2000-11-27) here by declare that this seminar entitled "Capital formation in farm households of Kerala" has been prepared by me independently after going through various references cited here. I have not copied from any of my fellow students or their seminar reports.

Vellanikkara,
15-09-2001

RANI,G
2000-11-27

CAPITAL FORMATION IN FARM HOUSEHOLDS OF KERALA

Introduction

The prosperity of people in India is very much inter linked with progress in her agriculture in view of the predominantly agricultural character of the economy. In the context of economic liberalization it is argued that the agriculture sector should be given the status of industry in order to meet the domestic as well as export demands. Capital formation in Agriculture is a pre-requisite for the growth of Agriculture and is vital for sustained growth of the sector to meet the increasing demands.

Recently the government has set the target of GDP growth at eight percent per annum for the tenth five year plan period; and within this overall growth the target for agriculture growth has been fixed at four percent. It is not impossible to achieve this target unless capital formation in farm sector increases up to fifteen percent of its contribution to the GDP.

In the recent years, Capital formation in farm sector has not been even half of this. That is why inspite of the monsoons having been very satisfactory during the Nineties, the growth rate in Agricultural sector has been less than half of that in the Eighties. Thus we can say that in agriculture the quantum of capital formation over a period is far more decisive than the quantum of rainfall received in that period.(Singh,B.P.2001)

Capital Formation

According to Nurkse "The meaning of Capital Formation is that society does not apply the whole of its current productive activity to the needs and desires of immediate consumption but direct a part of it to the making of capital goods, tools and instruments, machines and transport facilities, plant and equipment. This diversion of a part of society's currently available resources to the purpose of increasing the stock of capital goods so as to make possible an expansion of consumable output in future"

Importance of Capital Formation

- Capital Formation is regarded as one of the important and principal factors in economic development.
- The vicious cycle of poverty in underdeveloped countries can be broken through capital formation.

Due to low levels of income in developing countries, demand, production and investment are deficient. This result in deficiency of capital goods, which can be removed by capital formation.

- The main purpose of economic development is to build capital equipment on a sufficient scale to increase productivity in agriculture and industry. Capital Formation leads to fuller utilization of available resources.
- Capital Formation leads to Technical progress which helps to realize the economies of large scale production and increases specialization. It provides machines, tools and equipment for growing labour force. Thus investment in capital formation increases employment opportunities also.
- Capital Formation leads to expansion of market. It is capital formation, which helps to remove market

imperfections by the creation of economic and social overhead capital and thus breaks the vicious cycles of poverty both from demand and supply side.

Thus Capital formation leads to increase in size of national output, income and employment thereby solving the problems of inflation and balance of payments and making the economy free from the burden of foreign debts. (Jhingan, M.L.1998)

Capital Formation in Agriculture.

Capital formation in agriculture comprises asset creation, directly and indirectly, for augmenting production. It refers to reclamation of land, bunding and other land improvements, digging and repair of wells, development of minor irrigation, laying of orchards and plantation, purchase of implements, machinery and transport equipments and farm building construction.(All India Rural Credit Survey Committee Report, 1954).

It is actually additions to physical man made productive assets that are durable and capable of yielding income over a period of time. Investment in all these varied types of activities in agriculture can be financed by individual farmers having surplus or by the collective agencies like co-operative, non-government organizations (NGOs) or by the Government. Capital Formation in agriculture consists of public and private investment . While private investment is limited and restricted to short-term gains, public investment aims at welfare of the society

Public Investment in Agriculture

Public investment of agriculture was mainly confined to major and medium irrigation, and construction of embankments. Huge investments in large scale dams, flood control and water supply for agriculture made substantial contribution to hydropower generation and food grain production. But, side by side, this had produced a lot of environmental and ecological problems. In many cases traditional cropping had to be changed to low value staple. The holistic approach to development has raised the question of relative importance of increasing agricultural production by retaining the ecological balance and the technological approach of ravaging the natural resources for food production. Contemporary concern over the Tehri and Narmada and other dams are only the reflection of that great issue of development approach.

The call is now for a greater effective investment in agriculture both nominal terms of increasing recovery and in real terms of greater and diversified output consistent with regional diversity of ecology and resource pattern (Vaidyanathan, 1994).

It is believed that crop-specific green revolution has to be redefined and diversification of agricultural production with the help of technological adoption is important not only for overall growth of agriculture, but also for increasing the income of the small and marginal farmers nearer the poverty level. Instead of investing huge amounts in long gestation irrigation and power projects, the scarce capital has to be invested in building diversified assets and equipments necessary for agricultural development. It will increase the capital stock as well as productiveness. The Working group on Capital Formation and Savings in India (Government of India, 1982) and the Khusro Committee pointed out several such physical assets formation for which public investment is urgent [Reserve Bank of India (RBI), 1989].

Mono-centric investment in irrigation and mono-crop production system of green revolution has now to yield place to a diversified investment and diversified production system under the liberalized open economic regime which establishes greater linkage with the world market. The production sub-system encompasses development of different agricultural crops in different regions. It requires development of different types of land throughout the country consistent with a agro-climatic zones.

The distribution sub-system requires storage, transport, wholesaling which needs large investment. The agricultural extension sub-system, input distribution sub-system, education sub-system includes huge investments in training, seed, fertilizer, biotechnology, farm machinery, pesticide and electricity. Thus investment in agriculture can have greater spread resulting in higher rate of return.

Infrastructures have important forward and backward linkages. A network roads and transport connecting every corner of the country will extend the market and break the vicious circle of backwardness. With growing agricultural production, market access is important for increasing the saving and surplus of the farmers who are often the victims of both the bumper crop and lean production. Thus agricultural development. It will increase the capital stock as well as productiveness. The Working group on Capital Formation and Savings in India (Government of India, 1982) and the Khusro Committee pointed out several such physical assets formation for which public investment is urgent [Reserve Bank of India (RBI), 1989].

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Private Investment in Agriculture

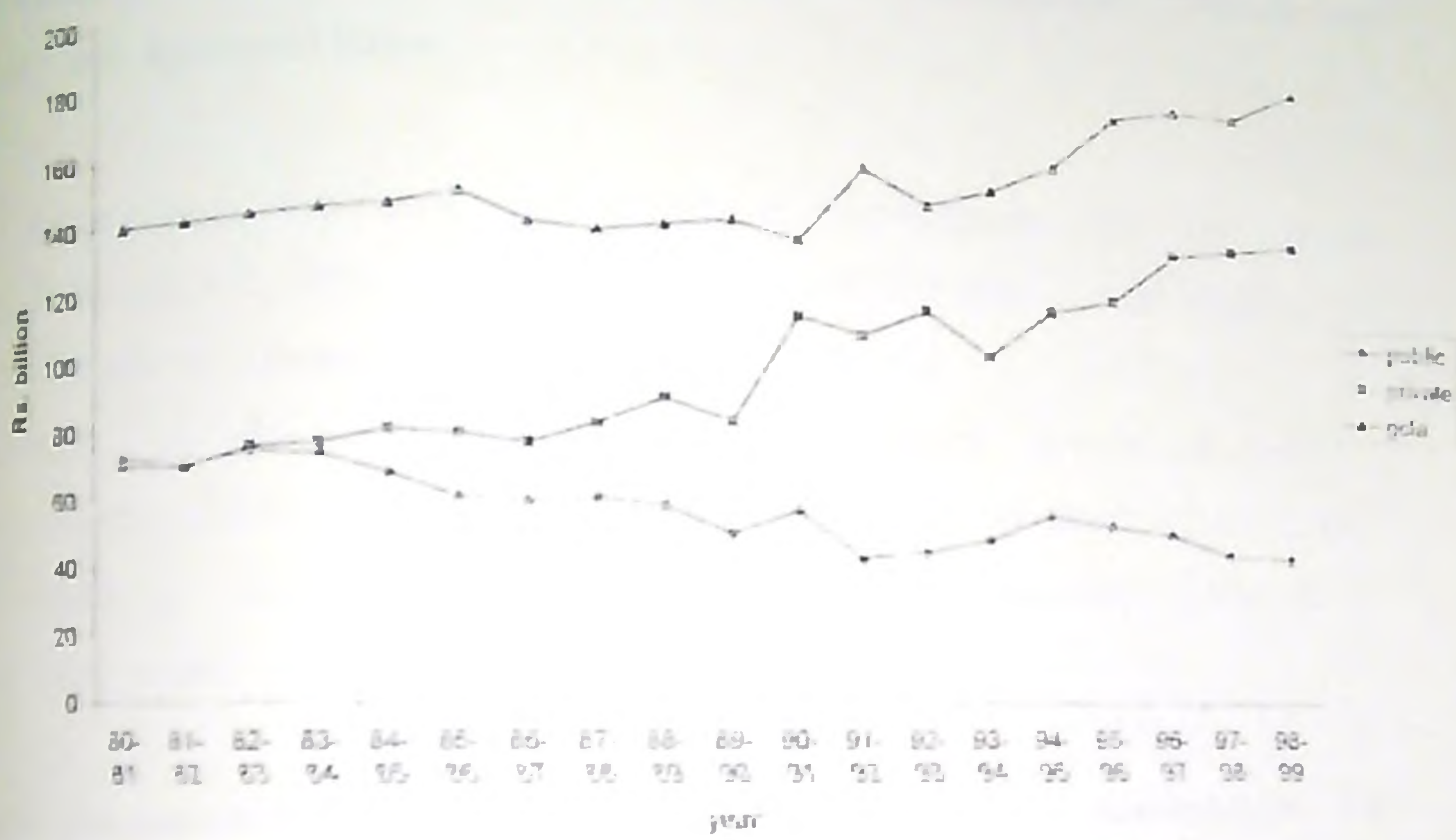
Profitability of investment, measured by the expected rate of return on investment, is the key determinant in private investment decision-making. If this return exceeds the rate of interest on funds borrowed for investment in question, the investment is a worthwhile proposition (in the case of one's own funds the relevant reference point would be the opportunity cost of such funds). However, uncertainties about the expected returns, risks associated with these, and an investor's risk-taking capacity (plus his attitude towards risk) render investment decision-making a truly complex process.

The lion's share of private investment comes from household sector. At low levels of income, farm household investment is first determined by survival needs. As long as a minimum of food security is not attained, investment decisions are characterized by high risk aversion and a high rate of time preference, which can be adverse to sustainability and to efficiency. At higher income levels, farm households can be very responsive to outside incentives. In agriculture and unorganized sector savings of the households depend on agricultural output, consumption, tenurial condition, price and marketing of products as also on the spread of financial institutions and instruments. Mobilisation of savings by the financial institutions in the rural sector, has been substantial.

At the disaggregated level India has now three distinct systems of agricultural production the green revolution pattern of production, the tenurial reform-based production system and the dryland and hill area system of production. While the agricultural surplus accruing under the green revolution system goes to the big farmers, the increase of agricultural production and productivity under tenurial reform system is more evenly distributed and the saving goes to the medium and small farmers also. Greater public investment in minor irrigation, storage, road and other infrastructure will further accelerate the growth process (Saha and Swaminathan, 1994).

Trends in Public and Private Investment in Agriculture in India

GCFA when decomposed into public and private investments



The behaviour and structure of gross capital formation in agriculture, forestry and fishery sectors (GCFA) as per type of assets and institutions is based on the revised and updated series from 1960 to 1998 at base 1993-94 prices. The analysis reveals a steady increase in GCFA (inclusive of change in stocks)over the years from a meagre level of Rs 63 billion in 1960-61 to Rs 182 billion in 1978-79. Thereafter, it declined up to 1986-87, and gradually recovered touching Rs 190 billion in 1998-99 . Thus over a 20 year period, 1978-98, the story of GCFA appears to be that of stagnation. The behaviour of GCFA is somewhat interesting when decomposed by the type of institutions, viz, public and private. Since the beginning of 1980s. GCFA in public sector started coming down gradually and continued falling till early 1990s, while that under accelerated from 1993-94 onwards. The share of private sector GCFA in total GCFA increased from 49 per cent in 1980-81 to 75 percent in 1998-99.

Two things, which are interpreted to indicate 'relative neglect' of Agriculture

- In comparison to the share of agriculture GDP in over all GDP(about 25% in second half of 1990s), its share in GDCF is much lower (between 6% to 7%).
- The fall in share of GCFA in total GDCF (from 14.5-6%) from early 1980s to late 1990s is much faster than fall in share of agriculture in GDP of the economy (36%-25%) over the same period.

Factors responsible for decline in capital formation in agriculture

- People find it easier to save in the form of financial assets because of quick liquidity of bank deposits rather than invest in capital formation in agriculture.
- The rapidly declining farm size and the changing pattern of operational holdings may be another factor which has affected capital formation in agriculture by the private sector.
- Benami landholders and absentee landlords do not generally show interest in creating permanent assets in the agriculture as their interests are elsewhere and hence for this substantial part of land holdings, capital formation does not take place as banks are also unable to provide term loans due to lack of security. Similarly,

farmers who take land on lease also do not show much interest in creasing assets in the agriculture sector as their tenure is not certain and is generally given on an annual basis in view of the fear of creating tenancy rights.

- Lack of proper implementation of land reforms in the country has resulted in not allocating lands to the landless and property rights were not conferred to the landless tillers. As the landlords owning substantial number of acres of land which are above the prescribed land ceilings, they are unable to cultivate the entire landholding by themselves and therefore they are not able to invest substantial amounts for capital formation in this sector.
- Small and marginal farmers who account for about 76 per cent of operational holdings and 29 per cent of the operated are, are generally interested in formation of capital base but their investable surplus is too limited to allow substantial investments in fixed assets.
- Public and private investments are complementary rather than a substitution for each other and thus a fall in public investment affects private capital formation in agriculture.
- Utilization of plan allocation mainly for maintenance of irrigation structures rather than creating new structures, has affected investment in agriculture.

Thus, reduced public sector investment in agriculture combined with unutilized potential from public irrigation works, density of agricultural infrastructure, unattractive growth horizons, adverse terms of trade, change in investment pattern and the institutional credit structure has adversely affected capital formation in private sector in agriculture.(Karmakar,K.G.1999)

Economic reforms and scope for investment in agriculture

Economic reforms and liberalized trade would improve terms of trade for agriculture in the long run. Agriculture has suffered adverse terms of trade because prices of industrial inputs for agriculture and consumer goods for rural population have increased at rates higher than that of their own products. However, this situation will change due to liberalization in the trade.

Opening up of Indian agriculture under GATT/WTO and expected changes in world agriculture, is likely to accelerate the process of correction in terms of trade for agricultural commodities.

Stepping up output is very important taking advantage of opportunities opened up by liberalization. This can happen only if we are able to step up investment. Public investment is the key, but private investment is more important in view of paucity of resources and the ability to involve financial resources.

If technological changes are brought about as a result of enhanced trade due to GATT, modernization of agriculture due to competition may arise due to productivity of the resources being used. Aggregate supply response to price rise increase will not be very high. Technological changes would need infrastructure like irrigation, roads, marketing and so on, which do not come necessarily through private investment. Therefore, public investment is necessary. Supply response has been classified into price related and non-price related factors. Non-price related factors relate to technological changes, irrigation, etc. Research studies have come to the conclusion that non-price related factors are far more important than price-related factors in bringing about adequate supply response. The inference is that 2/3rd of increase in output over the last 30-40 years in the country can be attributed to non-price related factors.

There is expected to be greater concentration of production of non-grain products or non-traditional sectors such as horticulture, floriculture, agro-processing and so on which shall have higher demand not only within the country, but even abroad. Therefore, infrastructural and credit requirements will arise. The country has to enhance investment levels and also introduce new technologies and the WTO agreement is expected to be favourable to developing economies. Because in the name of health standards, there could be non-tariff barriers in India if we develop suitable technology for production of various portable products and maintain quality of the products as per international standards. If the country is able to invest in these areas, it would be possible to improve trade. In order to benefit from these new opportunities, the country has to take a number of measures and investment becomes a key factor for sustained growth in desired sectors.

Perspectives

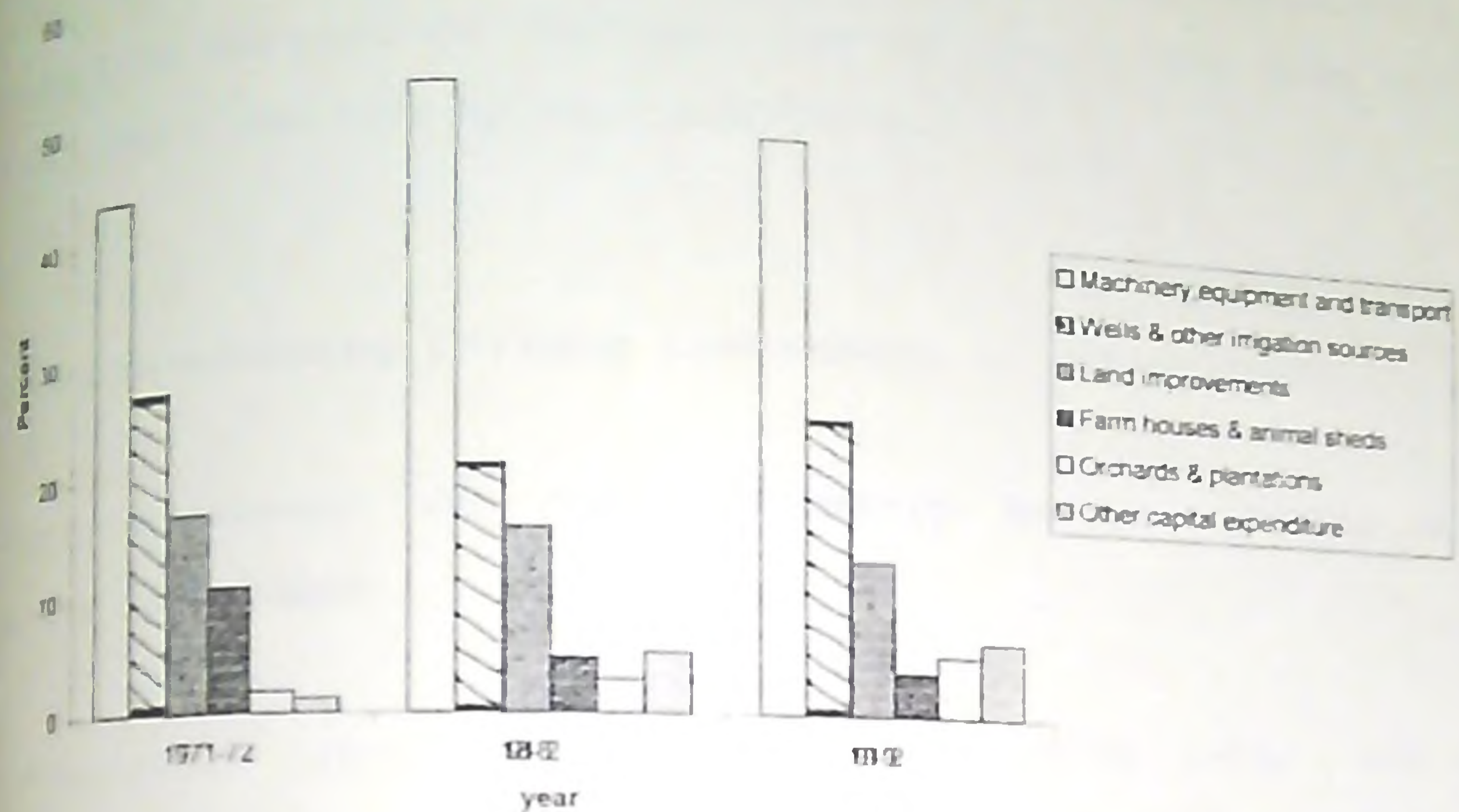
To sum up, falling real public investment in agriculture is due to falling allocation to the agricultural sector in the national plans, increase in recurring expenditure and party due to the under-use of irrigation potential created mainly through medium and major irrigation projects.

In the private sector, to a large extent, public and private investment are complementary, rather than substitutes for each other, and thus falling public investment is affecting private capital formation in agriculture. Investment in agriculture in the private sector is largely influenced by the availability of formal term credit, level of public investment and profitability of production. Analysis of the factors determining private investment has shown that major factors with significant effect include the stock of unutilized potential from public irrigation works, the density of electrical infrastructure and the flat rate tariff for electricity. The decline in public investment in the eighties may already be exerting an influence on private investment levels, which are stagnant in real terms. The process of economic reforms and the gradual opening up of Indian agriculture to world markets, is likely to turn the terms of trade in favour of agriculture. To fully exploit this opportunity, investment in both public sector and private sector, should increase.

Structure of Private (Household) Investment in Agriculture

Given the predominance of private sector capital formation, it is worth asking at this stage what is the structure of this private investment in agriculture, and how has it changed over the years? Private sector investment in agriculture comprises investments in the household sector and corporate sector-both organized and unorganized. The organized segment contains big firms primarily in the plantation sector, and their estimates of capital formation are available in their accounting books. The unorganized sector however, does not have any such systematic information. They are basically private co-operatives like sugar, milk, poultry, etc, and other very small and cottage agricultural enterprises (like dairy, agricultural implements, etc) and not industries. Information on their contribution to capital formation in agriculture is diverse and diffused. It is accounted through some benchmark surveys conducted by the CSO. Similarly, for household's component, CSO along with RBI has to conduct surveys (All India Debt and Investment surveys, popularly known as AIDIS) once in 10 years to estimate their contribution to capital formation in agriculture. For the intervening years, estimates are interpolated.Within the private sector, the organized corporate component accounts for less than 5 per cent of the private GCFA at all -India level during 1990s. The overwhelming share is that of the household sector, which may partially include the share of unorganized corporate sector and private co-operatives as well.

Percentage distribution of fixed capital assets of HH in Agriculture



The above graph shows the percentage of investment in various items of capital formation as obtained from the survey conducted by AIDIS.The items of capital formation considered for the study are as follows.

- Machinery and transport equipments.
- Wells and other irrigation sources.
- Land improvements.
- Farm houses and animal sheds.
- Orchards and plantations.
- Other capital expenditure.

The graph shows that the percentage of investment is highest for machinery and transport equipments compared to others. This percentage increase may be due to the high cost of machinery and transport equipments.

Factors determining private investment in agriculture

Public investment or complementarity between public and private investment

During green revolution period in 1960s when public investment had increased private investment also increased. The rate of investment in agriculture rose for only a decade following 'Green Revolution' thereafter, there was a significant decline in CF in agriculture at constant prices by both public and private sectors. The high complementarity between public and private investment for 4 decades and adverse terms of trade for agriculture in 1980s, may partially explain the decline in private investment. After 1987-88, there has been increase in private investment even through public investment continued to decline. This is due to significant rise in agricultural prices in that few years.

Technology

Due to new technology, profitability has arisen and investment is picking up. Despite falling public investment, there is evidence of continuing growth in agriculture, including production of good grains. This may be due to rise in productivity, technology spread to new areas and infrastructure is being utilized better.

Terms of Trade

Private investment is determined significantly by terms of trade. Indian industry was protected by various trade policies, but not Indian Agriculture. The administered prices have caused improvable terms of trade for agriculture by keeping agricultural prices artificially low. Subsidies on different items of agricultural input have an important role in generating surplus. On the one side, it is argued that greater input subsidies on irrigation, fertiliser, seed, oil, electiricity and credit increase production at reduced cost and ensure price stability and food security for the millions of poor around the poverty line. One the other hand, casuality is based on market principles. It is argued that subsidized production and pricing repressed the agricultural system and the terms of trade. Reduced subsidies and price incentives will encourage production, increase profit and capital accumulation and capital formation. Unfavourable terms of trade for agriculture will reduce agricultural surplus, discourage private investment and increase the intensity of rural poverty, and the favourable terms of trade will increase income, encourage investment and reduce rural poverty.

Subsidy type intervention and market-oriented incentive are alternative mechanisms to encourage agricultural production and capital formation. In both the strategies the marketable surplus is likely to increase, which may be ploughed back in agricultural development or may be spent in conspicuous consumption or may be siphoned off from agriculture and diverted to the financial market. The growing importance of non-food consumption and financial asset holding in the agricultural sector provides an explanation for the decline in capital formation in agriculture in recent years.

Institutional Credit

It has formed major proportion of total fixed Capital Formation in Indian agriculture.Therefore credit is an important contributing factor for enhancing private investment in agriculture.

Profitability in Agriculture sector

When the value of input is found to be less than value of output profitability is more and in such conditions it was found there is an increase in private investment. For example when the price of fertilizers, seeds etc rises more than price of grains profitability decrease. Also farmers will not be able to follow recommended practices and there by production decreases.

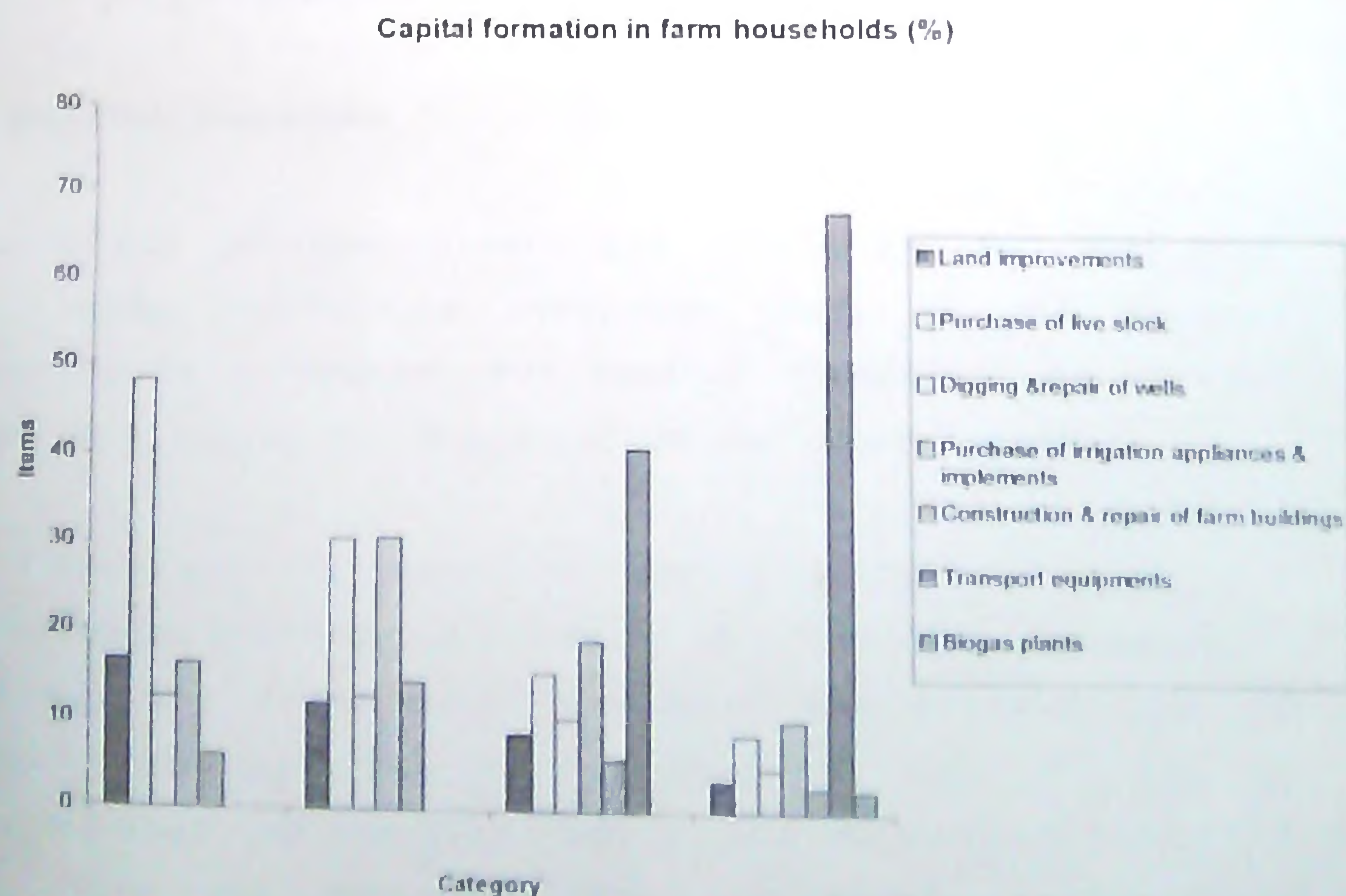
A Micro Level Investigation.

In a block level study conducted by Prema,A (1996) Capital Formation is referred as investment in productive assets other than purchase of land. However expenditure on land for reclamation and soil conservation were treated as investment since they increased productivity of sail.

In the study stratification was done based on holding size as.

Class I	-	Upto and including 0.25ha
Class II	-	0.25ha - 0.5 ha
Class III	-	0.5ha - 1ha
Class IV	-	Above - 1ha.

Graph showing Capital Formation in farm households.



Class wise analysis showed that livestock was the major item of capital formation in Class I and Class II farms. In class I, livestock was followed by land improvement (16.81%), irrigation appliances (16.31%) and digging and repair of wells (12.55%). Apart from livestock, irrigation appliances, followed by construction and repair of buildings were the most important items of Capital Formation in class II farms.

Transport equipments was the most important item of capital forming in Class II and Class IV farms (40.65 and 67.54%) respectively. Other major items of Capital Formation in class III and Class IV farm are purchase of irrigation applicants and implements (19.08 and 10.38% respectively). In class IV farms, one farmer had invested in biogas plant, which accounted for 2.41% of Capital Formation in that class.Land improvements and digging and repair pf wells were usually neglected by these farmers.

Net Capital formation

Since all physical assets are liable to wear and tear this value depreciates over the year. So net capital formation is estimated. Net capital formation was arrived at after allowing for depreciation and other losses.

NCF = Gross capital formation - depreciation

It showed an increase in value as the farm size increased. When all the farms were considered the overall rate of Capital Formation per farm marked out to 7.6. It was reported that Capital Formation at the rate of at least 10% per annum was necessary for sustainable agricultural development. The remarkably low rate of Capital Formation in class I and Class II farms may be that investments in farm assets might not be economically liable they might not have the ability to invest because of poor savings.

Net capital formation in farm households.

Items	Class I	Class II	Class III	Class IV
Land improvement	173.08 (18.27)	224.42 (12.47)	413.33 (7.84)	381.43 (3.09)
Purchase of livestock	484.57 (51.16)	558.77 (31.04)	719.29 (13.63)	929.77 (7.55)
Digging and repair of wells	139.68 (14.75)	255.73 (14.21)	589.22 (11.17)	548.23 (4.45)
Purchase of irrigation appliances and implements	178.14 (18.81)	663.33 (36.86)	1103.25 (20.92)	1290.10 (10.48)
Construction and repair of farm buildings	28.35 (2.99)	97.54 (5.14)	137.17 (2.60)	49.34 (0.40)
Purchase of transport	-	-	2312.50 (43.85)	8787.50 (71.41)
Bio-gas plant	-	-	-	319.60 (2.59)
Total	947.1 (100.00)	1799.79 (100.00)	5274.76 (100.00)	12305.97 (100.00)

Fig in parantheses give percentage to total.

Class wise analysis showed that in classI the value was obtained for construction and repair of farm buildings, which indicated that they haven't invested an wells etc.

during the reference year. In class I farms, livestock (51.16%) was followed by irrigation appliances (18.81%) land improvement (18.27%) digging and repair of wells (14.75%) whereas in class II, the pattern was irrigation appliances and implements (36.86%) followed by livestock (31.05%) and digging and repair of wells (14.21%).

Irrigation appliances followed by livestock were the major items contributing to 35.05% and 29.17% of net capital formation at aggregate level. It was followed by digging and repair of wells (16.61%). Land improvements (12.92% and construction and repair of farm buildings (2.77%).

Rate of Capital Formation

The rate of capital formation (RCF)in the year 't' was calculated for the aggregate.

RCFt = NCFt in rupees per farm/Kt-1 in rupees per farm x100

Where NCFt is the Net capital formation in year 't' and Kt-1 is the value of productive assets at the end of (t-1)th year.

Rate of capital formation showed an increase in value as the farm size increased.

When all the farms were considered the overall rate of Capital Formation per farm marked out to 7.6%. It was reported that Capital Formation at the rate of at least 10% per annum was necessary for sustainable agricultural development. The remarkably low rate of Capital Formation in class I and Class II farms may be that investments in farm assets might not be economically liable they might not have the ability to invest because of poor savings.

Rate of capital formation in farm households

Details	Class I	Class II	Class III	Class IV
Gross capital formation (GCF) (Rs.)	1328.34	2429.91	6150.00	14064.84
Net capital formation (NCF) (Rs.)	947.12	1799.79	5274.76	12305.97
Value of capial in t-1 year(kt-1) (Rs.)	46527.42	65792.01	50122.89	104750.40
Rate of capital formation%	2.04	2.74	10.52	11.75

Major Constraints to Capital Formation

- High consumption expenditure valued as the major constraint in capital formation accounting to 50%. The stocking prices of the consumer goods and food items, due to inflation may be attributed to be the reason for this.
- High wage rate (45.83%), non availability of labour (41.67%) were the other two important constraints to

investment. These two problems are complementary and high wage rate is the resultant of non availability of labour.

- High price of various inputs was recognized as the next important problem. Adoption of recommended doses of fertilizes, manures etc. depend mainly on price of the inputs.
- Unemployment of educated youth and lack of irrigation facilities were also remarked as constraints to capital formation.

Suggestions and Policy implications

- The concerned institution should undertake systematic surveys in all the districts and develop the profile of households both in rural and urban in terms of their socio-economic condition. This profile is useful for region specific plans.
- Concerned departmental authorities should guide and channelise the investments in a proper manner and ensure the maximum utilize of the existing potential.
- Group farming and group management practices could help to reduce cost of evaluation and people should be encouraged to avail the services of Krishi Bhavan .
- People should be encouraged to practice thrift and increase their savings. Banking institutions should make offers to formulate more remunerative and attractive deposit schemes.
- Efforts should be made to identify the constraints and obstacles to Capital Formation and try to rectify them.

Conclusion

Agriculture in Kerala is passing through a very difficult period as a result of the steep fall in prices of most of the farm commodities. Recent developments in global trade have adversely affected a wide spectrum of economic activities. Being the major cash crop producing state in the country, Kerala is perhaps the worst hit on account of the new agenda for trade liberalisation adopted by government of India through its import policy. The emerging scenario warrants a paradigm shift in the approach for agricultural development in favour of consolidation of the small size holdings through appropriate institutional arrangements promoting group endeavors and sharpening the competitive edge through improvement in productivity and quality. Scaling up of the production potential through induction of new technologies including bio-technology, well organised arrangements for micro propagation, value addition at the farm level and linkage with agro processing are the measures warranted to salvage the farm front from its present plight. All these processes require adequate capital investment. Thus we can say that prosperity in agriculture sector in Kerala is so closely linked with capital formation in the sector.(Economic review,2000)

Discussion

What is the reason for the decline in public investment?

The observed declining trend in the public sector GCFA since early 1980s is attributed to several factors: neglect of agriculture, rising subsidies and drying up of resources with the government, growing opposition to big dams and so on. Another important reason could have been the dramatic fall in the world rice price during 1980s from about $400/tonne to about $220/tonne. This upset the economics of major rice dominated irrigation systems and the internal rate of return (IRR) estimated on reduced rice prices turned out to be much lower than what was envisaged earlier. This perhaps dissuaded international funding agencies to lend for major irrigation schemes.

Inspite of the complementarity between public and private investment why there is a rise in private investment in recent years eventhough public investment is decreasing?

The recent recovery in private investment despite the decline in public investment, can in part be attributed to the significant rise in agricultural prices in the last few years. Technology advancements like the spread of high yielding varieties and improved utilisation of the available infrastructure must have induced private investment. Institutional credit must also have been providing substantial amounts by way of term loans for agriculture and allied purposes since its inception in 1982 which facilitated capital formation.

What is the role of institutions in promoting capital formation in the present day situation ?

In the present day situation reserve bank of India's policy is to 'create an environment in which funds are available at a lower interest rate'. RBI announced a two per cent cut in the cash reserve ratio (CRR) from 7.5 per cent to 5.5 per cent for banks. This will help to mobilise deposits from banks.In such a situation capital formation in farm households should increase.

But economists are saying that fresh investments in the current phase may not be determined just by the cost of credit, rather it will go up only if there is a revival of over all demand which is severely lacking during the current slow down phase of Indian economy (Mukherjee,2001).

What is the importance of capital formation in the homestead farming systems of Kerala?

In homestead farming systems where multi-tier cropping is practised investments are necessary to improve soil fertility and for irrigation. Heavy investments for farm machinery however are not much important under homestead farming.But to support diverse crops maintenance of soil fertility is important.

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ABSTRACT

Agriculture continues to be the single largest contributor to Indian economy.In the context of economic liberalisation it is argued that the agriculture sector should be given the status of an industry in order to meet the domestic as well as export demands.Capital formation in agriculture is a pre-requisite for the growth of agriculture and is vital for sustainable growth of the sector to meet the increasing demands.In the perspective of the experience of green revolution, investments in agriculture, both public and private, have to be diversified consistent with geophysical conditions so that increased production, employment and income generatio can alleviate poverty(Banerjee,1996)

Public investment in agriculture has decreased over the past twenty years.This is mainly due to defective planning and wrong and erratic policies.Though the share of private investments in agriculture increased, the gross capital formation in the sector was found to be stagnating for the past twenty years due to complementary nature of public investment and private investment.(Gulathi and Bathla,2001)

Farm households contribute an overwhelming share of private capital formation in agriculture.In a study conducted by Prema(1996)in Kodakara Block Panchayat of Thrissur district, it was found that the rate of capital formation is only 7.6% which is less than that required for sustainable growth i.e.10%.A new strategy of capital formation in agriculture along with financial restructuring in the rural sector aimed at sustainable development of agriculture without damage to the environment is the need of the hour.

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TIME MANAGEMENT

BY

RAJESH.P

(2000-11-45)

SEMINAR REPORT

Submitted in partial fulfillment of the requirement for the Course No Ag.Extn.651

DEPARTMENT OF AGRICULTURAL EXTENSION
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1. INTRODUCTION

The world has become very fast due to modern technology. We are trying to do as much as possible within twenty four hours allotted to us. From time immemorial the importance of time has been greatly understood.

In Egyptian civilization when floods ran through river of Nile the Egyptians knew it is time for sowing of wheat. The Sumerians calculated seven days by identifying seven planets around earth. People of the old world could say time just by looking at the sun or the moon.

History is full of quotations,legends, fairytales, jokes all describing and emphasizing the importance of time. New York times reported " an unhurried sense of time is in itself is a form of wealth"

Abraham Lincon one of the renowned presidents of America said " nothing valuable can be lost by taking time "

Above and all there is something which we should ask ourselves to understand what is time and why it is to be managed look the beautiful saying given below

To realize the value of one year

Ask a student who has failed the examination

To realize the value of one month

Ask a mother who has given birth to a premature baby

To realize the value of one week

Ask an editor of a weekly

To realize the value of one day

Ask a daily wage laborer

To realize the value of one hour

Ask lovers who are waiting to meet

To realize the value of one minute

Ask a person who has missed the train

To realize the value of one second

Ask a person who has survived an accident

To realize the value of one milli second

Ask a person who has won silver medal in Olympics.

For some people time is money and for some time is wealth some says that time is precious. There are some specific characteristics of time that makes it important one to be managed.

2. CHARACTERISTICS OF TIME:

Unique resource-time cannot be created or destroyed, and it is present everywhere in this universe.We cannot see time but we know that it is there.

Saved or stored- we can save or money in banks. We can store our costly items in lockers. Still now not a single instrument is developed for storing of time.

Bent or borrowed-we can borrow money and other things from other people or from some institutions. We can manipulate any thing in this world but till this age none has ever borrowed or manipulated time.

Irreversible-please look at your watches for a second or two. The second hand is moving while you are looking at it. That seconds that are lost by its movement will never come back.

Equal for all- regardless of your sex, sect and degree the second hand moves at same speed for all of us. No matter whether you are a prime minister of a country or a common citizen you have only 60minutes an hour and 24 hours a day.

Maximized- it does not mean that we can increase our time from 24 hours to 30 or 35 hours. We can optimize the use of our time by proper time management.

Wasted-time wasting is the useless spending of time. If we are spending time without any use for ourselves or others it is the wasting of our time.

3. TYPES OF TIME [SHAH, 1995]

Biological - of the 24 hours available to us about one third we spend for our sleep, food, our regular exercise etc. An adequate and pleasant sleep is essential for the proper functioning of the body.Same is the case with all other things.Very often we cut off our sleep to increase our work hours.It is not a good solution.

Business- the time we are spending for our work constitutes our business time. For an executive it is the office time ,for a student or a teacher it is the class time. It depends on ones occupation.

Social- excluding both the biological time and business time there is time left in our day. It is the time we are spending for our family our friends that means our social life. This constitutes our social time.

4. TIME PERCEPTIONS

Man is a creature of habit. The way we spend our time is largely habitual. Most people do not really consciously think about how they are spending. Time management expert Merril Douglas says that " the way you spend your time determines the way you lives your life and that is who you are ". Tomorrow is connected to today just the same as today was connected to yesterday.

Are you always early or always late to class?

Are you always in a hurry?

Are you unable to cope with your examination blues?

These questions you have to ask yourself. Few people satisfactorily define time. Every one of us has an intuitive sense of what time means to us but we are unaware of that. At the same time we are also unaware that others also have a completely different sense of time. It is this different time perceptions, which leads to several human problems. So by understanding our own sense of time and that of our colleagues and friends we can become a better time manager.

William Hoffer [1997] classified peoples in to eight common categories based on their time perceptions. Most of the people belong to this categories but some draws a combination of two categories and will exhibit the character of both.

1) Futurist

Most of the people (65%) show this steadily expanding sense of time. Such a person is in the mainstream of life, a solid and capable, if somewhat average citizen. He gets along with almost everyone. For these type of people past in unimportant rather painful. He does not worry about his past mistakes. He knows well that he is living in the present and in that way today is important and he carefully plans for the future.

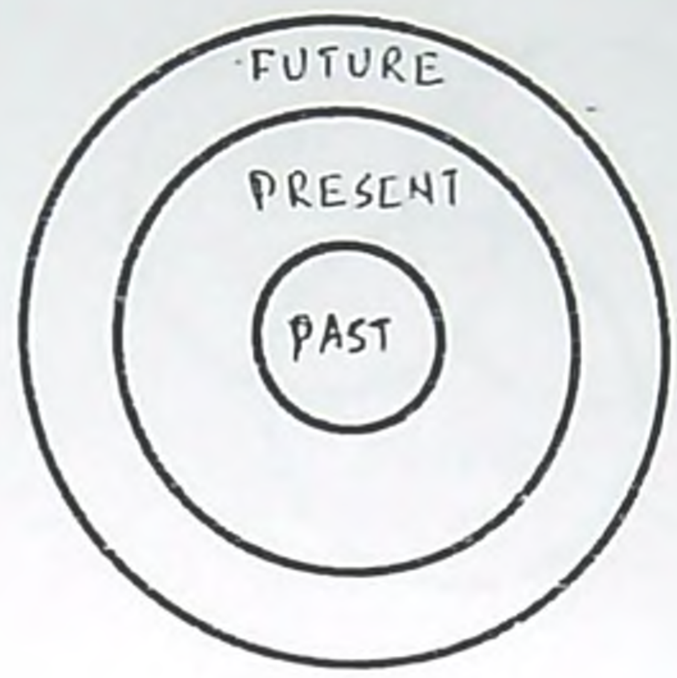
2) **Janus**

For these type of persons present unimportant perhaps painful. He or she is a busy person but usually involved with things rather than people. But they are optimistic about the future. They are intelligent ,motivated and busy. Because of their uneasiness with present he undergoes a lot of stress and strain and because of this there is a tendency of alcohol abuse among this type of persons.

3) **Existential**

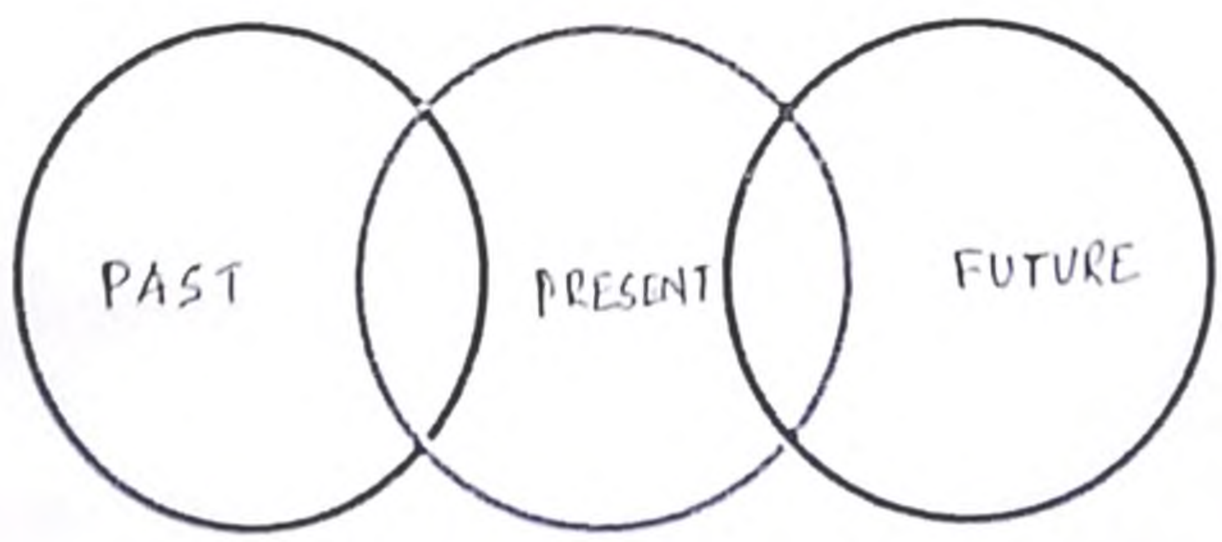
This is the opposite of Janus type. Present is important. Very good in human interaction. For them future is unimportant so they have difficulty in coping with new technology and they are unable to visualize long term goals. He will do well in all phases of business where human interaction is essential. They are prompt and punctual and very good in human interaction. Present is some times so overwhelming that these persons also exhibits a tendency towards alcohol abuse.

4) Explosive



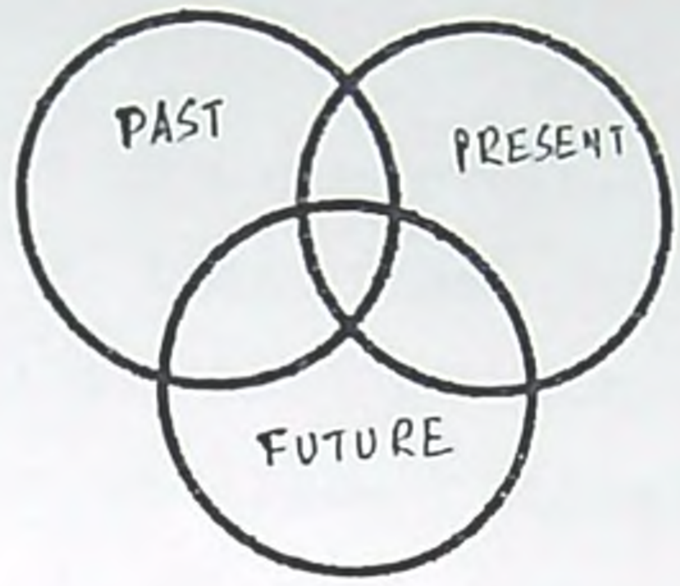
Full of energy. Speed of his actions often creates mistakes and problems in his human relations. He speaks without stopping but too busy to listen to others. No care is given for other person's space or time. They are successful people because of their hard work. They are impulsive and internally angry persons and are prime candidates for high blood pressure.

5) Tidal



The same size and the overlapping of the circles shows that the person of this type of time perception is a quietly content person who is relatively pleased with his past, present and future. He lives his life with a sense of continuity. He or she has learned how the lessons of past relate to present. He is steady and deliberate. He works hard and often achieves his ambitious goals.

6) **Medallion**



This is the rarest of the time perceptions. Balanced imaginative individual who sees all sides of the problem. He is capable of achieving ambitious goals but it is not important for him.

7) **Random**

The name itself shows the character of the individual and from the arrangement of the circles it can be well defined that the individual is with no sense of identity and is not moving his life in any particular direction. He leads a chaotic life and probably suffers from deep inner problem.

8) **Pessimistic**

This is the dangerous of the time perceptions. It is just the opposite of the futurist model. He feels he has nothing to look forward to. These people often show suicidal tendency.

5. TIME ROBBERS

1) Interruptions

(a) Telephone - telephones are one of the most extensively used electronic media in this time. It is one of the greatest time saver also. But if not wisely it will become one of the worst time killers. Consider a situation when we are going some where from our house, urgently. When we are about to close the door the phone rings, definitely we will come back and attend the phone. If the person in the other end is in a mood to talk and if we cannot say excuse to him we cant complete that urgent task.

(b) Personal visitors- they will become a distraction when we are busy at work. Suppose we are studying for an examination at home sitting alone. If a friend of our father or mother come we can't tell him that my father is not here please come back after some time. So much of our time is lost for them.

2) Meetings

Meetings will become time wasters when there is no clear objective, no proper direction, no effective leadership, excessive length of meeting, high level meeting on minor problems etc.

Consider a hostel situation where there is a sanitary problem, which can be cleared by simply cleaning a channel. For this purpose if a committee is constituted including the vice chancellor, registrar and other high officials it will take pretty long time.

3) Tasks you have delegated

Delegation is very common phenomena. Teacher delegates students, superiors to their assistants, father to son, mother to daughter etc. are very common. If you are an executive you can delegate your personal assistant to attend and screen the phone calls for you. If the delegation is not proper or if the assistant is not trained well he will create more problem.

4) Procrastination

There is a very common adage that 'procrastination is the thief of time' and 'procrastination is the mother of all evils'. From these adages it is understood that procrastination is an important time robber.

What is procrastination? It is simply postponing. It can be due to two reasons;

(a) Habit-it is some thing inborn .it is the tendency for postponing things.

(b) Inertia- it is the resistance offered by the body.A body likes to continue doing things that it was doing before.

Other reasons for procrastinations are unpleasantness of the task, difficulty of the task and indecision.

5) Acting with incomplete information

If you are going for a survey or an interview and if you do not know where you can get the respondents or where the interview is most of your time will be lost simply by searching the place or the respondents. So it is better to get adequate information before going for an interview or a survey.

6) Inadequate technical knowledge

Some days before the new paper were full of news about different types of rains of different colours. Almost all colours were heard then. Red, blue, green etc. were there. Some of our scientists told that it is because of some acid some said it is some dust still now nobody know what it is. This problem is mainly due to inadequate technical knowledge.

7) Dealing with group members:

Think of what is happening in our assembly. If you on your television you can see many people shouting slogans some fighting some rushing towards the door. Most of the time of the assembly which is for discussing the problems of the state and the people is lost by this. The speaker who is the chairperson of the assembly spends much of his time dealing with those members who are creating problems.

8) Stress and fatigue:

In our society working women population is more. Due to the formation of the nuclear families there the women has to do all tasks like look after her children, look after the needs of her husband ,to cook food and then she has to reach the office and the same thing repeated in the evening. This continuous work will result in stress and fatigue, which is a very serious time waster.

9) Inability to say *'NO'*:

No very simple word very difficult to say. Consider a situation when you are studying in our room in our hostel for some examination. If friend of ours come to your room and he want you also to accompany him and if you did not tell 'NO' to him it will result in many difficulties.

10) Fire fighting:

It is actually crisis management. According to Peter Drucker the most common type of management followed by managers is crisis management. Anticipation of the crisis is best for managing a crisis. By anticipating we can prevent the crisis from happening.

6. RULES THAT CAN BE APPLIED FOR MANAGING TIME

As a general rule for getting things done the quickest, to do the thing that everyone else has to do at the times everyone else isn't doing them - **Mark McCormack** ,

Parkinson's Law states "work expands to fill the time available for its completion".
So set dead lines and respect them. Most people work best under a slight tension.

Premack principle: If you have two tasks A and B and if you prefer A over B, do B before A. You will do both of them better.

Pareto principle: If all items to be done are arranged in order of value, 80% of value would come from 20% of items, while remaining 20% of value would come from 80% of items.

To become more effective and satisfied with your use of time, learn to concentrate on 20% activities with high value.

Think of your hundred wishes and arrange them in the order of your preferences. The first twenty wishes will give you eighty percent of satisfaction.

7. TIME MANAGEMENT:

Time Management is really self-management. The objective is not to become super productive or super efficient but to optimize the use of our time to achieve or objectives. To work smarter not harder.

The objective of time management is to increase and optimise the use of your discretionary time. **(Pearson)**

Time is the scarcest resource; unless it is managed nothing else can be managed
(Peter Drucker)

Benjamin Franklin, "time as the stuff of which life is made".

Time management does not provide solution for management problems. It will provide discretionary time in which the manager can find solutions, plan for future and assess overall progress.
(Mayer 1995)

8. TIME MANAGEMENT STRATEGIES

1) **Spend time planning and organizing** – time planning is the most talked about yet neglected elements in life.

I don't have time, I want to do but I don't have time, how often you have heard this or asked this to yourself. Poor time management can lead to delayed decision, unscheduled meetings, meetings extended beyond schedule etc. so spend time for planning your activities. Every night before sleep spend five minutes for planning the coming day and make a list of activities that are to be performed.

2) Don't be a perfectionist- according to our own culture and all other cultures those who believe in god says that only gods can create perfect things. For all things there are certain standards fixed don't try to go beyond that standard it will be mere waste of time.

3) Learn to say NO- a very simple word but very difficult to say. So don't say yes when you want to say no. Try to say **no** in a nice way

4) Learn to prioritize- here we can successfully use Pareto principle. We can arrange our tasks according to our priority so that 20% of the tasks will give 80% of satisfaction. Divide your activities into urgent and important, urgent but not important, not urgent but important and them prioritize.

5) Combine several tasks- combine those activities having similar characteristics so that it is easy to do them. Those activities that come in same way can also be combined.

6) Consider your internal prime time- what is internal primetime? It is the time of the day that you are more active and can do your work more effectively with more concentration. You have to identify yourself that whether you are a morning person, a night owl or a late afternoon whiz. Use this time for serious work that the chance of mistake is very less.

7) Be flexible- allow time for interruptions. Experts suggest planning for only 50% of our total time. There are interruptions that will definitely come and that we can't avoid. So 50% of our time must be left for these interruptions.

8) Do the right thing right- doing right thing right is different from doing things right. In the case of time management doing right thing right is more important than doing things right. Any one can do right things but doing right things right is more important.

9) Practice the art of intelligent neglect- eliminate from your life trivial tasks or those tasks which do not have long term consequences and try to concentrate on tasks which have long term consequences for you.

10) Conquer procrastination- unpleasantness is one of the greatest single cause of procrastination in this case do unpleasant things first. This way we can quickly get them out of the way leaving you free that you can concentrate on the rest of the days work.

Another important cause of procrastination is the difficulty of the task. Here we can break down difficult tasks into smaller nits and focusing on one part at a time. The policy of 'divide and conquer' can be effectively used here.

Before concluding we can summarize the whole time management in just seven words

D-O I-T N-O-W

Once you decide on a plan and are , focused, just do it now.

D = Divide and conquer what you have to do. Break big tasks into little tasks and give each part of that task a realistic dead line.

O = organize your materials, how will you do it.

I = Ignore interruptions that are annoying distractions

T = Take the time to learn how to do things yourself.

N = Now, not tomorrow. Don't procrastinate.

O = Opportunity is knocking. Take the advantage of opportunities.

W = Watch out for time gobblers. Keep track of, and in control of, how much time you spend in internet, reading and sending e-mails, watching T.V, talking on the phone or fooling around.

Yager, 1999

CONCLUSION

Stop spending your time. Begin to manage and invest time. It could be the best investment you will ever make for yourself, your family and your occupation.
Now you are on a road to success and success demands a price in advance: the price of hard work. Now everybody works for eight hours to survive. But the way you manage these eight hours available to you marks the difference, between survival and success. Walter Judd said " man is so smart today, he controls almost all of nature- except his own nature

Time must be rationed. The minute hand is beyond our control, so it is a question, not of managing the clock, but of managing ourselves. Give some time for relaxation, give some time for your family and give time for your work. Allocate your time as a miser allocates his money. So form the next time remember to do things in time, every time, time after time.

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DISCUSSION

A) What is time?

According to Einstein time the third dimension coming after energy and matter. Time cannot be created nor it can be destroyed. It is always present here.

B) What is discretionary time ?

It is the time that is at our disposal. We can only manage time that is at our discretion. Other part of our time is that we cannot manage. For example consider your class time. You cant manage your class time because it is at your teachers disposal. Experts say that we can manage only fifty percent of our time.

B) Have you heard the story of rabbit and tortoise? Can you relate this story to your time management?

In the story the rabbit was winning first. But at last the rabbit won. Here rabbit can be equated to a person without any sense of time, overconfident and serious about nothing were as tortoise can be compared to a person who is giving importance to time an he knows how to utilize it to the best. Rabbit though fast because of his ignorance of value of time failed. Definitely it is mismanagement of time

ABSTRACT

Time Management is the art of managing time. The objective is not to become super efficient or supe. productive, but to use time to achieve one's objectives to work smarter and not harder.

There are mainly three types of time namely biological time, business time and social time. There are certain characteristics of time like uniqueness, irreversibility and the like which make the time more important one to be managed.

Time Management does not provide solution for management problems. It will provide discretionary time in which the manager can find solutions, plan for future and assess overall progress.

Time management expert Merrial Douglas said that the way you spend your time determines the way you live, your life and that is who you are. Tomorrow is connected to today just the same as today be connected to yesterday. People can be classified into eight common categories based on their time perception. They are Futurist, Janus, Existential, Explosive, Tidal, Medallion, Random and Pessimistic.

Time management identifies the important time stealer and the crux of time management lies on how we are tackling these time stealers.

fixed days. This connectivity can also be used to download online publications on useful topics from anywhere in the world.

10. Opening of cyber cafes to enable educated rural people and extension workers at village level to have direct access to World Wide Web for having market information etc.
11. Providing maps that display different features, such as population density, crops planted, etc.
12. Providing video clips to demonstrate complex procedures; and audio files for reboardcast on local radio stations.
13. Providing mechanism of user / beneficiary feed back for the Public Sector schemes.

3.5. How can cyber power be used?

The uses of cyber power and much varied and diverse.

3.5.1. Precision farming information

Agricultural managers have for decades taken advantages of new technologies, including information technologies, that enabled better management decision making an improved economic efficiency of operations. The extent and rate of change now occurring in the development of information technologies have opened the way for significant change in crop production management and agricultural decision-making. This vision is reflected in the concept of *Precision Agriculture*, offers the promise of increasing productivity while decreasing production costs and minimizing environmental impacts.

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