LINKAGES FOR LATERAL LEARNING AMONG FARMERS, SCIENTISTS AND EXTENSION WORKERS: STORY OF MATCH MAKERS AND LESSONS FOR LINK BREAKERS

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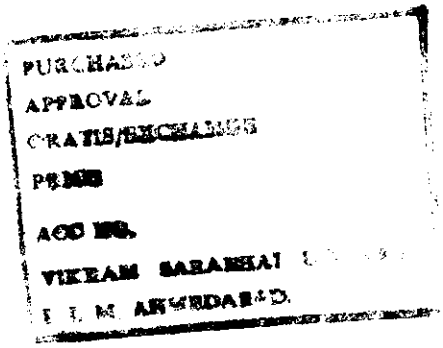
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ABSTRACT

The linkages between farmers, scientists and extension workers have been studied through several angles. The barriers to learning at individual and organizational level have been listed. The relation between the type of linkages and the portfolio of enterprises households have, is discussed through Mean-Variance Matrix. Finally, lessons for making and breaking links are reviewed. In appendix one channels of communication between farmers and scientists are analysed. In Appendix two a critique of study by ISNAR, The Hague, on the subject is presented. In Annex-3 a research review on inter-organizational linkages between research institutions engaged in research for rainfed regions is presented. Annex-4 includes discussion on institutional context for lateral learning.

It is argued that to forge new links between disadvantaged farmers, scientists and extension workers, some of the old links will have to be broken. After all, one could not add indefinitely without substracting. The technology transfer paradigm has emphasized the demand side individual oriented approach too much. There is a need for making a transition to portfolio approach to designing technology development and diffusion in high risk environments.

Linkages for Lateral Learning Among Farmers, Scientists and Extension Workers: Story of Match Makers

Anil K Gupta*

'Matchmaking' is a noble though unsung profession in Eastern societies. The 'matchmakers' keep track of eligible boys and girls of marriageable age. Whoever needs can take their help. Sometimes they would take initiatives on their own also. Marriages mediated by such matchmakers carry stamps of authenticity, long term sustainability and what not depending upon the credibility of matchmakers. It is not necessary that matchmakers be professionals only. They could be informal uncles and aunts of the eligible bachelors. But they perform an important function. They **network**, they provide **linkages** and they build **bridges**.

I have narrated this long preamble on 'matchmaking 'not because I want to sell my services. I want to explore this metaphor for understanding the problems of building linkages between clients (the advantaged and not-so-advantaged farmers), the scientists and the extension workers (as differentiated as farmers or scientists are or could be).

In the process of exploring the phenomenon of **match making** I will also critique the lexicon of linkages. For serious students of linkages, I have attached two appendices. First deals with different channels of communication between farmers and the scientists and the second provides a critique of the lessons for managing links between research and the farmers based on the synthesis by Merrill-Sands et al (1989). Match making between disadvantaged farmers in high risk regions such as Rainfed regions and the researchers and the extension workers is discussed in an accompanying paper on **Transferring Science for Development and Diffusion of Technology** (Gupta, 1989).

After discussing 'lexicon of linkages', we pursue the idea of learning at individual as well as organizational level briefly.The match between structure and strategy of linkages and the variabilities in socio-ecological environment (illustrated through mean-variance trade off) is elaborated to identify areas of urgent learning .Finally, the lessons for matchmakers and link breakers are listed because we believe that **functional linkages can not grow unless dysfunctional linkages are dissolved.**

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This is a draft for discussion at the workshop on Making Link Between Agricultural Research and Technology Users, November 19-25, 1989, ISNAR, The Hague.I am grateful to Deborah Merrill-Sands for her comments on the proposal of this paper.

Part -One

Lexicon of Linkages[1]

The fact the most developing countries were colonies of Western powers which had primary interest in promoting their own economies at the cost of the economy of colonies, explains why the research system in these countries were organized to support commercial farmers in more favourable and homogeneous agro-ecological areas.

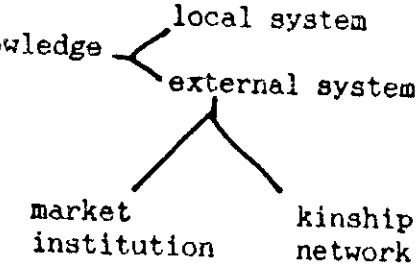
First Match between the needs of rulers and the resources of the ruled thus was reflected in the organization of cash crop oriented research system.This aspect has been very well brought out in the ISNAR study on Linkages .

Second Match between the interests of resource-rich farmers and the objectives of research system (even private, why only public !) was steered by the market forces. Input agencies could not sell much inputs in hill areas, flood or drought prone regions with all the attendant uncertainties. Likewise processing industries could not rely on the supply of produce - uncertain, scattered, ungraded as it was - from rainfed regions.

Market forces acted as 'monitors' of only some links and forged these whenever need arose. Association of industries or chambers of commerce are heard by the finance ministers before they frame the budget proposals. Whoever has seen such consultation with organizations of disadvantaged households (not resource poor) .I avoid the term 'resource poor 'for reasons below .

Disadvantaged households are poor in which resources:

- Capital
- Information/Knowledge
- Labour
- Land



Surely, the disadvantaged households, isolated as they are from market and public research institutions, are very strongly embedded in the kinship networks and informal knowledge networks. They are quite rich in labour and skills about using local resources (at least some of them, if not all).

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1 All references to specific terms , titles or concepts in this part are to the ones used in the discussion paper-also referred as Study- by Kaimowitz and Merrill-Sands (1989) prepared for the workshop.

Third Match between relatively poor or small scale cash crop producers or growers of irrigated concentrated crops or owners of cross breed cattle or horticultural farms and public institutions is not weak. Farmers' agitations have never been heard in millet or pulse growing regions. Some small producers are better articulated and networked with research system than many large land owners of dry uplands/swamp low lands.

Fourth Match between skills of disadvantaged households and their resources is not necessarily weak notwithstanding the survival needs. After all, don't the same poor farmers who are in chronic deficit also plant and maintain slow growing tree species in drylands/hill areas? The timeframe used by any decision maker is a function of the control he/she has on the respective resource market. When it comes to planting trees at their homesteads, the poor household take a very long time frame. Same household uses very different time frame for appraising it's investment opportunities in different resource markets . The inadequate understanding by the scientists of the survival system of disadvantaged households leads to disjunction between supply and demand of technologies.Extension strategies will vary for different technologies also on this account .

Fifth Match between researchers and the farmers could take place formally or informally through a large number of channels as described in Appendix I. Among several intermediaries the role of media, students in agricultural colleges, para-vets.artisans. financial institutions, farmers' organizations, theater and films, farm journals, seasonal meetings with extension workers etc., remained some what less discussed in studies on Linkages and OFCOR . While strengthening new linkages there was no point in ignoring the existing functional or dysfunctional ,weak or strong linkages.

Sixth Match between espoused theory of On-farm Research (about its focus on active user participation) and the theories-in-use (about passive participation of users) may be achieved by (i) reducing expectations of key actors , (ii) simplifying concepts, (iii) adapting these to manpower and institutional realities of each country/regional context, (iv) demystifying appraisal criteria (such as partial budgeting), (v) emphasizing qualitative methods ,(vi) acknowledging merit of local methodological and institutional innovations and (vii) recognizing possibilities of inverse correlation between status and skills.

Seventh Match between the need for direct contact between (a) all researchers and some farmers or, (b) some researchers and some farmers or (c) all researchers and some extension workers and farmers or (d) some researchers and only extension workers has to be appraised on the grounds of parsimony. While alternative 'a' is ideal, we should not allow the best to become the enemy of better.

There are several issues which arise in above context.

i) Interaction with which group of farmers is superior to interaction with which type of extension workers.

ii) Does it matter that interaction with farmers are held at any place or any point of time?

iii) Do we imply that interaction with extension workers no matter of what quality or experience is decidedly inferior to interaction with any group of farmers regardless of their backgrounds.

Studies have shown that the type of questions which farmers would raise in different months, regions or commodities are affected by (a) the channel of communication, (b) the response of the receiver or expectation of response and (c) historical experience of the farmers (Gupta ,1980). Therefore, the match between researchers and farmers and/or extension workers cannot be adequately achieved without providing qualifying conditions.

Eighth Match is between the **felt and unfelt** needs of the users. The proposition in the Study that 'better technologies are likely to be generated by the scientists and adopted by the farmers when they respond to felt needs 'requires some' modification. For instance, for almost two decades farmers in Punjab did not feel the need for balanced use of organic and inorganic fertilizers besides micro-nutrients. The result was a considerable decline in the productivity of macro-nutrients. Would one justify in such a condition that technology transfer agencies should not promote the technologies requiring balanced use of fertilizer because the need was not felt in the earlier years? There are many other examples where given the short time frame or limitation of information environment farmers do not feel the need of certain types of technologies which ,objectively speaking, have to be developed as well as disseminated.

An example of the gaps in research which emanate from responding to only users' felt needs is that of very limited -almost negligible -number of post-graduate thesis pursued during 1973-1983 on conjunctive use of organic and inorganic fertilizer in the discipline of agronomy in India . A review of post-graduate thesis from more than 30 universities and colleges in five disciplines for a decade demonstrated several other such gaps (Gupta, Patel and Shah, 1987, 1989).

Ninth Match has to be sought between **individual and collective rationality.** There is a story of milk pots credited to Akbar and Birbal. Birbal was a minister in the court of King Akbar and was known for his wit and humour. Akbar and Birbal often had the games of one-man-upship. Once Akbar was not convinced that individual rationality was not only compatible with but could also lead to collective irrationality. Birbal asked Akbar to get

a pond dug. Later an announcement was made that all the citiz of the town had to pour a jar of milk into the pond before sun rise next day .

What do we think actually happened! The pond was filled wi water because everybody thought only he would put water and res would put milk and so their contribution would not be noticed This phenomena is also referred as prisoners' dilemma in game theory.

Strengthening linkages between individual and collective rationality has not been part of the training strategies for farmers, researchers and extension workers at national as well as international agricultural research centres. Very little emphasis is put on building linkages for transferring technologies to groups rather than individuals.The issues of social and ethnic / cultural conflicts , group dynamics triggered by individual oriented technology transfer , marketing ideas and services through group approval vis-a-vis individual approval , management of common properties whether for sustainable pest control or soil and water conservation in essentially stratified societies etc., are usually not on the agenda .

Tenth Match has to be between the endowments of disadvantaged households and the technologies that extension system is supposed to deliver. The theory of household portfolio analyzed through socio-ecological paradigm (Gupta,1984 , 1985) may provide one way of identifying patterns in the endowments of poor farmers. This also requires changes in the incentive system for scientists who otherwise would not like to develop technologies with limited potential of diffusion.

Diversified resource use practices of rural households require diversified approaches of technology development and transfer. Greater the shuffling of enterprises in the household portfolio greater would be the need for timely adaptation in linkages among various organizations dealing with inputs or outputs of each resource market. In developed regions because of higher rate of capital accumulation, greater demand of market inputs, the coordination/networking among various organizations is triggered by market forces. The problem arises in regions where demand is low and dispersed with the result that market force has no interest in coordinating the delivery and demand systems. Need for public interventions become pronounced in such cases. The paradox is that public interventions are also found to be much more dominant and strong in the **spaces ,seasons and sectors** where market forces are strong. What type of strategies need to be developed for building linkages among different systems will therefore, vary in different agro-climatic/socio-ecological conditions. We come back to this in second part .

The need for linkages is closely linked with the need for learning. Incentives for exchange of resources, information and authority among different organizations may vary over time as

well as space. However, one thing is common which influences the sustainability of linkages and that is the extent to which participating members in a network find exchanges rewarding in terms of lessons for future operations.

Detailed discussion on the socio-ecological , technological and institutional environment for studying linkages in Research for Rainfed Regions is given in Part -One of the **Annexure -Three** viz: Managing Research Networks for Helping Poor in Risky Regions :A Study of Inter- Organizational Linkages . Literature is reviewed briefly in second part of the proposal . Our contention here is that linkages between different streams of extension dealing with say crop ,livestock , trees ,tools etc., may not adequately evolve if the research streams for respective commodities or disciplines are not properly linked .

Part-Two :Linkages for Learning

Sustainability in any system depends considerably on the barriers and the opportunities which exist for learning with in and outside the system . It is not enough if only members of an organization learn . To institutionalize a small change in one sub system we have to make many changes in several other sub systems and at several levels (Mathur and Gupta,1984). Since in development practically nothing can be done by any one organization , need exists for taking an inter-organizational perspective .

2 Barriers to learning

Learning requires discrediting . Both at organizational and individual level ,the incentives for discrediting are generally low in public as well as private bureaucracies though more in the case of the former . Often administrators follow what Argyris calls 'Single Loop ' model of learning . They emphasize what I may call instructional routine . Do what you are told . Learn to follow . Whenever in difficulty refer the matter to higher ups or just redouble efforts . However, 'Double Loop' refers to a situation in which the person is encouraged to question the belief system underlying an assumed causal relationship . Thus thermostat is an example of single loop model . In case the thermostat could change its value by looking at the contents of a refrigerator as they are changed , it will become double loop model .

Systems have thus to generate capacity for recalibrating their sensors with the change in the environment .The leaders can reinforce such a type of learning by 'monitoring context rather than just the content '.

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2 This section draws upon three papers entitled " Why Do Not We Learn ! " (Gupta,1984) and "When Shall We Learn " (Gupta 1987) and "Institutionalizing Lateral Learning in On-Farm Research and Extension Programes in Eastern India :an exploration in organizational learning (Singh et al ,1987).

But why do we not find many examples of extension-research system having double loop systems of learning . Many dysfunctional linkages continue while efforts for forging new linkages are being made .

Barriers to learning

- My learning is not enough , others must also learn ;

- Benefits assumed from learning are not sure and sufficient ;

- The cost on non-learning is borne by others .how does it matter if I do not learn ;

- Learning takes time , one is always in hurry while planning . Who has the time to review past experience and learn from previous mistakes ;

- Learning from `below and outside´ (i.e. from juniors .farmers and extension workers for researchers and vice versa) requires capacity to acknowledge lack of correlation between status and skills ;

- Replicating `success´ rather than the `process ´ of discovering rules or grammar of success is most admired in bureaucracies. Allowance for learning the process may mean providing room for decentralised designing , who will take the `risk ´ of having diversity in program content . Will not it increase the burden for monitoring ?

- Learning implies being accountable both horizontally (towards the clients) and vertically (towards the juniors) . If planners monitor the monies spent and goods delivered , who will care to monitor client satisfaction or creativity at lower levels ;

Kaimowitz and Merrill-Sands (1989) rightly argue for putting `Links into Context ´. However , there are a few cautions which may be useful to exercise while putting links into their context :

- The pressure from farmer groups particularly from the ones in high risk environments (it is only rare that farmers,pastoralists or artisans will ever be able to form group in drought or flood prone regions) is unlikely to be co-terminus with the pressure from donors for bringing about change . The donor pressure because of the process through which donor advice is generally generated is not likely to

be an important means of influencing policy changes in favour of the poor. Political pressure from donors is some thing which I personally dislike as a means of even contemplating change no matter even if in positive direction . I will prefer donors strengthening the institutional capacity to generate signals for more poor-responsive policies .

- It is not true that when resources are constrained the managers are unlikely to foster linkages . Need for networking and pooling inter-organizational resources is most evident when no one organization has all the resources necessary for achieving given objectives. Our studies have shown that it is the 'optimal scarcity ' or what Hedberg (1981) calls 'minimal affluence ' which may breed both learning and linking .

- The operationalization of Eco-specific design of resource delivery systems (Gupta ,1985,1989) requires linking the nature of :

risk adjustment opportunities (Assurances - both vertical i.e. about future returns from present investments and horizontal i.e. assurance about others' behaviour vis-a-vis ones' own) ,

resources (Access differentials in society) and

skills available (i.e. Ability to convert access into investments

with the design parameters of delivery system .

Putting links into socio-ecological context

Let us assume four socio-ecological contexts . Each context is dominated by specific type of portfolio of enterprises or bundle of enterprises evolved by the households living in that context for a long period of time . These portfolios are analysed here in terms of the average returns that are generated by the households along with the given fluctuations in the cash flows or the returns .Typologies are:

-High mean or average returns with High variance or fluctuations in returns (Type one);

-High mean returns with Low variance (Type two);

-Low mean with High variance (Type three) ; and

-Low mean with Low variance (Type four) .

Type one portfolio includes combination of cash crops ,cross bred cattle, hybrid varieties , fast growing tree species etc. These activities provide high returns , require larger amount of capital , better access to institutions providing inputs ,advice and markets . At the same time due to technological reasons (pest and disease vulnerability) or market reasons (price fluctuations due to local or global changes in demand or supply) the variance is also very high . Not every body can insulate himself/herself from the fluctuations . Though income levels are highly uneven , the minimum level of living is also high because the market wage rates in these regions are high as also the employment opportunities .

Type two portfolios are the most rare ones and indicate least vulnerability . In some of the plantation crop regions or irrigated wheat and paddy regions one could find a high ,stable and regular income stream. The mechanization will be much more here than even in the first case . The high and sustained surplus will lead to very developed markets . Income differences will be much less uneven than in the first case .

Type three indicates the most vulnerable portfolio. Households in semi-arid and arid regions having sheep and goat, growing local varieties of millets ,pulses and oilseeds that too mainly in mixtures rather than in sole condition . Households have deficit in their budget ,suffer from chronic malnutrition ,have high participation rates for women and children. Due to large scale outmigration of men , the proportion of women headed or supported households with high proportion of old and infant or child dependents is also very high . The market forces are very weak , the available stock of technological alternatives is very low and even with in that very little is diffused at the field level .The ecological heterogeneity is very high such that it is not possible to even have technological solutions which will diffuse very widely . This is the portfolio which deserves highest priority for on-farm research as well as for building extension research linkage .

Type four portfolios would abound in medium rainfall regions with moderate to poor soils ,cropping intensity is higher than is the case in Type three but crops are mainly rainfed with low productivity. The livestock breeds of cattle and buffaloes are local with low but stable productivity .The economy is diversified but at low level of commercialization . The barter terms of exchange are generally adverse for the local produce . The poverty levels are high but income differences are less skewed .

Design of linkages

Type one (High Mean-High Variance) :

Strong Demand for technology ;greater reliance on market ,public intervention restricted to regulation ; extension through commod-

ity based farmers groups , marketing channels for outputs in case of high value crops and inputs for low value commodities : technology can be more cost effectively diffused through market segmented approach, public agencies could concentrate on technologies aimed at sustainability e.g. balanced used of fertilizer, biological pest control as against chemical control , group based synchronised sprays etc.; macro policies for quality control , insurance and transport ,storage and processing will need greater care ; no need for village based extension workers ,instead district based strong research and extension centres need to be set up so that farmers and their bodies bear cost of travel to these centres for getting information ; wherever they may consider necessary the farmer groups may hire private agents for technology transfer ; subsidies be aimed at only institutional development and not for inputs , some emphasis on contractual services etc.

Type Two (High Mean - Low variance) :

Here main difference from the type-one is that degree of reliance on market forces will be higher , computer based intelligence systems could be located at the district level to provide opportunities to producers to generate very precise need based technological packages ; contractual services may be relied much more here ; policies for value addition will need greater attention due to higher reliability in output flows ; producers organization may own the extension system rather then relying on public or private channels ; government should provide tax incentives to private sector for investment in research system (and not for extension purposes).

Type Three (Low Mean -Low Variance) :

Need for on-farm research is most pronounced here ; public system for extension should be specially geared to deal with women clients , common property systems , group based technology transfer ; extension system should spot farmer innovators and arrange their visits to various regions to spot local innovations and organize local experimentation; large number of dispersed facilities for research and extension will need to be created due to low level of population density ; private sector as well as farmers' organizations in surplus regions with Type one and two portfolios will need incentives and pressures to cross subsidise research and extension investment in these regions ; subsidies for market channels for input as well as output marketing channels will be most necessary because market fluctuations often offset whatever little gains are made possible through technological changes ; due to diversified but inadequately adapted portfolios of households vulnerable to spatial and seasonal variabilities ,the extension system has to be diversified including multipurpose and inter-disciplinary workers ; networking among extension ,research ,marketing and input agencies will need to be closely monitored ; public distribution system for basic needs will need to be strengthened so as to shift the portfolios of the

household towards more sustainable tree and pasture based farming systems ; greater reliance will thus have to be on supply side interventions ; mobile systems of technology transfer will have be developed because populations will be most mobile here due to seasonal migrations , sedentary systems will be most inappropriate ; conservation technologies will have greater priority and thus training in group action will be necessary for on-farm researchers as well as extension workers .

Type Four (Low Mean - Low variance) :

This is the context for which moderate technological advance exists ; here also market forces are weak though they are stronger than in the case of type-three ; with proper incentives market based extension system is more likely to operate here than in the earlier case ,however, the reliance will have to be kept on the supply side interventions in the early period of technological change ; the on-farm research system can be linked with extension at an early stage itself unlike in Type three context where linkage will have to forged only after stabilization of on-farm research system ; livestock ,agro-forestry and farm implements will have relatively higher marginal contributions than just the input based crop technology due to better possibilities of water conservation ; group action will be important here too except that here groups may be more easy to form ; centralised-monitoring with decentralised planning may be more appropriate here .

It is obvious that the parameters on which extension and on farm researchers will need to be evaluated will be have to be different in each of the cases . In first two cases greater reliance can be placed on output monitoring where as in latter two cases input monitoring will be given importance .The motivational strategies will also differ. In type three case the result or feedback induced motivation (Mathai,Pareek and Rao ,1978) will be weak and program leaders will have to use team based rather than individual based performance criteria. Given higher uncertainty in Type -three case and least in Type two , only a few practices can be transferred from one to another case . Learning from experimentation in first two and latter two categories separately will have to be organised . Since variability is large in Type three case , the need for experiential methods of institution building rather than normative or prescriptive methods will be useful .

Learning laterally among different systems will thus become cornerstone of institutional development . We have given in Annexure -Four an excerpt from (Singh et al ,1987) providing examples of `Lateral Learning ' process triggered in an Eastern Indian agricultural university by Indian Institute of management , Ahmedabad (also see Gupta et al ,1987).

Part-Three : Lessons for Link Breakers and Match makers

In a paper on match making why are we discussing the role of link breaking ?

- Learning is linked with unlearning : once bitten twice shy !

As we mentioned in the beginning ,to strengthen certain new links with in and outside an organization ,certain old links will have to be loosened or dissolved . In bureaucracies , organizational folk lore acts as the memory cell of the organization . Old events when linkages with others did not work are recalled to justify inertia in this regard . The strong links with past memory of failure is essential . It can be done not by characterizing earlier experience as invalid or illogical but by redefining the context . The causal model underlying failure has to be changed . For instance , extension of say a variety of hybrid sorghum suffered not because extension workers were less sincere but because the scientists gave less importance to lower harvest index and fodder quality . The tendency to take any and every research finding to be valid in each local context will have to questioned . How will local confidence be generated without local trials ? . What is the best way to do it and where should it be done is discussed elsewhere (Gupta ,1989). Risk averse supply side can not enthuse risk averse farmers . Issue is to help extension and on farm researchers to take risk through unlearning and modified performance appraisal .

- To make horizontal links , break vertical links !

In an action research study on district project planning (1978-1981)in six drought prone districts of India , we learned that horizontal inks could not be strengthened at district level unless the vertical links of each department between field units and the head quarter were weakened . The monitoring system were designed to discourage lateral linkages . Recent studies and Three tier workshops on Management of Research for Rainfed Regions (jointly organised by NAARM,CRIDA,ICAR and IIM A) have revealed the need for new initiatives in fostering lateral linkages . it was found that in some cases permission from headquarter had to be taken for even inviting an outside researcher in some of the regional research organizations . Several commodity stations located at the same site but working under different programe coordinators did not compare their results of the trials in the same agro-ecological station .Kaimowitz and Merrill-Sands are right when they suggest the need for special incentives to promote group action and sharing of information .Middle Tier Workshop on Research Management (December ,1988) brought out the role evaluation parameters used by Agriculture Scientists Recruitment Board (ASRB) played in strengthening individual result oriented culture . May be 'break' is a strong word . We may say that loosen or dilute the vertical links so as to make the links horizontally .

- Centralised planning -centralised monitoring vis-a-vis decentralised planning and decentralised monitoring :merit of mutual monitoring !

In absence of any type of `mutual monitoring´ ,incentives for linkages at local level are reduced . We had argued earlier that monitoring systems can improve considerably by eliciting critical information through various groups of people (Gupta,1981). It may now be added that performance appraisal through monitoring ,(a) performance of information networks and (b) inter-organizational sharing of resources , a different culture may be created than is the case currently . As shown elsewhere (Gupta ,1980,1989), the one way communication - one way power reflected in the first case above is bound to lead to organizational decay because of organizational insulation from changes in its environment . Hedberg(1981) call it a paradox of Tents and Palaces . The organizations which use tent pegs instead of building palaces can quickly move into new niches and avoid obsolescence .

Finally we may suggest that recasting the lexicon of linkages itself may help a great deal in fostering new images of cooperation . But energy comes out of conflicts.

Breaking or diluting or redefining links with `resource rich ´(say by relying on market channels while dealing with them) may be necessary to foster links with disadvantaged household who are poor in most material resources (though are rich in local non-tradable information).

The challenge is to recognize that making links or `matches´ is a game of breaking some links .

Appendix I

CHANNELS OF COMMUNICATION BETWEEN FARMERS AND SCIENTISTS

Formal Exchange

1. Exchange among farmers and scientists takes place in Kisan Mela (Farmers' Fair) held in Rabi (Winter) and Kharif (Monsoon) just before harvest seasons at:

   where

   - research station (HQ)
   - regional research stations/National Agricultural Research Project (NARP)
   - krishi vigyan kendras

   when

   - question-answer session
   - visit to the technology sites (fields with new varieties/practices)
   - visit to the stalls in the exhibition
   - interaction with the sales field force of input industries.

   how

   - induced participation (extension workers bringing bus loads of farmers)
   - voluntary participation (farmers coming on their own)
   - students in agricultural courses bringing their parents or relatives
   - students from rural areas themselves acting as carriers of information

2. Half yearly training/orientation of extension workers before the onset of Rabi and Kharif seasons at university HQ.

   - All district extension officers along with senior assistants attend 2-3 days orientation/crash programme for understanding strategy for next crop.
   - In some universities, instead of inviting extension workers to university HQ, multi-disciplinary teams of

scientists visit different districts to make what they call 'constraint inventory'. Some informal mutual learning does take place in the process.

Extension workers bring feedback on last year's technological messages and hot debates take place on some contentious issues.

3. Periodic meetings under T&V System.

   - In absence of fresh fortnightly messages year after year, the interest wears down. The flow still is one way, from SMS (Subject Matter Specialists) to extension workers. Feedback is weak.

   - Contact between farmers and extension workers though more frequent in developed regions is less effective because contact farmers are often better informed. In poorly endowed regions there is not much that extension worker has to offer to the farmers and he avoids contact and thus is ineffective. In medium growth regions, the system works better provided there is a strong institutional back up.

4. Farm Journals

   - Letters to the editors of these journals are an important source of information for articulate farmers for problem which are not short term in nature.

   - Problem specific campaigns.

5. Extension campaign by the graduate students in agricultural universities as a part of their final year curriculum through village camps. Consolidation of farmers' problems and discussion with students and teachers during after the camp.

6. On-farm research and extension programme

   - Experiments on Cultivators' Fields (ECF) is a programme for development of agronomic practices for different varieties/advanced lines for high, moderate and low input environments. The project provides for carefully designed trials akin to on-station trials and moves to different villages after three years. Managed by the scientists and results are analysed as a part of all India coordinated trials.

   - Operation Research Projects aimed at technology transfer through local problem solving for different commodities (pulses, oilseeds, cereals etc.) resource management coordination (watershed/water management) or client groups (Tribals, Scheduled/Backward castes) or regional needs (North-East hill area people) etc.

- Other programmes such as frontline demonstration under National Demonstration Scheme, Lab-to-Land programme or Krishi Vigyan Kendra etc., supplement efforts like radio-talk, discussion forum (Charcha Mandals), use of folk theatre for communication, television programme etc. Correspondence courses for farmers are also aimed at connecting farmers to the scientists.

- In earlier years, feature film makers were encouraged to include scenes of technological importance in rural situations. Not much effort was made to generate feedback of farmers to these messages.

7. On-farm research for rainfed low-land/up-land/medium land rice, mustard and other crops.

- The trials are formal but learning is both formal and informal. The methods for proper appraisal of trial are still being developed. In many cases, the design of trial takes place before the results of survey of local constraints are available. This is true of programme designed by IFAD/IRRI experts as well.

- Some innovative efforts have been made such as distributing residual seeds of advanced lines rejected out of breeding programmes at station to give another chance to these lines at farmers' fields. Farmer to farmer diffusion is monitored in the next season to appraise the farmers' preference for these lines. Although, formal programme of technology development by bringing such lines back to station for advancement in varietal testing and release process is yet to be started, the process has a potential (Maurya, 1985-89).

- Under ORP for dryland watershed, scientists have tried to supplement farmers' own practices with the improved ones. Experience of grafting technological transplants has generated ideas for modifying research programme as well.

- District Technical Committees in Bangladesh provide, theoretically at least, an opportunity to extension workers and on-farm researchers to recount their experience of trials/demonstrations laid out at farmers' fields. The process is weak but can be improved.

8. Under National Agricultural Research Project (NARP) status reports were prepared for each Regional Research Station (RRS). Eventhough, these reports dealt with mostly the physical resources and cropping system in the hinterland of RRS, some mention was made about key constraints of farmers problems.

Informal Exchanges

1. Technological Tours: Scientists do visit farmers' fields as a part of their own commodity/disciplinary interests off and on while visiting regional research stations or attending other meetings.

2. Farmers visit the scientists directly at the research station. Undoubtedly these are not the disadvantaged poor farmers but some feedback from such farmers is received through these informal interactions.

3. Students from rural areas bring some of the important problems in the classroom discussion.

4. Media, particularly, vernacular press also highlights some of the serious farmers' problems which scientist notice directly or through formal scanning of farm news done by extension directorates in some universities/State and Central Government departments of agriculture.

5. Farmers' association/Plantation workers' unions in some rare cases have raised issues of technological impacts on them as in the case of pesticide/herbicide effects; or cultural incompatibility of certain technological recommendations (rat control being a taboo in some areas; workers demanding an additional coconut for climbing trees to place rat killing tablets in clums of coconut leaves in Southern island states; etc.).

6. Many sensitive scientists specifically visit 'problem' regions on hearing farmers' problem and study the same for their professional reasons.

7. During drought years, massive movement of people and cattle takes place towards urban regions. While in their native regions, the pastoralists remain inaccessible because of difficult terrain and low population density, they are available in large concentrations in cattle camps. We had suggested that such cattle camps be used to document people's knowledge and disseminate relevant technological practices back to them. Some beginning has been made during last drought of 1987.

8. Livestock breeders' association, though weak in most developing countries, are another vehicle for exchange of knowledge between scientists and the pastoralists.

9. Workshop of artisans, pastoralists, horticulturists etc. are organized now and then which provide both formal and informal opportunity to the scientists to learn about people's problems.

10. NGOs/parastatals/cooperatives also mediate between farmer and the researcher in some cases.

Appendix II

Critique of Lessons for Managing the Link Between Research and Farmers

Several useful lessons have been synthesized by Merrill-Sands et al (1989) from the nine case studies of On-Farm Client Oriented Research Programme at ISNAR. Critique below is intended to trigger debate. Hopefully, this will help in moving towards more precise and testable propositions.

1. **Meeting or activities to sustain farmers' involvement in OFCOR are necessary. These are easier to organize and sustain when On Farm Trial (OFT) sites are clustered in specific villages or sites.**

   This is undoubtedly one of the most important dimension of OFCOR. However, the method seems to be becoming the purpose here with the result that goal of technology development may suffer. This is more true for rainfed regions.

   The concentration of OFTs in the selected villages/sites violates one of the necessary conditions of technological diffusion, i.e., the new technology must be tried against the local best. In rainfed regions, the niches of optimal or most favourable conditions for different crops or agricultural enterprises being researched by a OFR team are unlikely to be found in any one, two or three villages. The ideal niche for mustard and wheat cultivated on residual moisture are characteristically different as apparent from ecological maps prepared in Bangladesh (by OFRD scientists) and in Eastern India (Gupta, 1989; Gupta et al, 1986). Thus the purpose of organizing meetings may be served by concentrating in a few villages, but the purpose of these meetings will be at least partially lost. Undoubtedly, the farmers will wonder at the 'science/logic' underlying scientists' practice of locating all types of trials in selected villages only. This is a strong criticism of FSR site concept developed by IRRI and CIMMYT and followed in Bangladesh as well as many other countries. Since, not for all technologies the selected site is inappropriate, the contradictions do not always manifest in short term. But farmers do grumble when treatments do not make sense to them.

   On the other hand, when technologies are tried against local best, farmers respond through horizontal farmer-to-farmer diffusion - a sure test of any technology. They also respond much more enthusiastically. Further, the morale of scientist also is boosted when he begins with more favourable constellation of condition within a given region. Desai and Patel (1984) also questioned locating ORP of certain commodities in villages where these commodities were not important at all.

2. **Selecting Farmer Cooperators: A purposive selection farmer using criteria which explicitly reflect the objective of the research activity is a minimal requirement.**

There was an intense debate on the subject in OFRD, BARI, Bangladesh when the conflict between developing technologies for farmers or soil series was raised (see, the notes by Gupta, 1986; Fakhrul's rejoinder and proceedings of OFR review meetings of OFRD, 1986). Empirical research by us had shown earlier in Western Indian semi-arid context that ecological variables contribute far more towards variance in choice of certain technologies than social or economic variables in rainfed regions (Gupta, Patel and Shah, 1985). The residual moisture, soil fertility index, previous crop or fallow condition etc. influenced certain choices much more than access to banks/availability of credit or land-holding size as a proxy of economic status. While we had taken the view that selection of farmers should precede the selection of site, the later deliberation proved this as an inadequate formulation in many cases. Thus identification of sites on the basis of ecological niches (not necessarily soil series because empirical research on its contribution to choice of technology is still inadequate) may be not only necessary but a minimal requirement. Not all research can be class specific though some can certainly be, but all research is indeed eco specific in rainfed regions.

3. **Synthesizing farm level information is possible mainly through (a) frequent and ongoing contact with farmers and (b) involvement of field staff - junior scientists, technicians and field assistants.**

This is a lesson well learned. However, the solutions suggested need more precision and should incorporate wider range of choices. Frequent communication with farmers will be functional and sustainable only if:

i) farmers' (different social groups) notice a sign of scientists acknowledging explicitly limitations of their own understanding;

ii) farmers find scientists changing or modifying their research design/priorities both at their fields and on station; and

iii) farmers see the scientists acknowledging superiority of farmers' practices over technological recommendations in the cases where such is indeed the care (as often found in rainfed regions).

Several ways of institutionalization of synthesis and incorporation of farmers' feedback in research programme were evolved in Bangladesh through collaborative efforts of the author and OFRD scientists of BARI (Gupta et al. 1986,

proceedings of Annual Research Review Meeting, OFRD, Bangladesh Agricultural Research Institute, 1986; Jabbar and Abedin, 1989).

a) Each research proposal or experimental design to be backed up by: (i) information on justification not only in technical but also in socio-ecological terms; (ii) criteria for evaluation of the experiment as success or failure again in terms of users' preferences and (iii) discussion on existing farmers' practices/wisdom underlying the same wherever applicable.

b) Annual workshop for review of last year's research results and planning next year's programme must include (examples of lessons learned from farmers about (i) innovative practices; (ii) modifications made by farmers in scientists' recommendation, (iii) experiments started, modified or stopped on account of feedback from farmers and extension workers (who complain that scientists sometime continue with experiments which extension workers consider invalid).

c) The schedule of meetings with farmers was also worked out in the draft guidelines developed for on-farm research at Bangladesh Agricultural Research Institute. It was clarified that discussion with farmers should take place keeping in account following aspects:

   i) The ideas for research may be collected from everybody but generation of priorities may require separate meetings with poorer and better endowed farming households;

   ii) Whenever there are natural contingencies like a dry spell or heavy rains or hailstorm, the coping strategies of the farmers needed to be studied and documented;

   iii) Contingency treatments were to be designed keeping in view local conditions and available technologies so that trials were not laid out irrespective of whether climatic presumptions were valid or not at the time of grounding trials. Evaluation of these contingency treatments provides another opportunity for synthesizing farmers' knowledge and influence over the scientists;

   iv) Results of research are seldom shared with the farmers in all the nine case studies. This is an important step both for ethical and scientific purposes if sustainable bridges have to be formed between farmers and the scientists (Gupta, 1983, 1987).

4. **Interdisciplinary Research System: Integration by 'Stapling'**

The OFCOR studies have confirmed our earlier observation (Gupta, 1986) that much of what passed under FSR involved integration by stapling. However, the remedy suggested has some problems. Given the increasing importance of phenomenological orientation in most scholarly pursuits, there is no escape from becoming interdisciplinary oneself. Team building as a subject of research has hardly received any attention in the faculty of agricultural universities/institutes. 'Mutual monitoring', 'lateral learning' and 'culture of acknowledgement' (of even personal communication) are three of the important determinants of team building in field research.

5. **Incorporating Social Scientists vis-a-vis Social Sciences**

I do not agree with the observation that "those programme without social scientists or with minimal social science input, were the most vulnerable to loosing their focus on clients' needs and priorities, their dynamism and their systems perspective".

One should first of all distinguish the incorporation of social scientists from the social science skills/ perspective. Much of what agricultural economists do in OFCOR world over is accounting and not economic research. part of the problem lies with the training provided by the IARCs.

Further, my experience in Bangladesh and later in India convinces me to state that biological scientists can acquire the social science skills far more easily and readily than vice versa (Gupta, 1986). I do not dispute need for social science input but I do dispute the correlation sought to be established between the focus on client needs with the availability of social scientists. (Citation of Ewell's paper in this regard may also be inappropriate).

There is a real supply constraint in terms of good social scientists in most developing countries. In any case, there is no substitute to the direct interface between biological scientists and the farmers. Sectoralization or Itemization as Bernard Schaffer put it, of understanding clients' needs as a social scientist's job will prove to be most inappropriate for achieving the objectives of OFCOR.

6. **Institutionalizing Social Science Research Through Foreign Experts**

The problem in finding national equivalents in status and skills to replace foreign scientists is an artificial one. When most expatriate scientists believe in training technicians and not technologists or scientists, should one be surprised over this observation? Also, the observation

may not be an entirely accurate description of the problem. This is an area where considerable soul-searching is required on the part of donor agencies.

7. **Client-based Research Agenda**

Component technology trials need not be necessarily non-client oriented, as implied in the study. It is true that back up support from senior scientists is not available to field researchers. However, the conclusion that "instability in staffing social scientists, who bring a holistic and integrative perspective to on-farm research, has also contributed to methodological stagnation" is not easy to accept. There is nothing innate in social sciences which should lend these to a "holistic or integrative" perspective any more or less than other sciences. The ideological values and ethical issues which underlie the research trade off have to be faced in any branch of science - social science being no exception.

8. **Involvement of Extension Workers in Defining Research Agenda**

This is undeniably an important objective but not too much emphasis need be put on it. Neither the farmers nor extension workers can always anticipate or guide the search for futuristic technologies (Gupta, 1987).

Relying entirely on demand based model of technology generation will reduce the zone of responsibility of the supply side, i.e., the scientists. Hence, scope for both type of intervention must be provided for.

9. **Combining On-farm Research and Technology Transfer**

The contradictions can indeed arise when research and development functions are mixed up (Desai and Patel, 1984). Properly designed on-farm research, I submit, will subsume extension function. Trial in contrast with local best inevitably leads to transfer if the results of trials are significantly superior to the experience with local technologies.

10. All the five lessons in the Study regarding linking On Farm Research and Transfer of Technology (TOT) agencies are valid, i.e., on-farm research can not substitute for extension, it should move beyond informal field level cooperation, develop partnership with TOT organizations, anticipate need for links early in the research process and build linkages at multiple levels (Merrill-Sands et al, 1989: 20).

One has to only qualify these by suggesting that operationalizing these lessons will require a combination of strategies, structures and skills. The study has not elaborated on these. For instance, the strategy required to build linkages between a weak extension system for livestock

rearers with an equally weak research system may be totally different from the strategy for linking extension system in cash crop growing region with private and public research back up for these commodities.

The design of the resource delivery systems, we have argued must correspond with spatial, sectoral, seasonal and social aspects of the client system. Further, the design of delivery system must deal with the existing situation with regard to access that different classes of households have to resources, assurances they have about (a) future returns from present investments (vertical assurances) and (b) other's behaviour vis-a-vis ones own (horizontal assurances) and ability or skills that people had or have or need to have. Given any two vectors as fixed, the way of manipulating third can be worked out in Socio Ecological Paradigm (Gupta, 1985, 1987 and 1989).

In system theory perspective, learning is triggered and sustained through heterogeneity. Homogeneity in design leads to entropy (Friedlander, 1983).

Draft Research Proposal: 1989

MANAGING RESEARCH NETWORKS FOR HELPING POOR IN RISKY REGIONS: A STUDY OF INTER-ORGANIZATIONAL LINKAGES*

Context

The resilience of Indian agriculture achieved through a mix of public policies; institutional infrastructure, technological backup and farmers' participation has received global acclaim. There is no doubt that agricultural scientists have played a pivotal role in achieving high production targets in irrigated and low risk regions. However, the scientists & planners are not satisfied with the technological alternatives generated in or transferred to dry regions (Venkateshwaralu, 1989; Singh, 1987 Draft Working Group Report on Agri. Research & Education, VIII F.Y.P. Planning Commission 1989).

Higher the uncertainty in the environment for which technologies have to be developed , greater is the compulsion for inter-disciplinary research. The survival systems of disadvantaged households in arid and semi-arid regions are quite diversified. Crop-Livestock-Tree-Craft interaction are very complex and dynamic. Given the evolution of disciplinary expertise in science and technology institutions in our country, no one organization is expected to have all the expertise necessary for tackling such inter-enterprise interactions in the rainfed farming systems.

While no one organization can provide all the resources necessary for such research to be pursued , it is also true that

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each organization has some redundant resources. These can't be optimally utilized within the boundary of that organization. The redundancy of some resources and scarcity of others may generate the need for inter-organizationl networks. At the same time, distribution of authority, power and control over scarce resources and access to key decision makers may be such that some functional networks may not emerge while other dysfunctional networks may get formed. Managing networks thus becomes an important challenge for the organizational leaders.

In agriculture research system the planners have been conscious about the need for induced coordination through administered networks. All India Coordinated Research Projects, Technology Mission, Research Committees, National Agricultural Research Project, Scientific Panels and bilateral arrangements between Indian Council of Agricultural Research (I.C.A.R.) and other research systems such as State Agricultural Universities (S.A.Us) and International Agricultural Research Centres (I.A.R.Cs) are some of the ways in which inter-organizational coordination is achieved. It is obvious that arrangements devised at one point of time may not turn out to be entirely suitable with the increase in the environmental complexity over time.

Given limited breakthrough in research for rainfed regions the challenges before scientists in terms of socio-ecological, technological, institutional and public policy contexts are quite complex. In order to strengthen the capacity of the scientists to deliver technological alternatives by working at

station and/or at farmers' fields, it is necessary that the changes are attempted in various subsystems that are interacting at the household and institutional level. In this study we are not concentrating on the dimensions such as price policy or infrastructural support in the form of irrigation or drainage which influence the demand for technology. We are also not studying the problems that lie exclusively in the domain of technology transfer. Our thrust is in identifying opportunities for networking or coordination that can strengthen the research system with particular reference to the problems of high risk rainfed regions. The linkage with other systems are thus primarily seen from the regulatory, resource and feedback perspective. In the first part of the proposal we identify some of the key challenges that scientists have to face in different domains. In second part brief review of literature from the organizational theory stream is presented to conceptualize the inter-organizational context of research.

Part I : The Context of Agricultural Research

a) Socio Ecological Environment

In arid and semi-aridregions, the scientists confront low population density, weak market infrastructure, high ecological heterogeneity even at short distances, very high climatic risks, 'hungry' soils etc. Majority of the farmers and pastoralists have been marginalised due to frequent drought and weak public policies.

In humid and sub-humid regions prone to floods, the problems are very different. Population density is much higher, soils are generally very productive, drainage is poor, markets are less developed and social institutional structure is quite oppressive (some call it even semi-feudal). Topographical variability, coupled with climatic variabilities generates very risky environment for low land as well as unirrigated uplands.

Due to impoverishment, large number of males out migrate leaving the women to pursue farm operations. Institutions, weak as they are, prove particularly inadequate to deal with women headed or managed households.

The household adjustment with risk has been studied extensively in literature (Chaudhary & Bapat 1975, Jodha 1978 1983, Gupta 1981, 1984, 1987, 1989). The recent thrust on research prioritization on the basis of agro-climatic zones further underlines the need for proper characterization of socio-ecological environment. Some attempt in this regard was made in National Agricultural Research Project (NARP) in which the Status Reports were prepared before setting up various regional research centres. However, the mechanisms for updating this knowledge have to be strengthened particularly in rainfed regions where dynamics of environment takes long time to unfold.

It is possible that linkages, between different enterprises once monitored at household level through the Status Reports may

generate pressure for linkages among disciplines / commodities at research station as well. Since the expertise for such components to be linked is unlikely to be available in one place , need for inter-organizational linkages may arise.

b) Technological Environment

The technological alternatives have to surpass the 'stability' of the indigenously evolved farming systems. It is true that short term stability is being achieved in many cases at the cost of long term ecological degradation at least in the arid west. The extra-ordinary high growth rates of sheep and goat in Western India reflect one such feedback of household choices on ecological system.

Many of the technological alternatives require group actions or management of resources on common property basis be it soil and water conservation, drainage, pest control, grazing management etc. Most of the efforts in past have been aimed at generating individual level technologies.

Given the diversity of household economy and risk adjustment strategies of farmers and pastoralists, 'cafeteria' approach to generation of technology becomes necessary. The alternatives such as Mexican wheat or dwarf upland irrigated rice varieties which could diffuse widely are unlikely to become available in rainfed regions. As a result the location specificity in technology generation becomes very crucial. It has a bearing on the incentive systems that are built in research organizations for making

research with limited diffusion attractive and organization ally meaningful. Some others involved in the development of Hybrid Varieties of Sorghum and millets question this emphasis on the location specific research. They believe that varieties will have to be continuously screened for wide adaptability. Though package of practices could be location specific (N.G.P. Rao, 1989)

Many issues concerning crop-livestock-tree-tool interactions in rainfed regions were discussed in a middle level national workshop on Management of Research for Rainfed Regions, December 1988 and a top level workshop held at IIM-A in Nov, 1989 in collaboration with NAARM, CRIDA and ICAR.

Crop-livestock tree interaction are extremely important but institutional linkages continue to be weak. Recent studies have highlighted several parameters which need to be taken into account. For instance crop residue digestibility of new varieties developed at CIMMYT has been found to be less than 50% as against 52-65% for the traditional varie ties (McDowell 1988 : 67). Others have argued that selec tion of varieties/quality may not be advisable in the early stages of breeding (Onim, 1988 : 157). No correlation has been found between grain yield and straw quality when 100 varieties of a cereal were screened (Orskov, 1988 : 159).

It is being now recognized that despite the time and loca tion interactions, nutritive value of straw of different rainfed crops does differ from variety to variety. Studies have shown that dwarf varieties have generally less digesta-

bility (Capper, 1988 : 250). Even though there are arguments against taking straw quality and quantity into account while developing high yielding varieties (Berhane, 1988 : 253) there is evidence available in India from many crops including sorghum where farmers have discontinued cultivation of hybrids in certain cases due to poor straw quality. ICRISAT has already started screening millet varieties for fodder quality. Our own studies have shown that farmers in dry regions prefer taller varieties with higher fodder content. These are issues which call for closer interaction between crop and livestock research scientists.

The fodder quality may vary depending upon soil and water quality and age at which harvested. If harvesting is advanced slightly (harvest at physiological maturity or soon after), the quality of straw may improve considerably. The straw of totally dry crop suffers from disappearance of carotene, higher lignification and has lesser digestibility (Rangnekar, 1989). There may however, be trade off before the household. For instance, if harvested early but not stacked properly, the straw quality may deteriorate. The labour is a constraint at harvest stage. Whether plant breeders should give importance to quality of straw in different crops is still under dispute. What is not disputed is that landed and landless households dependent upon livestock in rainfed regions do not consider a crop as a failure if only straw yield is achieved. It may be added here that unlike quality issues of grains (which plant breeder decided was not a priority since calories and not protein was the first need of poor), quality

issues of straw may still be on the agenda.

Ecological context in which crop is grown may also need to be studied more carefully. For instance ,other things being equal one would notice the jowar to be concentrated over slightly better soils and rainfall regimes than Bajra. With the result the probability of 100% failure in the year of drought is much more in Bajra than in Jowar (Gupta 1983,1984) though some others have disputed this (Jodha, 1984).

Farm equipments whether operated by hand, bullocks or power have also not been tested on the farmers' field on a scale large enough such that reliable estimates about their utility could be developed. In the absence of such facilities the farmers' feedback to the scientist is weaker (Gupta, Patel and Shah 1987). The scientists are looking for opportunities of active collaboration with industries to remove this gap (Srivastava, 1989).

c) Institutional Environment

The technological issues relating to various dimensions of research for rainfed regions are also institutional in nature. Bush (1984:218) has shown in specific case on Sorghum Research that breeding goals are often conflicting due to a combination of three factors:

1. Sorghum is utilized in production systems that differ sharply from one another by producers that have different uses for the crop.
2. Scientists work in disciplinary groups with narrow agendas and are often isolated from their colleagues in other disciplines, as well as from political client groups.

3. Plant breeders are limited in the characters for which they can simultaneously breed and therefore must make trade-offs. Additionally, plant breeding has at its center the concept of selection, a concept that demands diversity at the same time as it seeks uniformity. These potential conflicts reflect broader problems of value. Questions of distributive justice are raised by the differential distribution of the benefits of research. Trade-offs between nutrition and yield are also trade-offs between health and abundance. The demand for higher productivity must be weighed against the long-term consequences of an energy-intensive agriculture. The advance of disciplinary knowledge must be considered in the light of the integrated knowledge valued by farmers and the ideal of the ultimate unity of science. These and other value issues permeate the goals and practices of sorghum researchers.

Another dimension of institutional environment is the way research programmes are organized. In ICAR it could be on the basis of regional (e.g. CAZRI for arid regions; North-Eastern Complex), disciplines (soil sciences, plant protection, agricultural engineering research institutions), commodities (Coordinated Research Projects or National Research Centres on sorghum, millets, oilseeds, rice etc). functions (NAARM, agricultural research and management training), problem are (dryland, soil salinity research project and institutes) etc. Linkages between different institutions/ organization/programmes are still evolving. In some cases resource constraints come in the way of better coordination, in other cases the top level coordination itself is inadequate (a problem which ICAR is fully seized with).

While planners have recognized the need for adoption of conservation farming systems (Randhawa & Abrol, 1988), integrated pest management, sustainable rainfed system etc., it is also true that research system continues to be

biased in favour of single-crop single season and only chemical based experiments. The cropping system programme is trying to correct this bias.

A review of post-graduate thesis from more than 25 universities and colleges completed during 1973-83 had revealed significant gaps in the research areas. For instance among a large a number of theses on study of various aspects of fertilizer use there were only a few theses which looked at the simultaneous use of organic and inorganic fertilizers (Gupta, Patel and Shah, 1987). Linkages between post-graduate research, dryland research programme and other such schemes needed urgent review (Top Level Workshop on Management of Research for Rainfed Regions, November 2-4, 1989, IIM, Ahmedabad).

The Technology Mission on Oilseed was launched in May 1986 to ensure that linkages of this commodity with other support system are not only strenthened but also monitered at high level for achievng the ;(a)Improvement in crop technology ,(b) Support to the farmer,to apply improved crop technology (c)Improved post harvest technology & (d) Suport to industry for applying post harvest ttechnology.

Linkage with agro-processing units and agricultural research groups also needs to be studied so that appropriate signals can be generated for prioritizing allocation of research resources. For instance hemi-cellulose fraction in the fodder is quite useful for ruminants but is totally useless for paper industry (Van Soest, 1988 : 305). Whose

needs should take priority is not an easy decision in any research programme. However, the process of making trade offs explicit provides a reasonable basis of dialogue among various stakeholders.

d) Public Policy Environment

There have been several reviews of the agricultural research system including the latest by GVK Rao Committee (1988). The major problems that were identified in the linkages of ICAR with All India Coordinated Research Projects (AICRPs) and SAUs were: dual control of the Project Coordinator and the Director of the Institute where the AICRP Headquarter is located; the lack of coordination between the research programme in some of the ICAR institutions and the State Agricultural Universities and lack of participation by one group of scientists in the workshops of other related disciplines.

Problems were also encountered in the linkages between ICAR and Indian Council of Medical Research (ICMR), Bhabha Atomic Research Center (BARC), Council of Scientific and Industrial Research (CSIR), Department of Science and Technology (DST), Department Of Education(DOE) etc. The linkages with ICSSR, IIMA and other academic bodies though were forged but have not been very active. The mutual responsibilities in collaborative arrangements with international agricultural research centres also lacked clarity in some cases. The SAUs felt that they did not have adequate freedom in some of the collaborative projects.

The Review brought out many other aspects of internal working in ICAR system which may have a bearing on its linkages with other organizations.

A number of factors have been identified contributing to the weakness in the role of ICAR headquarters in supporting the ICAR research programmes. For instance: a) the dichotomy of administrative and technical wings at the ICAR headquarters and b) little technical/administrative support to the DDGs for servicing the institutes (Acharya, 1987 ; 185-186).

An exploratory study of scientific goal setting was completed by us in 1985, to look at the concerns of dry farmers, scientists and the post-graduate students (Gupta, Patel and Shah, 1987). There is a need to systematically document the research planning process in above context so that organizational and management interventions for strengthening the generation of viable technologies can be designed.

Part II : Inter-Organizational Networking/Coordination: Review of Literature

Given the resource constraints in the developing countries, the need for optimal utilization of human and material resources through viable inter-organizational linkages will always remain high.

At the same time one has to recognize that organizations often clamour for direct control over all the necessary resources. This, they believe, will help them become fully autonomous.

The research systems have one characteristic difference compared to others. And that is their knowledge intensity. It is possible for any organization to manage access to physical resources. It is difficult however, to assume that it could also bring together all types of scientific expertise under one roof. Need remains for forging various types of interactions viz., collaborative, authoritarian, contractual pooling (of resources/manpower - temporarily in the matrix form of organization); competitive, reciprocal (generalised or specific-formal implying any resource being exchanged for any other resource, latter refers to exchange of any specific resource), collusion or cartel (multi-national or private sector national companies form cartel or collude for restricting access to information, resources or technology to anybody outside their cartel); interlocking of directorship or management committees (director or members of one company/institute represented statutorily, voluntarily or through equity participation on the Board of Directors or Management Committees of other companies/institutes); associations (professional, regional, disciplinary, cadre-based) etc.

All these interactions could be mandatory/obligatory, voluntary or coercive.

Why do Inter-Organizational Networks Evolve?

These could evolve in a political economic system to exchange or allocate the scarce resources viz., money and authority. The equilibrium in these exchanges could take place through consensus around (i) respective domains (boundary of influence);

(ii) ideologies; (iii) evaluative criteria and (iv) distribution/coordination of work (Benson, 1975; Lauman and Pappi, 1976).

In agricultural research systems, goals and operating cultures of different organizations performing related tasks may overlap, converge or conflict. These conflicts could be resolved through authoritarian, disruptive, manipulative or cooperative strategies (Benson, 1975). However, it has been shown that several strategies or combinations of these could be used simultaneously in different exchanges among organizations (Gupta, 1987).

Several factors that may influence Inter-Organizational Networking have been identified by Boje and Whetten (1981) as:(a) a formulation of a joint programme strategy to increase the flow of clients and attributed influence; (b) placement of administrators from one organization on the management committee of another; (c) geographical proximity; (d) mandatory or imposed relationships among various organizations(these may increase the frequency of contact or exchange of resources but are likely to reduce attributed influence of one over another ;also see, Aldrich, 1977; Aldrich and Pfeffer, 1976); (e) the organization having a large number of social and work related (we may add ethnic, cultural or regional based) ties with each other may be able to take a more central position and attributed influence.

Boje and Whetten (1981) conclude that (i) both organizational strategies and environmental constraints influence

the evolution of interorganizational relationships; (ii) externally imposed ties have costs as well as benefits. The vulnerability of central organization often is increased because it is caught between conflicting expectation and dependencies; (iii) the joint programmes and formal and informal communications were the best predictors of referral network centrality and (iv) past emphasis on dyadic analysis may be misplaced because it is the network characteristic which affect the stability, quality and usefulness of exchange among the members of a network.

Whetten and Leung (1979) argued that some of the interorganizational linkages could even be dysfunctional. When organizations are required to engage in relationships that they did not prefer, they felt more threatened. They questioned the assumptions of more linkages implying larger organizational set and thus greater power.

Van de Van and Walker (1984) suggested that these linkages should be studied over time so that one could also look at the attempts that were made and aborted as distinct from those which were continued. It was recognized that perception of different organizations about goal congruence may change at different times because of changes in the resource dependence (also see, Richard et al, 1977).

Satpathy, Das and Mitra (1986) felt that among other things joint supervision, inter departmental committees and seminars might improve the effectiveness of interorganizational coordination.

Toole and O'Toole (1981) felt that peer structure might achieve lesser gains than hierarchical means of coordination because it lacked the ability to manipulate, use formal authority and resources.

At the same time the non-threatening environment of peer review has always been acknowledged as extremely important in forging academic linkages.

Venkateswaralu, Subba Rao and Raghavendra Rao (1987) felt that some of the linkages between AICRP and NARP were weak because scientists located in NARP did not appreciate repetitive work involved in AICRP. The non-participation of farmers in identification of problems was also identified as a major lacuna. The motivation of the scientists suffered because scientific panels and regional committees having representatives of different organizations did not visit regional research centres.

Bhale and Narayanan (1987) and Raman (1988) have also felt that horizontal linkages in the national agricultural research system with other organizations and programmes need to be strengthened.

Williamson (1981) using transaction cost approach argued that inter-organizational interactions can be better studied if the sociological dimensions like bounded rationality, ideological and domain consensus are linked with political economic concepts involving power as well as coordination cost.

Organization of clients to make demands on different supply systems has also been suggested a means of coordination where market forces fail to articulate the concerns of the poor (Gupta, 1985, Khandwalla, 1986).

It has been suggested that organizations may get astray if the objectives set up in the beginning are not modified over time (Mathur and Gupta, 1984). Whether dysfunctional linkage survive or functional ones don't evolve because of limited plasticity in this regard remains to be studied.

Greenland, Graswell and Dagg, 1989 concluded that agricultural research network were playing a key role in the Coordination of international efforts to develop improved technologies for food production by farmers in developing countries.

Provan (1983) considered federations as a linkage-network. He identified three types of federation viz. participatory, independent and mandated Federations. Inter-dependent organizations attempted to reduce both environmental uncertainty and complexity through the establishment of an organizational entity designed to manage the flow of resources both within federation and between affiliates and elements of the external environments (Also See, Wiwel & Hunter, 1985).

Balaguru and Rajagopalan (1986) suggested need for stronger linkages at the field level between the scientists & extension workers. They did not go into the factors which weakened the existing linkages. Desai and Patel (1984) however, noticed that

when research and development functions were linked up simultaneously rather than sequentially, it was the research function which suffered. This has implication for the type of networks which may become weaker or stronger over time.

Kean and Linfstan (1988) felt that networks established quite strong linkages with many external sources of knowledge. There had been considerable exchange of information with the international agricultural research centres in particular with CIMMYT, ICRISAT, IITA, IRRI and CIP. Links had also been established with ICRAF, ICIPE, ILCA, IAEA & ISNAR. Several of these organizations had established networks.

Barker (1985) observed, "A link must be forged not only between the IARCs and national programmes but between these and research laboratories in the developed countries. The link must be forged in such a way that the research priorities will reflect the needs of developing countries as seen by them and not by the developed country scientists".

Scobie (1987) highlighted in Latin American context that "Network provides access to materials and information essential for national researchers. A particular advantage of research network compared to individual activities is that experience at several locations can partially substitute for variation over time at a single site." It may be added that such an advantage of network was already being derived in India through AICRP approach.

Cheng (1983) investigated the relations between interdependence and co-ordination in organizations. From a study of 127 work units in 33 organizations it was observed that as the level of interdependence increased the level of coordination and the impact of coordination on unit output also increased.

Lawrence & William (1987) treated inter organizational linkages as a policy issue. They were of the view that "little current descriptive information exists on the character of the functional linkages between research and technology transfer or of the organizational linkages between and among agricultural scientists, extension specialists and extension agents".

Mohammed & Tisdell (1986) while studying research system in Bangladesh, observed following deficiencies (1) Organizational difficulties (2) Lack of Physical facilities and inadequate training (3) low level of skill and ineffective training (4) Insufficient linkage between research, extension and farmers.

Terry and Sajise (1984) noted that each specific local system is always interacting with neighboring local systems (horizontal integration into system networks) and systems of lesser or greater scale below it (vertical integration into system hierarchies).

Aldrich, Howard and Pfeffer (1976) felt that an integrated and coordinated approach to a problem will not evolve if organizations were left free to pursue their own goals. Where such

goals included survival, preservation of a privileged position, or dominance of the field, there was a basic incompatibility with a broader perspective. Normal interorganizational transactions were on too low a level and were too issue-specific to achieve coordination among organizations at the population level even when they were ostensibly dealing with the same general problem.

Falguni Sen and Ahmad (1980) studied linkages in ICAR research system within and between institutes. This observed (1) importance of each division and its linkage with other divisions is understood and frequently demonstrated, (2) credit to the whole institute rather than to individuals is encouraged. They described many linkages such as between Cotton Technological Research Institute, All India Commodity Coordinated Project ICAR and Textile Industries. They also pointed out the difficulties involved in inter divisional coordination in the ICAR institutes a) lack of faith in the scientific expertise of others b) fear of credit-sharing/stealing c) personality problems and d) refusal to share equipment and other resources.

Adeyemo Remi (1984) studied agricultural research priorities and criteria for investigating effective agricultural research in Nigeria. It was indicated that agricultural research programmes must maintain accountability to the public, must be coordinated internally within, and between, disciplines and between organizations. These must maintain relevance to people' needs, require flexibility and innovative approaches for continued improvement

and shifting emphases and must possess sound means of evaluation in which performance, not research activity was the criteria for the continuation of support.

Gupta (1988) suggest several ways of strengthening the links between formal and informal knowledge systems. Networking was considered for experimentation because scientific validation in high risk areas. required larger number of well dispersed trial.

Gupta (1987) felt that the matrix structure which brings specialists from different line departments under a new functional division or project organisation, has not proved very useful in long term research. He added that to increase horizontal accountability between farmers and scientists, there must be vertical accountability between junior and senior scientists.

Among several issues that have been reviewed , less attention has been paid to (a) nature of reciprocity among different organizations, (b) ways of attributing credits in inter-organizational research endeavor, (c) management styles or structures that can moderate the need of individual or organizational autonomy and compulsion of collaborative resource use for pursuing social goals in timebound manner. Experience of Technology Mission, may reveal useful lessons in this regard.

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ANNEXURE - FOUR

The Institutional Context For Lateral Learning

Indian Institute of Management, Ahmedabad (IIM-A) and Narendra Dev University of Agriculture and Technology (NDUAT) Faizabad entered into a collaboration for strengthening on-farm research in an overall context of research management process. The memorandum of understanding recognized the common interest of both the institutions in identifying durable alternatives for poverty alleviations in some of the most backward regions of the country.

The process of institution building has been explained in the accompanying paper (Gupta et al 1988). We may add that the innovative attempt aimed at lateral learning amongst different programmes of on-farm research and extension at NDUAT has received considerable attention in other agricultural universities as well as Indian Council of Agricultural Research (ICAR). The requests have been received by the Director Research and IIM-A for triggering such a process in other universities as well. It is useful to note that many of these programmes are monitored by different programme leaders/Deputy Director Generals at ICAR. It is possible that the implications of this experiment may be drawn for similar efforts at national level. In such a case an important institutional lesson would have been learned. And this would be about the fact that different sectoral and programme interventions aimed at improving the livelihood of small farmers in risky ecological regions cannot succeed unless appropriate complementarity between these programmes is built.

The pressure for uniformity in method and approaches is inherent in a centralized bureaucratic system . This does not pose a serious problem while dealing with technology development and transfer for low risk, well endowed irrigated regions. The conditions at research stations are not very different from that of the farmers in such regions. Further, the remaining inefficiencies of public delivery systems for various agricultural inputs are more than compensated by the private market forces. The strong articulation of demand by affluent farmers also creates direct channels of communications with agricultural research and policy system.

The conditions of the disadvantaged household in rain fed regions are quite different. On the one hand the institutional relations in the villages are quite archaic and even exploitative. On the other hand the historical deprivation has muted the voice of majority of the poor peasants in these areas. They have learned to be helpless. They do not make demands on the delivery systems. Those farmers who make demands in such regions are not very different from the well endowed farmers of irrigated regions. Their demands are not very different also (Gupta 1986). The market forces are weak and public infrastructure is quite poor. Frequent floods and occasional droughts in Eastern U.P. generate deficit in the household budget of most small farmers. This leads to a process of dependent development.

It is in this context that policy planners and agricultural scientists are trying to trigger second green revolution in

Eastern India. The environmental uncertainties, resource scarcity in the university coupled with weak channels of communication with the disadvantaged farmers and labourers make the task of defining and implementing a liberating and sustainable research agenda extremely difficult. The experiences narrated in the next part provide illustration of the creativity that has been unleashed in the given institutional setting.

It may be added that helpless scientists can not eliminate the helplessness of the helpless farmers. Also as J.B.S. Haldane once mentioned, "when you do not have ideas , you go and look for equipment" (Naik and Sankaran ,1972) . The resourcefulness may after all be in the mind of the scientists.

Part -Four : interventions and Implications

In a study of two agricultural universities Mathai, Pareek and Rao(1978) had noted the following:

(a) A substantial number of scientists in both the universities felt deprived of opportunities for participation in decision making. This feeling seemed highest in social science and agricultural engineering departments.

(b) Need for closer interaction between farmers and the scientists was recognised. Though it was also noted that it would be difficult for every researcher to interact with all the farmers having problems of his/her interest. A mechanism had to be discovered by which researcher learned about the frequency and intensity of farmers' problems in the area of university's operations.

(c) Feedback on research could be a great motivator for the scientists;

(d) The opportunity of sharing the research findings with students and other peers might satisfy the psychological needs;

(e) The problem of limited opportunities for an on-station researcher to work closely with farmers required some innovative solution.

(f) The disciplinary scientists working in commodity department did not have effective linkages with commodity programmes. This problem was serious with junior researchers.

(g) The link between extension and research staff was weak.

(h) While the senior scientists or the chief at the main station knew enough about what was happening at the regional research station but reverse was not true. Some of the scientists at regional stations had not ever visited the main campus (emphasis ours).

The situation in some regard has improved a great deal . The Vice Chancellor at NDUAT was not only highly accessible and informal in his interactions with the scientists but also appreciated the idiosyncracies of the innovative colleagues .

In various meetings which he attended he made his priorities quite clear . On the eve of annual kisan mela (Farmers' fair) he acknowledged the efforts of the IIM A Team in strengthening the farmer partcipatory research planning process . The pro Vice Chancellor also took keen interest in the entire process . More clear understanding of the institutional processes will emerge through the discussion on specific suggestions which emerged in the workshops on lateral learning .

Workshops : Generating a Common Agenda

First workshop on the subject was organised in January, 1988 for the purpose of discovering scope for learning amongst each of the 7 programmes involving work on the farmers' field. The feedback from the scientists from Krishi Vigyan Kendra (Farmers' Science Centre) was sought through post as they could not attend the

meeting due to some communication gap .The programmes from which the scientists were invited included : Lab to Land Programme(LTLP), Operational Research Project(ORP), On-farm Rice Research(OFRR), On-farm Oilseeds Research(OFOR), experiments on cultivators' field(ECF), national demonstration scheme(NDS), etc. Each programme team was requested to present their approach to research and extension on farmers' field and underline the limitations experienced in the process. If any innovative solution has been found that also was to be shared. Some of the key issues which emerged in this workshop are listed below:

1) whether discontinuance analysis on the pattern of adoption has been done in the village from where scientists have moved out.

2) often adaptation or modification or discontinuance of the technology was subsumed under the category of non adoption. The opportunity of learning about farmers' experimentation was thus lost. It was inquired as to what extent concrete instances of this type had been noted.

3) To what extent, the original design of experiment or demonstration had been modified in the light of farmers' feedback or the implication of one year result for another year's design ?

4) Whether the team of scientists had ever toured around the farmers' field to monitor the deviations attempted by farmers in the same technology? This was similar to the process of adaptation. The only difference was that sometimes farmers adapted a concept rather than a practice even in a different crop or commodity compared to one in which the original technology was demonstrated.

5) To what extent empirical experiments have been done to prove that line sowing was better than broadcast in case of crops grown on residual moisture in the farmers' field.

6) How did scientists evolve the precise treatments for a demonstration particularly when the recommendations were far more generalised and might not suit the specific micro-ecological conditions of the village where the demonstration was being laid out.

7) Recognising that not very rigorous analysis has been done in the case of demonstration as well as experiments , methodological clarity was emhasized . An issue was raised about the newness of the technology demonstrated by the farmers. To what extent the technology to be demonstrated could be different or better than what farmers already practiced ?

8) The selection of farmers under national demonstration scheme was supposed to be done by a committee of Subject Matter Specialists, District Collectors, Horticulture Officer, District Plant Protection Officer and the representatives of Krishi Vigyan Kendra together with the University scientists .The problems in coordination with various departments (having different technological and institutional objectives) in selecting farmers remained to be properly understood and analysed.

9) The innovative practices evolved by the farmers either to remove the constraints in the adaptation of modern technology or to resolve problem with the local technology were cited by the scientists. However, the formal experimentation on any of these practices could not be initiated. Neither the on-station scientists nor the on-farm scientists considered research on experimentation on farmers' innovative practices within their domain . On Farm rice research programe was an exception .

10) To understand the role of farmers' feedback in analysing the research at the station a question was asked as to how many experiments were started on the station on the basis of feedback from farmers' field. It was recognised that a change not monitored may be a change not desired (Gupta 1983, 1987).

11) The policy of ICAR of fixing uniform target yields, for different regions was considered as incompatible with the potential of different agro-climatic regions.

12) The variation in the yield across different plots as well as different field trials remained to be analysed systematically .Except the report on NDS ,no other report gave reasons for poor performance of some of the trials.

13) Experiment on Cultivators Field was a formalised and institutionalised on-farm research programme involving advanced lines as well as advanced technology adaptation of new practices. Whether zoning of different regions needed to be done on administrative or agro-climatic factors was an issue warranting further attention.

14) A universal problem in on-farm trials was faced

regarding difficulty at the level of farmers to appreciate the necessity of control plot with no treatment or control of pest, weeds, etc. It was also noted that farmers started competing with the scientists putting in more input in their trial/plot . This was a problem found in other parts of the world also . The question arouse about the communication of research objectives and establishing rapport with the farmers. Perhaps, if one built upon farmers' own experimentation such problems could be minimized because it would be easier than to demonstrate what it meant to continue the experimentation.

15) The research on poor farmers' field was found to generate several difficult questions. For instance, the risks inherent in some of the trials also acted as deterrent.

The trials on conjunctive use of organic and inorganic fertiliser were also missing.

The concept of compensation had been developed to overcome this problem in On Farm Rice Research.

16) One of the major gap in planning on-farm research/extension was the absence of contingency planning in the design of trials/demonstrations. Anticipating the most favourable risk contingencies one ought to design alternative treatments in case, one or the other type of risk arose . This is the gap which has been found in the on-farm research methodology of both IRRI as well as CIMMYT. Earlier in Bangladesh also this gap was noted (Gupta, 1986).

17) There was no system for regular monitoring of farmers' practices around their plots or households round the year so as to understand the interplay between technological and management factors.

18) The predominant focus on evaluating the trials, extension and demonstrations was on the basis of grain yield. The other by-products and fodder related aspects were not given adequate attention. The availability of seed was expressed as one of the major constraints in widespread testing of new lines. In number of replications the opportunity of wider testing of new genotypes was restricted.

19) The objectives of Operational Research Project on water management included experimentation on using surface water only. The adaptive use of surface and ground water was not provided for.

20) The involvement of social scientists in working out the pay-off matrix for collective choice was not institutionalised. The technologists found it difficult to work out the norms of collective rationality in managing a

common property research. The research on management of CPRs was a single most important gap in the agricultural universities in general, and farming systems research in particular.

21) Several technologies had multiple effects or attracted the yield to multiple routes. In such cases, the methodologies for capturing direct and indirect effects remain to be incorporated in the system of appraising technological effects.

22) In those on-farm research projects, where different organisations are involved in monitoring of coordination problems and feeding the possible solutions to the right level in the demonstration was a function which needed to be performed by Director Research more systematically. Often the on-farm research has implied only demonstration or adaptation of new technology. In case of farm implements the linkage with manufacturing and after-sale service of the implements was considered a necessary adjunct of technological development process.

23) When breeding material was scarce, need for parallel processing in common was extremely important. The parallel processing implies that at least two sets will be made of heavy breeding line so that one set would be tested under the farmers' condition and another set under on-station condition. This will help in clear discrimination between on-station and on-farm processing of advanced lines material.

24) In some of the internationally coordinated on-farm research programme such as the one organised by ICAR, IRRI to dilling the design of experiments/diagnostic surveys was criticised. The ritual of survey was gone through but the experimental design was drawn up without analysing the results of the survey and linking them with the research objectives. On one hand, the international research organisations like IRRI was trying to promote farmer participatory research and on the other hand, they were practicing and non-participating methodologies.

25) On the issue of developing varieties through farmer participation several questions were raised:

a) how did scientists decide which advanced line to be taken to the farmers' field ;

b) at whose farmers plot which line should be tried against what control;

c) whether sufficient screening for the disease and pests attacked had been done;

d) will the farmers be able to maintain the purity of

the seed given the nature of experimental design and farmers' own practices;

e) how would a line found useful in this process be named or released;

f) what would be the legal aspects of the varietal release processes;

g) could not the pre-released variety become a source of profit for some individuals;

h) could one really distinguish the needs of genotype for resource poor farmers as distinct from resource rich farmers;

i) what are the factors which will prevent the resource rich farmer from benefiting from a variety which may have been developed for low input environment;

j) how should one link up the maximisation of the ecological diversity through testing of lines in different varieties with the concept of multi location trials which was necessary for assessing new technology by the varietal release committee.

D. Before organising the second workshop on Lateral Learning a background note was prepared and titled " Issues in strengthening ongoing programmes of developmental technologies at farmer fields" (Gupta 1988). A meeting of the coordinators was organised by Director(Research) to discuss how different groups could organise their presentation on various issues listed in the note. Subsequently a meeting was held in May 9,1988 presided by Dr. Kirti Singh, Vice Chancellor, of the university and addressed by Pro Vice-chancellor Dr. R.P. Singh, Director, Research Dr. R.K. Singh and participated by all the other concerned scientists working on the farmer's field. Dr.RS Paroda (Deputy Director General, ICAR) also attend the meeting besides the representative of donor agency Mr. Anthony Bottrall. The purpose of the workshop was to identify the common problems

faced by the different groups in design of research/extension programmes, selection of farmers, design of trials, participation of farmers in design and monitoring of trials, etc. It was recognised that common problems may not lead to common solutions. Thus each programme was supposed to evolve specific solutions but building upon the ideas and initiatives attempted in other programmes. The plurality of approach was reinforced. Given the scarce resources of a new and evolving university, there was no escape from efficient utilisation of resources through networking and better interprogramme coordination. The linkage between on-station and on-farm research were particularly persued. Some of the important issues which emerged were the following:

Selection of farmers/crops

- The programmes on experiment on cultivators' field involved division of a district into four different zones. Each zone was furhter divided into clusters of blocks. Within a block cluster of villages was selected and surveyed. Within a village the farmers were selected with the help of random number tables. However, some compromise has to be made. Only one type of experiment was conducted in the village. The plot was changed every season. The farmers did not have much choice in selecting the kind of trial conducted on their field. The issue was raised whether the selection of fields needed to be on totally random basis or on the basis of the statified sampling basis. The stratification could be done on the basis of microecological factors.

The farmers having similar experiments on their fields were not

brought together to review each others' field. The central guidelines did not provide for documentation of farmers' perception during or after the experiments. There was no provision for post-trial study of farmers adaptation/rejection behaviour also. While the methodology was very rigorous in terms of statistical quality of data it remained to be improved in its institutional social participative and ecological dimensions.

ORP on Water Management:

The farmers were selected on the basis of plots within an outlet of an irrigation canal. The selection was contingent on the condition that farmers could accept the recommendations given by the scientists. The inputs were provided to the farmers. However, the team did not influence the water flow in the canal, although the roaster for water supply prepared by the project engineer was made known to the farmers in advance. It was noted that deviations in terms of water use was far more than what scientists anticipated. Those farmers who used ground water as well as surface water were excluded and experiments were aimed at only those using surface irrigation.

NDS (National Demonstration Scheme)

The suitability of the plot was the major consideration while selecting the farmers. Only those farmers who had a minimum plot of stipulated acrage were selected. It did not, however, exclude marginal farmers as evident from the fact that their share was more than that of large farmers in last few years. About 10 to 20% drop- out or turnover of selected plots did take place within

a season because farmers change their minds. Several issues were raised such as

- no demonstrations were laid on the fields of tenants
- The preference for marginal or small farmers was not underlined in case of demonstration of oil seed programme. The restriction of 1 acre in case of oilseed was found to be suboptimal and the national guidelines needed to be modified. The difference in the plot size in different types of crops was an important insight gained from the scientits in this programme.

Lab to Land Programme:

The programme included marginal/small farmers and even landless agricultural labourers who were provided with improved goats and poultry units.

The political interference/participation in the selection of farmers were far more eviedent in this case than other programmes. Perhaps this was the only programme which could respond to the demand for research input in the constituencies of Member of Legislative Assembly and Member of Parliament. To that extent the political demand existed for transfer of technology. The experience of this programme provided an additional dimension for linking political elite with the lobbying for research allocation.

Oilseed programme:

The selection of the farmer in this case was quite different from the earlier programms. The improved seed was given to those farmers who approached the scientists from the nearing villages. Depending upon the time available scientist did visit some of the plots of such farmers.

IFAD/IRRI programme:

Three different ecological systems have been selected for on-farm rice research namely very deep water, shallow deep and upland.

About 100 farmers were to be selected from this programme on the basis of guidelines given by IRRI. The scope of farmers participation in either design of trials, their layout, monitoring or evaluation was minimal. In a sense these were multilocation testing of technologies identified by the scientists in consultation with some of the national scientists. Interestingly enough there was no relationship between the diagnostic survey and the research programme since the latter has been finalised before the results of the farmers' survey were available. It is learnt that this programme is already being reviewed by ICAR and perhaps some mid-course correction may follow. It is obvious that this latest intervention from IRRI did not show any effort to incorporate the lessons of on-farm rice research in which IRRI has been engaged in large number of countries for more than a decade.

Design of Trials:

1. The design of trials were far more formalised and standardised in case of ECF. Some times advance lines were indeed taken up in some of these trials particularly that of ECF.

2. The workshop recommended that there should be variety/advance line identification committee at the level of university. It should identify promising lines of each crops for trial under various programmes in different regions. Some of the plant breeders noted that there were better varieties available than the once being demonstrated or experimented for adapting agronomic recommendations at the farmers fields.

3. It was suggested that technologies generated under ECF should form the basis of demonstration under NDS and Lab to Land Programme.

4. The need for adopting the cropping system approach atleast in certain trials was felt. Perhaps the progression towards farming systems need not be linear in these programmes.

5. The trials on the component technology could be laid out to enable evaluation on the cropping or the farming system basis.

6. The feedback from ECF and ORP needed to be utilised for refining onstation research experiments.

7. The need for control plot or observation for comparing the results of the trials or demonstration was also felt.

8. The approach of taking a whole village or watershed as in

case of ORP has been adopted in on-farm rice research project.

9. The advance lines were given to any farmer who was interested in the village in the lot of 3 lines having one standard check and two advance lines. The farmers were supposed to try them under their own management conditions. The appraisal of technology was essentially by monitoring farmer to farmer diffusion.

10. The need for maximising ecological diversity by taking advance lines both on university farms and farmers' fields in different districts of Eastern UP was recognised.

Adoption modification and discontinuance analysis: The post experiment information was not being collected in ECF. Although scientists felt that something like this could be done. In ORP on Water management farmers did not find the water scheduling very appropriate for their crops. The use of specific implements was found to be related more with the type of bullocks available with the farmers than with the need of the soil. It was also mentioned that farmers sometimes start experimentation with variations of a technology even before the technlogical results were available. Scientists recognised the need for documenting these variations as well as modifications being carried out by the farmers of the recommended practices. It could influence the on-station research as well.

The scientists in several programmes recognised their limitation in recalling his specific modification\adaptation or innovation adopted by the farmers since the programme did not provide for

their documentation.

Feedback from Extension\on-farm research:

It was admitted that institutionalised feedback from extension to research was weak eventhough the Director of Extension had provided numerous opportunities for the scientists to participate in their training programmes. The participants in this training programmes were Agricultural Officers of State departments. A suggestion was made that scientists participating in this programme as well as the coordinator of the programme should document questions raised in the programme but not satisfactorily answered. The Director Research should then every three months circulate these questions to all the faculty members. The information should immediately be passed on to the concerned departments for their comments and if necessrary, submitting a research prooposal. It would be desirable, if the research scientists gave due acknowledgements to extension workers who identified these problems.

Influencing National Policy:

In light of the numerous insights which had become available to the process of lateral learning it was felt that coordinators of national programmes would have to be requested to consider these issues so that more flexibility was available to the outstation scientists.

Director (Research) also took upon himself the responsibility for feeding relevant policy issues to the senior leaders at ICAR.

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