TECHNOLOGY FOR DRY FARMING: HOW THE SCIENTISTS, STUDENTS AND FARMERS VIEW THE CHALLENGE?[1]

An exploratory study of scientific goal setting in dry farming areas was pursued during 1985. The post-graduate students as well as scientists engaged in dry farming research from a north-Indian agricultural university and its regional station were interviewed besides the scientists from All India Coordinated Research Project on Dryland Agriculture, Hyderabad. The farmers operating in the hinterland of the university as well as regional station were also contacted to contrast their perception with that of the scientists. Perception of scientists regarding indigenous technology developed by the farmers was studied to understand the match or mis-match existing between their perception vis-à-vis that of the farmers. The post-graduate research pursued in different universities during 1973 to 1983 in five disciplines viz., Agronomy, Genetics and Plant Breeding, Economics, Extension and Sociology was analysed to understand the type of the skills which are being built up for facing the challenge of 21st Century. The policy implications for making dry farming research more attractive for the post-graduate students and the concerned scientists have been given. The need for restructuring the approach to dry farming research management has been underlined. The contribution of ecological variables as distinct from economic variables in the choice of technology by the farmers have also been studied.

Context

The problem of generating technological alternatives that can help the poor people in dry regions improve their productivity, is attracting considerable attention of the national planners. However, the contention of this exploratory study[2] is that there is a considerable mismatch between the way scientists perceive the problems of dry land to be and the ways dry farmers particularly the poorer one look at it. The responsibility for generating this mismatch does not lie only with the scientists but with the science managers and top planners who continue to look at the problem from the conceptual glasses suited for uniformly endowed irrigated regions.

There are several factors which influence the pursuit of technological breakthrough in dry regions. However, we have tried to look at only some and that too to generate hypothesis rather than to prove or disprove any particular view point. The key objectives of the study were:

[1] IIM Working Paper No. 708

[2] The first draft of this report was finalized within seven months of launching the project in December, 1984. Idea was to do an exploratory study so as to understand the nature of the problem. A more detailed study on agricultural research management in risky ecological contexts is being taken up as a sequel to present study. Purpose is to link on-farm and on-station research. The content page of the main report is given in Appendix 2.

a) To understand the factors which determine or influence the choice of research problems by the students.
b) To study the scientists' perceptions while defining the problems of dry regions. How do the react to some of the traditional practices of dry farmers. To what extent there exists if any, a relationship between their economic and ecological background and perception of farmers' problems.
c) How do farmers react to the new technology (documentation of some of the examples of the indigenous technologies).
d) To study the pattern in the articulation of problems by farmers through the columns of farm journal of HAU.
e) To review the post-graduate research pursued in different universities so that status of the problems affecting poorer population can be estimated.

Methodology

The sample of students was very small and entirely taken from HAU, Hisar. The response rate of the scientists engaged in dry farming research was far more encouraging. From All India Co-ordinated Research Project on Dryland Agriculture, about 69 percent scientists responded to our questionnaire. Individual interviews were held with large number of scientists.

From HAAU, Hisar, thirty-seven scientists responded (25 from main campus, Hisar and 12 from regional research station at Bawal, Dist. Mahendragarh).

The sample of farmers has been drawn from districts Mahendragarh and Hisar randomly. In all 81 farmers were contacted to elicit their preference for various plant types, technological requirements and their endowment. In addition to simple correlational analysis discriminant analysis was done to generate hypothesis about the contribution of ecological and economic factors in adoption and expectation of technology.

Review of Literature

Attempt has been made to review some of the important contributions in this field. Views of the scientists like Vernon Rutton and D.K. Desai have been contrasted with those of others who do not believe that scientists should not be burdened with the social responsibility.

The assumptions about the farmers' decision-making and risk adjustments, we hypothesis, are likely to have considerable influence on the trade-off pursued by the scientists. We have suggested that the conditions under which different types of crosses were screened and the given extent of standard variations around the mean were tolerated are essentially political choices affected by the value system of the scientists. The interface between the decision-making of the farmers and that of the scientists can be studied only if the black box of the scientific trade-off is opened up and the politics of plant breeding and package

approach to technology is debated openly. The biological as well as social scientists have neglected the study of farmers' risk adjustment considerably. The Socio-Ecological Paradigm has been briefly described to illustrate the spatial, seasonal and sectoral characteristics of farmers' decision-making. The farmers' risk adjustment can be understood by taking into account the access various classes of farmers have to resources, the assurance that they can obtain from formal and informal institutions about the future returns from present investment using their current abilities or skills. The issues of scientific culture have been raised essentially to relate the decision-making options of a scientist with the organizational and managerial context of their work.

Need for learning from the farmers has been highlighted by referring to some of the post-graduate research which was guided way back in mid-sixties. However, discontinuation of this line of research has been regretted because in risky ecological regions considerable learning could be achieved by analyzing the indigenous technological choices of the farmers and historical wisdom contained therein. We are not trying to romanticize the reality of indigenous technology. We recognize that there are several features of traditional technology which deserves to be modified in light of present day science and technology. However, it cannot be ignored that if poor farmers have survived for so long in risky ecological regions they could not have done so without continuing the traditional of experimentation i.e. trial and error. It may look strange but it is true that till 1985 only three thesis were discovered which had tried to unravel the science of traditional agricultural practices.

While reviewing the literature in context of the scientific inquiry we have raised the issue of success of scientific endeavour. How do we define what is the successful research and what parameters should we use to up-date the norms of defining success with passage of time. Is not it illogical that the norms of success suitable for irrigated well-endowed regions should be used for evaluating the efforts of the scientists engaged in research on risky problems? The scientists engaged in risky and challenging dry farming research deserve much greater support that what they are getting[3].

A question which arises from this study (although not much discussed in the report) is whether the principles of organizing and managing research on problems with uncertain outcomes will be same as principles applicable for research with certain outcomes. We intend to pursue this question in the next research project.

[3] It might shock those who think that there was no shortage of funds for Dry Farming Research that the T.A. bills of some of the scientists engaged in ORP at Hisar centre of All India Coordinated Research Project on Dry Land Agriculture are yet to be reimbursed after a wait of almost a year (see, Annual Report of the Centre for Rabi, 1985-86, Hisar). Should we blame the scientists if they do not travel enough and contact the farmers?

If the answer is no then we must also ask ourselves whether the norms of granting degrees or evaluating the effort and output of scientists in such contexts should not be different.

In our view such questions have neither been raised and, therefore, nor have been answered.

The need for placing science in its social context has been identified and articulated for long time. However, as this study shows no concrete efforts have been made so far to identify the processes by which relationship between the expectations of poor farmers and labourers on one hand and the skills and expectations of the scientists on the other hand can be established.

We are not suggesting that farmers can always anticipate the type of technological alternatives which need to be developed. For instance, it was not because of the suggestion of the farmers that high yielding varieties of wheat and rice were developed in early sixties. But this argument should not be used to suggest that an approach which paid-off in irrigated agriculture would necessarily pay-off in rain-fed agriculture as well.

How to Make Dry Farm Research Attractive for Post-Graduate Students

Everybody would agree that if any long term and sustained research thrust has to be given towards the problem of dry regions there is no alternative but to make dry farm research more attractive for post-graduate students. The issue thus is what set of incentives need to be provided for bringing about a shift in the priorities of post-graduate students. Part of the problem why no major breakthrough was being achieved in dry farming could be because of the fact that most scientists who pursued or guide such research have themselves been trained in research on irrigated agriculture.

Our view is that while greater allocation of fund for dry farming is necessary by itself it would not serve all the purpose unless supply of properly trained skills to deal with future problem can be ensured. (Imagine marching into 21st Century with skills suitable for problems of 20th Century)[4].

Even though our sample was small in case of students and meaningful conclusion can be drawn we have nevertheless raised certain questions.

For instance, it appears that students from drier villages and having drier landholding might see greater scope for differentiating technological requirements of different classes of farmers and may be more sympathetic to the

[4] Prof. I.G. Patel often used to say in the context of management training particularly in field of development that often we were training managers for future in skills suited for solving problems of yesterdays.

problems of dry farming research. Another important finding of the way students took their major, minor and supporting subjects was the lack of inter-disciplinary tie-ups. Despite numberless appeals by the leaders of agricultural research system suggesting the need for inter-disciplinary research the phenomena is yet to take roots in agricultural universities.

Another disturbing finding is that the students from social science did not refer to journals concerning other biological sciences and vice-versa. Thus not only that the inter-disciplinary specialization was avoided even cross disciplinary reading was not pursued with obvious implications for the perspective building amongst the students. The suggestions with regard to making dry farming research more attractive are the following:

a) Since the generation of data as well as obtaining low variance in different replications over time and space is very difficult in totally rainfed experiments, there is a need to re-conceptualize the philosophy behind granting of degrees. There is no reason why a student is penalized if the crop on which he was working fails as long as he has pursued various steps of research systematically and could explain the failure scientifically and originally.

b) Long term research programmes could be developed so that in the event of failure of certain experiments, students would have some data available for developing appropriate skills.

c) Another alternative could be to simultaneously pursue the dry farming research at the farmers' field so that even natural scientists could learn from farmers' own risk adjustment during the period of drought or other ecological stress.

d) It may be desirable to offer special fellowship and incentives to the students from backward regions and poor dry farming households for pursuing research on challenging problems of this nature with assurance of at least five years post-training placement as pool officer of scientific fellow. The students should be allowed to do their Ph. D. on such work with full salary.

How do Scientists Pursue Research

It was assumed that one of the ways in which one could understand about the scientists' perception of what they considered as important could be to identify (a) whether there were some ideas which scientists had but could not pursue and (b) whether there were some other ideas which were pursued for a while and then discontinued it. It was found that most of the ideas which could not be pursued related to either the disciplinary interest of the researcher or were the offshoot of the Ph. D. or M. Sc. Work of the concerned researcher. There was a rare case where the author was convinced of the genuinity of the research idea but ICAR authorities did not consider it worthwhile.

As far as the reasons of discontinuance were concerned there was only one case where a scientist reported discontinuance of an idea because benefit of that kind of research was not likely to flow to the poorest dry farmers. The other reasons ranged from lack of funding to other administrative, technological and professional constraints.

ICAR as well as the top managers of the agricultural universities might like to monitor the ideas never pursued or abandoned due to resource constraints. Such ideas depending upon the regional and national priorities might be put in a portfolio to be funded by various agencies or even out of special discretionary power of ICAR.

Amongst various sources of ideas the literature survey was cited as the most important source followed by the feedback from the farmer and the ORP (Operation Research Projects).

It appeared that yonger scientists tended to rely more on literature survey as the source of idea than the senior scientists. It was found to our surprise that there was much greater recognition of what farmer do in terms of indigenous innovations but the examination to test the validity or otherwise of these practices was rare.

The Perception by the Scientists of Farmers' Constraints

Amongst various hypothesis generated, some which are more important are being listed here:

a) There is a strong relationship between the economic background of the scientists and the manner in which they defined the constraints of dry farmers[5].

b) While scientists might assign some role to farmers in research projects normatively but in actual practice seldom allowed the farmers to play any concrete role. The experienced scientists were far more aware of farmers innovations than the younger scientists. If the contest for supremacy in different scientific ideas essentially was a contest for the image of future that different interest groups subscribed to then the value inherent in this contest need to be made explicit.

[5] We obviously are not suggesting that economic background of the scientists need to be taken into account while evaluating their work. What we are suggesting is that it might be useful for the scientists themselves to reflect on the assumptions they made about the problems of the farmers. These assumptions we are saying often are influenced by the background and world view of the scientists themselves. Minimum, the scientists could do is to subject as may of these assumptions as possible to empirical testing. We have no intention to pass judgement on their commitment to their professional roles on this ground.

It was very instructive that problem of risk as a constraint of the farmers was attached lowest importance by scientists with medium and big landholding background. The scientissts who had sufficiently irrigated landholding back home felt that the key constraints were lack of initiative on the part of farmers, poor extension and high cost of new technology. Likewise, it was noted that to the scientists belonging to the families owning large landholdings and higher degree of irrigation the credit did not appear as a major constraint. It was interesting to know that for senior scientists' immediate problem was with credit and extension and not the cost. Apparently they had become so sure of the technology that the variables which were not manipulable by the scientists were attributed maximum importance. Various statements made in the official documents including the report of National Commission on Developmental Backward Areas (NCDBA) underlie the excessive confidence that existed in the mind of scientists about the assumed strength of improved dry farming technology.

Inability of the majority of the scientists to question the characteristic of the existing technology only suggests now important it is to generate debate on the issues concerning alternative technological options.

Scientists' Awareness about Farmers' Innovative Practice

It is quite paradoxical that even though the establishment of land grant college system of research in late 19th Century in USA was preceded by formation of farmers" societies which pooled knowledge of informal R&D and disseminate them to others, the establishment of agricultural universities in India on similar pattern did not give sufficient attention to this respect. It was further recorded that in the golden jubilee document of ICAR no reference was made to the R&D by the farmers particularly the poorer ones. It does not need any further research to establish that such a high number of local varieties, farm implements and other practices could not have evolved without considerable trial and error and experimentation by the farmers in different parts of the country. We have tried to hypothesis some reasons responsible for snapping the links between the informal R&D and the formal R&D in this field. While a large number of scientists particularly from the Hyderabad sample of All India Dryland Project Headquarters had shown awareness of the farmers' innovative practices the regrettable feature was that not many of these insights had been validated experimentally. We had categorized the comments of the farmers as either sceptical, critical or somewhat contemptuous. It was strange that many scientists felt that since farmers did not keep any data how could formal scientific analysis benefit from their participation. There were others who did not believe that there was much to learn from the farmers anyway.

As far as critical perspectives were concerned, scientists had not distinguished those which farmers had tried and continued vis-à-vis those which they had tried

to note continue. Likewise, they had also not discriminated the knowledge about the prctices which farmers had but did not try and, therefore, did not continue. Numerous examples of indigenous technology have been given in Chapter 5. The question of finding out scientific basis of the farmers hypothesised still remains. It is really a pity that excepting the thesis guided by Dr. Y.P. Singh was back in 1966-67 formal examination of indigenous technology has not been taken up in any subsequent thesis research so far. The question which Dr. Singh had raised in mid-sixties could again be raised as to whether the indigenous technology in veterinary science or crop science were not relevant even today.

As regards the practices which scientists considered as sub-optimal our view was that in the true tradition of science, the scientists should phrase their opinion about farmers' practices in the form of hypothesis rather than axioms. It is obvious that by making an assumption we stop asking questions. To be aware of our assumption thus becomes an important prerequisite for any scientific pursuit. An example could be given about a statement that most farmers did not weed their crop s or used less quantity of seed than recommended. As we have shown in Chapter 8 that farmers in many cases had sound reasons for not doing so. However, there was a possibility that in some cases such a practice might be sub-optimal. The need, therefore, is to specify the context of technology far more precisely than it has been done today.

Several innovative practices which were acknowledged as innovative by the scientists had not been taken up for deriving the science of the same. For instance, while the blade hoe was found to be an effective instrument for weeding and water conservation, the precise differences in its dimensions at a short distance was not analyzed by relating soil structure, cropping patterns and the physics of this implement.

One of the important aspect with regard to the traditional technology was the relative importance that farmer attached to fodder vis-à-vis grain yield maximization strategy. Our contention in this chapter is that formal and informal R&D can reinforce rather than replace each other as seem to be the attempt presently. Also we do not think that marriage between these two systems of research can only be achieved by the involvement of social scientists. Our view is that proper incorporation of informal R&D can be expected only when natural and physical scientists directly interact with various classes of farmers to extend the frontiers of science.

Organizational Setting of Research

We have looked at it very briefly the inter-phase between ORP and the natural scientists and critiqued the tendency to convert ORPS into a sort of extended demonstrations. Many scientists regretted the weak link that seem to exist between ORP and research at experiment station. We have enumerated the key problems that scientists have identified with regard to working of ORP. It was

interesting that the "rational" resistance to change offered by the farmers in some cases was characterized as "lack of cooperation" by the scientists. The policy implications are summarized below:

1. Should not the on-farm trials be taken up more systematically under the explicit knowledge of the farmers that like in other trial, there was equal probability of failure. The tendency presently seem to be to reinforce the exploitation of the farmer that something better and not different was being demonstrated to them. The result was that many times when a trial did not perform as well as it was expected farmers become sceptical about prospects of new technology.

2. There is a need for considerable strengthening of the methodology of on-farm trials from the point of view of selection of plots, laying out of the trials, definition of the control, farmer managed plots as well as researcher managed plots etc. The farmers' participation in design of the experiments for instance regarding agronomic practice on inter-cropping has not been attempted on any significant scale in the country as yet[6].

3. There was a need to take even the early generations of the breeding material (i.e. segregating population) for screening at the farmers' fields in different well defined ecological niches.

4. If the option under 'c' appears too difficult to take up right away, at least panel of poor farmers as distinct from rich farmers could be invited to the experimental farms. They could be asked to rank and score different lines, segregating plants independently. Breeders could learn a lot if they could compare the selection criteria used by the farmers with that of their own. We are not suggesting that scientists should exclude any line simply because it was ranked low by the farmers. What we are appealing for is to have a degree of redundancy if necessary so that parallel processing[7] of alternative lines of research, breeding could be simultaneously pursued. Likewise, if farmers suggest certain designs of agronomic trials, or farm implements, the same could be taken up for further testing. It is important in such a case to note (a) the quality of feedback will depend upon the process through which such a panel of farmers are selected and explained the objective of the trial;

[6] Author was recently invited by Government of Bangladesh, Ministry of Agriculture and Forestry, Bangladesh Agricultural Research Council and Bangladesh Agricultural Research Institute to strengthen the On-Farm Research programme under the Farming System Research perspective using Socio Ecological Paradigm developed by the author based on his work in India. Numerous modifications in the methodologies on On-farm Research evolved at IRRI and CIMMYT have been identified and some of them are being tested out in Bangladesh. Author would be happy to provide further information in this regard. List of papers developed there is provided in the Annexure 1.

[7] Parallel processing of information is an unque trait of human mind which scientists pursuing thre idea of Artificial Intelligence are trying to use while developing expert system or heuristics.

(b) no amount of farmers' participation in on station trial would eliminate the need for on-farm trials through farmers' participation.

5. Headquarters of the dry land project should be located or shifted to actual conditions of dry land.

6. Bullock or camel drawn farm implements which played a crucial role in moisture conservation have not received adequate attention. There is almost no research going on traditional implements and scope of improving these.

7. The priorities at regional research centres have conventionally been defined by the chief scientist. As far as the local research problems were concerned no systematic methodology had yet been evolved to assign weights so that different problems could be ranked in the order of importance. It will be useful to analyze systematically the research priorities at different regional centres and understand the correspondence which these priorities have with the problem context of the poor farmers.

8. It is important to note that no breeding material is generated in the AICRPDA with only some exceptions. In other words, whatever breeding material is developed by the crop improvement programmes or by plant breeding departments of different universities, is adapted by the scientists in the coordinated project under various stress conditions. Only the packaging of the technology is done in this project. This raises several fundamental issues with regard to the priority that dry land related research should receive in various crop improvement coordinated projects.

9. The relationship between the district agricultural officers and the operational research project also were reported to be quite weak. There needs to be a serious effort to generate feedback from the functionaries at various levels in agricultural department so that researchers may not only get an additional perspective but also may be able to critically appraise their own understanding of the problems of the region.

10. The data processing capacities at regional research centre need to be considerably strengthened. Also there is no obligation presently on the scientists to get their data analysis scrutinized by trained statisticians or econometricians. So much so that when they make assumptions of benefits and costs they would not consider it necessary to get the assumptions checked-up by the economists.

11. The possibility of contracting research out by the coordinated project has also to be explored further. It is possible that for several problems which the project may identify as urgent or for which appropriate skills do not exist in the project, contracting out may be the only answer. Suggestion was also made by some other scientists for developing procedures and policy for contracting

out research to other scientists within the same institute or university or even other universities where a dry land research centre may not exist but where research conditions and scientific skills may exist.

12. There was a need for debate on desirable plant types for different agro-ecological regions. While it is being recognized that there is a need for location-specific research some scientist mentioned that plant type could not be expected to vary in different regions except for the duration of the crop. However, other scientists have contested this view and would believe that there may be difference in this regard. One of the items on agenda of the annual workshop may be to consolidate the given knowledge on the subject after an appropriate debate or discussions on desirable plant types for different crops in various regions.

13. Sponsoring deviant research: Very often a dilemma which a research manager faces is about a particular problem on which the concerned scientist may be extremely keen or hopeful whereas most others might disapprove of the concern. The problems become further serious if the scientist involved is of the rank S-1 i.e. the junior most. It will be useful to make an inventory of research ideas that scientists at the level of S-1 and S-2 have but they cannot pursue either because facilities are not available or because the ideas are not considered worthwhile by their superiors. Perhaps on an experimental basis few of the scientists having such ideas could be allowed go ahead with what we are calling, in absence of a better word, “deviant research”.

14. Dryland project should not remain merely a packaging appendix. It is like refitting an already tailored cloth. Our contention is that dryland must have some say in the tailoring process as well. (If the project has greater say in the breeding of crops, such an objective can well be accomplished).

15. Many times in view of short-term interest of the crop breeders, after doing cross-section adaptability tests for only limited period of time varieties are hurriedly released. It is soon discovered that these varieties have become highly susceptible to different pests and diseases. It may, therefore, be worthwhile to give proper attention to long-term conventional adaptation trials for ensuring that farmers do not pay the price for the benefits that may accrue to the scientists in form of al recognition for a variety.

16. Link between technology and institutional support say, custom hiring of tractors have to be looked into. Some action research project on these lines may also be encouraged in collaboration with financial institution so that technological diffusion in dry region does not remain handicapped for too long.

17. Designing credit technology tied action-research project in real drought prone regions is not going to be easy. The need for experimentation, however, remains.

18. Some hypothesis on which research is called for:

    a) Is it true that ideas on which individuals may feel constrained, do get attention of some or the other scientists at aggregate level? In other words, the ideas on which some scientists feel agitated are unlikely to be totally ignored by the scientific community.

    b) There are not many cases where scientific experiments or research programmes suffer due to bureaucratic transfers of scientists.

    c) There are not many ideas which get discontinued in practice because of lack of inter-disciplinary or inter-departmental cooperation.

    d) There is greater freedom to pursue individual ideas at regional research station compared to university or headquarter stations.

    e) Greater freedom and limited funds at regional station generate high frustration.

    f) Large proportion of scientists don't do research on crops or problems on which they pursue their Ph. D.

19. Administrative setting or scientific activity. The system of prioritization of research projects is still evolving and needs considerable strengthening. There is no livestock scientist in AICRPDA, which knowing the importance of livestock in dry regions and organic links between livestock andcrops is rather surprising and shocking.

20. There was yet no way to link the objectives of precise experiments taken up at various centres with the clearly defined spatial and economic boundary of farmers in the hinterland.

21. The autonomy of the coordinated project in matters like organization of annual workshop also is highly restricted. While ICAR reportedly supports the organization of annual conferences of different commodity oriented research programmes, due to highly restrictive policies, similar research workshop of 23 centres is considered unfeasible. On one hand, the scientists working on dryland projects generally locate din highly uncomfortable settings have to miss opportunities of interaction with other scientists working at university on the other hand they are denied the opportunity of annual get together also.

The scientists who – how many – from where should be invited is apparently decided at the level of ICAR. The implication is that only regional meetings are organized.

Thus, for the sake of efficient planning and management, the functional autonomy of the project should increase and without much further delay.

22. The issue of location of centres, headquarters, senior scientists etc., are linked with macro management issues of research system in the country. However, this should not detract us from observing that existing of such contradictions do affect the morale of scientists in the field. It would be useful to explore the issue of representatives of centres in various parts of the country. The hypothesis is that the conditions under which basic research is done ARE LEAST representatives of the regions in general and small farmers in particular.

23. Improvement in project coordination was said to be another issue needing urgent priority.

24. The budget allocation proposed for VII FYP at Haryana Agricultural University, Hisar reveals the dynamics very closely. The allocation of resources for cash crops both in terms of manpower and finance was perhaps quite disproportionate with either the area under those …. Or people dependent upon these crops. The historical choices in terms of support from other agencies (like World Bank for cotton) got reflected in the staffing pattern which in turn reinforced the resource allocative pattern. The oil seeds and pulses programme have indeed received considerable push in recent years, though to our regret focus in these programmes is also geared towards irrigated pulses and oilseeds.

25. The absence of funds for maintenance and repairs of jeep in a region where due to high ecological heterogenity, greater travelling would be necessary reflects another structural problem in resource allocation by ICAR.

26. Travel Facilities: Almost everybody expressed dissatisfactions with the fact that the policy for providing resources for travel, contingencies for wages of labour, material supplied had reportedly not been revised since 1977. One consequence of this perhaps was that the item of travel got cut most often whenever budget constraint was observed. Because of this constraint, many scientists at outstation felt that on one hand they missed the facilities available to scientists at the main campus and on the other, they did not get opportunities to attend the conferences or workshops also. Generally scientists at the headquarters only attended those meetings. This constraint was reportedly affecting adversely the frequent follow up of ORP as ell as other projects related to farmers.

27. Evaluation Policies: Number of publications, confidential reports, influence, deference towards superiors, ability to express onself in English contributions in form of variety or some other technology, seniority, quality of work etc., were some of the inputs reported by scientists in their evaluation process. A case was illustrated where achievements in the field in the form of a technology adopted by farmers was considered of lesser importance than publications in international journal when a senior scientist appeared for interview before ICAR. Some other felt that evaluation should be done against the duties assigned rather than duties for which a scientist may have been appointed. Apparently, there existed some divergence between the two and to an extent, it was unavoidable in any organization where exigencies of working might require some relocation of staff.

28. When scientists were asked to specify the parameters that should be given maximum weightage in their evaluation, only two out of nineteen scientists mentioned that applicability of research at farmers' level or feedback of extension agencies on the technology developed should be taken into account.

29. Almost in every academic institution, very low weightage is given to the feedback from the ultimate users of research, i.e. farmers or extension system or even policy makers.

30. Personnel Policies: Allocation of staff for different schemes at headquarters to field and vice versa, compensatory allowances for working in backward regions etc., are some aspects of personal policies which need consideration. Scientists in Bajra research programme illustrated the distortion in allocation of manpower amongst different schemes by comparing the manpower in Bajra scheme vis-à-vis other crops. One one hand Bajra was considered the most important crop for atleast half of Haryana, on the other hand, the manpower strength of this scheme was reported far lesser than many other schemes particularly concerning cash crops.

31. Organization of Unemployed Rural Youth for Taking up Community based Technological Changes: Government could authorize regional research stations to take up such projects under TRYSEM for popularising proven dry farming technologies for how long, shall we continue to suffer from constraints for identifying individual oriented research alternatives instead of group based alternatives. Recent studies on pests as common property suggest group based ….. as a viable line of future research in dry areas.

32. Setting up Processing Industry: For long the processing of farm produce has remained out of mainstream agricultural research. It may be, therefore, worthwhile to take up as action research project, the idea of setting up processing plant for different crops.

33. Technical Facilities: A case was brought to our attention where an agri-engineer was posted without the complementary staff like welder, fitter or machinist etc. Obviously such action may demoralise the concerned engineer and he may genuinely feel that senior research leaders were not interested in his success.

34. Decentralisation: This is an issue which was voiced by almost everybody ranging from very senior scientists at HAU as well as AICRPDA to very junior ones. Some felt that ICAR had not defined precise degrees of freedom that project coordinator or chief scientist had. Others felt that to the extent senior scientist administrators could decentralise decision-making to lower level scientists, they apparently did not do so. The responsibilities of scientists in the AICRPDA towards regional centres also needed to be spelled out more elaborately.

35. It may be useful if ICAR commissions some competent agencies to do management audit of coordinated projects as well as of university research systems.

36. We also came across example of some scientist posted at Bawal who had been given the feeling of punishment while being posted there. That such a move is highly dysfunctional needs hardly any emphasis.

37. Some scientists regretted that many technologies which were considered proven and better than farmers' practices were not subjected to rigorous financial appraisal before being released to farmers.

38. Some other scientists regretted that soil and underground water condition at HAU farm were not representative of dry regions. The ground-water table was very high and thus results of various experiments in which some dry land crops were reported to have out-yielded the irrigated crops might need some reappraisal.

39. The problem of physical facilities for laying out experiments at University farm has acquired an extremely disturbing dimensions. It seems* that manager of University research farm has been advised to maximise profits, logically, therefore, he gives highest importance to seed production which fetches profits. In the process, the allocation of area for laying out experiments becomes a subject of negotiation and given and takes. The parameters on which area was allocated for different crops, problems departments was not very clear. However, it was quite obvious that such a policy might prove disastrous in the long run. There could not be a better example of how commercialization of research outputs can also cause disruption in the research process itself. This problem it appears affect some

* We could not confirm this view by discussing the matter with farm superintendent.

of the dry land crops more than other because of high uncertainty of production.

40. Various irritants that demotivate younger scientists should be urgently removed so that younger scientist could find their working environment more satisfying and challenging.

41. While extension directorate at HAU, Hisar has a large complement of staff to supplement the efforts of the extension department, the meagre share of department of sociology reflects very much on the importance this discipline enjoys. There could be several reasons responsible for this neglect, not least important may be the fact that not many concrete insights might have emerged from the thesis done in this department for biological scientists. This situation certainly deserves serious attention so that social science contribution in agricultural research could gain greater validity and strength.

42. Haryana Kheti: Farm journal of HAU, the hypothesis are that the problems of poor farmers may

    a) either not get properly articulated through such a channel generally accessible to educated people,
    b) or even if these do get articulated, these problems may comprise a small proportion of the total problems communicated by apparently better off farmers.

Further, one could also hypothesise that problems of developed regions or cash crops may far exceed the problems from dry regions or food crops particularly millets, pulses and oilseeds.

43. Key insights emerging from this analysis can be summarized as given below:

    a) There were only 30 questions out of 290 which pertained to dry regions directly or indirectly.
    b) Out of these 30 questions, the focus was millets (4/30), oilseeds/mustard (10/30), pulses (11/30), sheep (1/30), goat (2/30) and others (2).
    c) Out of remaining 260 questions, the order of most important crops or problems is given here:

        i) Horticultural crops – fruits (30%)
        ii) Livestocks (Buffaloes, cows, etc. 11%)
        iii) Vegetables (8%)
        iv) Exotic cattle (7%)
        v) Cotton (7%)
        vi) Poultry (6%)
        vii) What, barley (6%)

viii) Soil and water-related problems (4%)
ix) Unspecified crops (6%)
x) Others (16%)

Obviously it is not our case that pattern of problem communication through the columns of Haryana Kheti can represent the pattern expected in other channels or that it has any semblance to the genuine problem context of various classes of farmers in Haryana.

44. Only about 10 per cent share of problems from dry regions should cause concern to extension planners as well as media managers of HAU, because with around 40 per cent of the state as rainfed (and perhaps one-fourth as highly dependent on rainfall excluding regions like Ambala) this proportion indicates either lack of faith amongst dry farmers towards this channel or the fact that general level of articulation is very low amongst such farmers.

45. The growers of cash crops including horticulatural crops (like grapes), vegetables etc., do articulate their problems much more than the rest.

Apparently because the technological information regarding cereals was far more easily available through traditional extension channels, the farmers chose to write to Haryana Kheti about those problems which could not be resolved at local level.

Were scientists to depend upon this channel for guaging the seriousness of different issues, they would make a very distorted set of priorities reflecting the concerns of better off farmers.

The extraordinarily low weight of browsers (sheep and goat) confirms the general apathy of shepherds towards formal channels of communication with the state.

If the articulation of the problem through a channel is any index of its relative reach amongst different interest groups the lower articulation by dry region related problem perhaps reflected on the typical reach of this medium.

45. The policy directive that follows from above analysis are as follows: (a) research institutions should monitor data on problems articulation to ensure that such a channel becomes accessible to poorer farmers of backward regions also (particularly because extension and sociology thesis pursued in such districts are invariably very few in all the states of the country, (b) the quality of answers should also be monitored as to check whether apathy was a consequence of indifferent or inadequate response, (c) geographical coverage of such a feedback also should be analysed to see the spatial diffusion of such a media, (d) proper acknowledgement should be made if some useful research leads emerge from such a feedback. As we will report separately there was not published paper considered important by scientists

which from its title gave any credit to farmer as source of the particular research idea. Also, none of the thesis abstract of various universities of the country from social science disciplines like Extension (n=167), Agri. Economics (n=142) and Sociology (20) gave any credit to farmers while discussion genesis of their research.

47. Perception of farmers and their background

    a) Scattering as a Hedge Against Risk: The issues to be explore dare whether fragmentation amongst poor is more on the high fertility lands than on poor fertility land second whether tin the process of inheritance or sub-division while the plots of poor fertility are swapped or exchanged. The plots of high fertility are almost always divided.

    b) In a rainfed region the relationship between S.I. and soil fertility is likely to be quite different from the relationship in a rainfed region endowed with considerable irrigation.

    c) This hypothesis also has an implication for the assumption of the scientists about the interaction between technological choices and economic processes in a dry region being converted into partially irrigated regions.

48. Area under bajra is inversally proportional to land size and intensity of irrigation. The poverty reach down affect of research on bajra thus may be considerable. The implication is that farmers even those who have irrigation tend to use water and other resources far more on Rabi crops than on kharif crops. The evidence is weak through intutively speaking quite plausible. This is related to a fact which scientists are well aware of that rainfed crops are neglected even by those who may have resources if they have alternative opportunities in terms of other crops in other seasons. Another aspect of this phenomena is the problem of salinity because of which large number of farmers do not want to use irrigation during kharif season so as not to affect the prospects of Rabi crop.

49. Area under gram may be universally correlated with lan Ëd size with reverse being the case in case of wheat and guar. The mustard not being rated in any significant way to land size. It might be useful to collect more data about the commodity composition of different classes in dry regions so that crops grown by the poor in greater proportion are given more importance/higher research resources than the crops grown predominantly by the rich.

50. Economic and Ecological Basis of Technological Diffusion: The sociological explanations of adoption of technology coupled with economic variables have led to considerable neglect of ecological variables in terms of diffusion of technology. An important implication of this neglect has been absence of

eco-specific research planning. Author had earlier argued that the technological change took place through a specific interaction between ecological and spatial characteristics on one hand and economic endowments on the other hand.

51. The other implication of socio-ecological explanation of technological diffusion is that scientists would target the trials of their improved technologies in the areas where the historical ecological niches exist. Also depending upon the local agro-climatic condition the precise disease, pests and other stress environment could be anticipated so that technology is properly tailored to local needs. For instance, it was found out that most problems of bajra were experienced by the farmers at the germination stage or at the earning in a particular group of villages in semi-arid part of western Haryana.

52. The implication is that the technology for bajra to have wider application will have to be developed with the assumption of rainfed conditions and smaller size of holdings.

53. Soil fertility index may be better discriminator than land and irrigation. The draft power (bullocks, camel, tractor hiring) and fallow during Rabi season may not have much bearing on the extent of acerage under this crop.

54. The discriminating variables in the order of importance distinguishing those who do inter-culture/weeding in bajra as per the recommendation and the who don't do at all are likely to be the land size, soil productivity index row to row spacing and extent of fallow in Rabi.

55. Scientists who often suggests that farmers are irrational because they did not do weeding did not take into account the specific circumstances under which weeds were found to be more. Studies on weeding have not taken into account the influence of various management practices on the weeding regimes. It has been assumed that weeds were indeed the problem under whatever management conditions.

56. The use of fertilizer seems to be the single most important discriminator amongst those who have higher than average yields.

57. The implication is that the breeding objectives of varieties for those who would like to have higher grain yields with higher grain to fodder ratio are obviously different from those who do extensive cultivation and grow this crop not only for grain but for fodder and thus have different varietal preference.

58. Unfortunately, most of the research on yield improved in context of millets has been with the assumption that farmers grow bajra intensively and primarily for the purpose of grain which obviously is not the case. The dwarf varieties have contributed towards a considerable fodder stress in drought

prone regions. Separate studies by the author have shown that the increasing instances of violence around grazing lands including village commons and private fallows are becoming rule rather than exception.

59. Incidentally in all the other experiments involving either varietal screening or inter-cropping only fertiliser was used instead of fertilizer and farmyard manure.

60. It is interesting to mention here that when discussions were held with an eminent pulse breeder at HAU about the importance of gram fodder as a parameter for appraising genotypes most astonishing reaction received was that fodder in case of gram was of insignificant importance both quantitatively and qualitatively.

61. While analysing category-wise differences in the adoption of technology or in the analysis of production characteristics it may be useful to take land product as the basis rather than only land size.

62. Farmers with low productivity neither have high grain to fodder ratio nor do they want a variety with higher grain to fodder ratio.

63. In All India Dry Land Project, an ideal variety is defined as the one with, `short maturity period, high potential, resistance to major diseases, non-shattering, bold seed and high gum content. Determinate and photo-insensitive plant types are yet other desirable characteristics'. It is obvious that the objectives of the technologists and that of farmers having low productivity but larger area under the crop seem to be at variance. We might hypothesize (even though we did not check up this issue with the farmers) that farmers growing this crop for self-consumption as fodder and seeds as cattle feed may not like to have determinate variety which will create the stress in terms of labour requirement for harvesting in a very small period of time.

64. The extent of fallow in Kharif may be the best predictor of the acerage under mustard crop.

65. Farmers having less fertile soils are likely to perform more than the recommended pre-sowing tillage. Apparently the recommendation of tillage practices have been developed with different conditions in mind then found most widely prevalent at farmers level. Paradoxically the problems of tillage under varying soil moisture conditions are defined with very different perspectives in mind by the technologists. For instance, it is noted, "in dry land agriculture soil moisture varies (when) occurrence of less than optimum soil moisture conditions are available for a very limited time. In view of this, use of improved and higher capacity implements will be required to cover more area in the limited time available and make the best and efficient use of

available power". It is quite obvious that while developing recommendations like mentioned above, the political economy of resource ownership by different classes of farmers is not considered at all. It is not surprising, therefore, that the technologists recommend greater tractorisation in the dry regions where employment is low and grains in timely operation have never been empirically demonstrated. In the present case people with poorer soils might prefer to conserve moisture through higher number of pre-sowing tillage and improve the yield and stability.

66. Farmers with significantly higher extent of irrigation may perform similar interculture operations as recommended compared to those who do not do interculture at all.

    Technologists do not recommend different intercultural practices under different conditions of management (in this case irrigation).

67. It appears that technologists should anticipate that there are some farmers who grow different crops with different purposes in mind and also with different interest of management. In such cases when yield goals are different, developing technological alternatives for improving the performance under varying management conditions on soil of different fertility levels becomes an important area of research.

68. There seems to be generally a preference for varieties that could produce little more fodder than the existing varieties. The technologists do not seem to take this objective of farmers into account while screening the germplasm for rainfed wheat.

69. However, in risky ecological contexts, successes like input responsive varieties of wheat and rice are not likely. The gains from technological advancements will be restricted to small spatial spreads. The ecological heterogeneity i.e. edaphic and climatic conditions varying at short distance, imply smaller pay off to biological research. Also, for the same reason, the need exists for taking into account the problems of specific eco-contexts.

    As far as the class specific features are concerned, we admit that not all technologies are likely to vary according to class interests though many would. Given the differences in the access to resources and institutions, need for specifically seeking an understanding of small farmers' expectations cannot be minimised. Harvest index is one breeding objective which, for instance, may vary a great deal amongst different classes.

70. Over a period of time the interest in organic fertilizers as also their interaction with inorganic fertilizer has been going down. This is an issue which should attract attention from the research planners. The fact that increasing exhortation by the planners towards dry farming and towards sustainable

agriculture (implying greater use of organic fertilizer/manure) has not had sizeable effect in terms of individual choices and research problems indicates a need for planned action.

71. Generally the scientists would advocate absolute freedom in terms of what problem they should decide to allocate to their students. It is also understandable that the students would like to have absolute freedom in this regard. However, given the shift in national priorities and considerable subsidies that government provides for higher education the case for influencing the choices of post-graduate research problems cannot be dismissed only on account of individual freedom. What methods should be chosen to generate the right type of solution is a matter which can be separately looked into. The point we would like the planners to notice is that the evidence on temporal distribution of problem-wise thesis research does not indicate a very strong correspondence between the planners' expectations and students' choices.

72. There were theses which concerned more than one region or more than one problem thus multiple count was inevitable. There were only 51/1128 theses concerning drought prone areas although 249/1129 (i.e. about 22%) concerned rainfed dry regions. The theses dealing with problem of irrigated area (partly or completely) were about 56 per cent of the total.

73. While in general, the problems of dry regions have received greater attention by the social scientists compared to the natural scientists, the allocation of research resources amongst different problems is obviously highly inadequate. Under such a context, the ex-ante role for social sciences can be hardly expected (though it is most desirable).

74. Majority of the students in social sciences gave importance to the problems or credit, working of extension system in general, followed by adoption of technology, agricultural administration, cash, food crops etc. The problems of livestock and related aspects were considered by only 3.29 per cent students.

75. Agricultural Extension: The distribution of extension thesis studied from the directory signifies that the share of rainfed and drought prone regions was only 9.1 per cent as against that of partially or fully irrigated regions being 27.3 per cent. Over the years the preparation of thesis for rainfed regions has slightly increased but that of drought prone areas has remain more or less same.

76. Crop-wise, region-wise distribution out of 900 theses titles, the nature of crop or commodity, 572 could not be identified from the titles. However, out of 113 theses for which this information was partially available there were only 17 theses dealing with dry region crops (15%) and obviously the bias towards cereals and cash crop is quite evident.

77. This also signifies a predominant bias in the extension research to define the problems with the farmers assuming technologies to be valid, relevant and beyond question. Undoubtedly, the early success of Green Revolution mesmerized the extension scientists so much with the obsolete model of diffusion of innovation by Rozer et al, that they have forgotten to look at the supply side totally.

78. Strangely enough the thesis on developmental organizations, agricultural administration, livestock have also been extremely disproportionate with the nature of problems. Within livestock there was no thesis reported on problems of sheep, goat, camel, etc. It seemed that livestock was generally interpreted in terms of only cattle or dairy animals. Given all the limitations of the sample our hunch is that the study of browsers does not attract many students because neither the planners nor the scientists seemed to have any empathy for the problems of shepherds living predominantly in stress prone ecologies.

79. Whether IADP bias continues?: It should not be surprising, therefore, to note that both the supply of skills and perceptions of demand of farmers vis-à-vis dry regions do not match. There is a need thus to (a) redefine the degree granting system, (b) provide more explicit incentives to students for doing research on problems of dry regions, (c) make it obligatory on the part of universities and research institutes to give considerable weightage to those students while selecting scientists who have done their research on entirely rainfed crops, (d) reduce emphasis on adoption studies and increase attention towards discontinuance studies as well as study of indigenous technologies, (e) launch study of livestock particularly browsers need to be given urgent attention because rearers of browsers are some of the poorest people; (f) appoint review teams in each university to look at the research problems; (g) attend to the supply side problems i.e. the process of doing research, scientific creativity, public administration and management of research and (h) study the dynamics and designs of lending on station with or farm research. The problems of hard tools, conjuctive use of organic and inorganic fertilizers, farmers' decision making etc., with specific reference to risky ecologies need considerable more attention. The instrumental view of science (as characterized by the choice of method first and problem later) needs to be discounted. That is precisely the difference between training technologists and educating scientists.

ANNEXURE – I

STRENGTHENING ON-FARM RESEARCHPROJECT AT BANGLADESH AGRICULTURAL RESEARCH INSTITUTE: SEPT. 1985-OCT, 1986

List of Selected Papers and Notes

FSR

1. How to prepare an impressionistic profile of a FSR site: a socio-ecological perspective.

2. Survival under stress: Understanding the dynamics of diversified resource use strategies of poor households in different ecological context, BARI, Joydebpur, 1986, Mimeo.

3. Understanding and improving homestead utilization system: a note to discuss the framework for a field investigation involving Economics, Horticulture and OFR Divisions.

4. Proposal to organize an Action-Workshop of extension workers, researchers and poor farmers innovators.

5. Understanding and Improving Homestead Utilization System: Why do we need women researchers?

6. Unheard Voices: Women's perspective in Homestead Utilization and Improvement: A Check list of Questions to be Pursued by Women Scientists for Developing Case Studies in the Field.

7. The Farmers Logic of Inter-cropping Pulse and Oil Seeds in Rainfed Bangladesh: A Preliminary Assessment, a joint paper written by Fazalul Haque, Abedin and Gupta presented at the International Food Legume, Improvement Conference at Khon Kaen, Thailand, September 1-5, 1986.

8. Draft Guidelines for the On-Farm Research, BARI: Prepared Through Joint Discussions of the Policy Group Comprising of the OFRD Scientists.

9. UNHEARD VOICES: Women and the Homestead Utilization System – A Joint Paper by Nadira Begum, Anil K. Gupta, Md. Zainul Abedin, D. Islam and Roushanara Begum presented at the Conference on Women and Agriculture, BARD Comilla, 1986.

10. Women and Homestead Utilization: Socio-Ecology of Risk Adjustment in Bangladesh, August, 1986.

11. Crop-Livestock Interactions in Bangladesh: Issues for Urgent Research (along with Z. Abedin, F. Islam and F. Haque), July, 1986.

12. Indigenous Technologies: Horticulture and Forestry – Dr. Monwar Hossain in consultation with Prof. Anil K. Gupta, August, 1986.

13. Women and Homestead Utilization: Socio-Economic and Ecological Context of Decision Making – Dr. M. Shahadail Hussain and consultation with Prof. Anil K. Gupta, August, 1986.

14. Generating Ecology and Class Specific Research Priorities: Socio-Ecological Perspectives on FSR, by Anil K. Gupta, N. Alam, Z. Abedin and M.M. Rahman: Paper presented at International Conference on Farming Systems Research, University of Kansas, Kansas, U.S.A., October 5-10, 1986.

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