

Science & Technology for Rural Development – is it different

We are all aware of the substantial investment that we as a nation have made in S & T education and research. It will also be generally agreed that the benefits from this huge and continuing investment do not flow to all sections of our society in equal or fair measure. While part of our national lives in the late 20th century, another part is still living in the medieval ages. No nation can progress much beyond the "national average". When these differences are too wide, they create not only social tensions but slow tensions but slow down progress and make it expensive, as we are finding.

How can the whole nation benefit from whatever S & T we have invested in? This is the question that worries not only politicians but also scientists. There is one group that feels we must set up separate establishments for "Appropriate" technology for Science for Rural Development etc. There have been demands for establishment for "Vedic Science" Indian Science" or "Indian Medicine" etc. While there is a case for funding organisations for specific objectives, I think we should not consider "Appropriate Technology" or "Ayurvedic Medicine" as a separate kind of science with different basics, where normal scientific principles are not valid.

Terms like "Appropriate Technology", "Renewable Energy" etc. in relation to use to of S & T for rural Development have produced some distortion in our efforts. It is my objective to try and show how the methods of S & T investigation used in basic and industrial research are badly needed for the development of the Rural India.

How can we get more S & T effort channelised to developing the backward regions and sections of society ? Is it only necessary to allocate more funds specifically for that ?

Briefly my thoughts in this regards are :

1. We should spread scientific methodology through education to all sections of society, in a way so that it is absorbed into the culture.
2. We must have a system which poses the right questions/ problems to the right people.

If these things can be done, I believe a lot of benefits will flow even from the existing S & T establishments to rural societies. What is more, this will elevate the overall quantity of our S & T effort and make it more original and less of a blind follower of the west.

There are two ways in which we apply S & T progress. First, we have some novel technique or product that fascinates us. We are therefore on the look out for an opportunity to use this information to our greatest advantage. Here solution of the problem is secondary and a successful application of our "idea" is the main objective. Most of our effort in S & T application falls in this category. In the second situation, we have a problem that seriously bothers us. We look at it, analyse, diagnose, think of alternatives, and select the best idea to meet the required situation. Relatively less effort goes into this kind of problem solving.

Both methods are valid, proven tools and are complementary. The overdependence on one however will impede progress. My belief is that at present we mostly look for "problems" to fit known solutions, but not the other way around. Primarily this is because the "problem" awareness in the scientific community is biased by poor information flow from our rural segment. Therefore published scientific information from (mostly western) Journals becomes the major inspiration for selection of new projects for investigation.

We have to select problems to tackle on some basis – because we have finite, limited resources. This is therefore a crucial decision. What are the scientists' expectations? I believe every scientist hopes for recognition and appreciation by his peers. Recognition comes from success in a challenging situation. If the work is trivial, success is not valued. If it is too difficult, success is elusive. A breakthrough is what makes the scientific work respectable. I am suggesting the following guidelines for selecting projects which I believe will meet the aspirations of the scientist and the needs of the society.

1. We should be able to utilise our strength – viz technical skill. There must be a challenge. The exercise must sharpen our skill and we must thus "grow" by solving or even attempting to solve that problem.
2. If solved, the program should experience exponential growth. All successful products or technologies show a sigma type growth curve. If our solution depends on charity or subsidy, the growth will be at best linear.
3. We should look at on going activities for "Problems" to tackle. They usually have relevance and urgency. Even small improvements have big impact.
4. We should involve costing and economics from selection stage of the project. Without cost consciousness development development efforts can go astray.
5. All activities have bottlenecks – limiting parameters. When these are tackled there is progress and new parameters become limiting. Removing bottleneck is therefore a continuing activity that ensures continuous progress until the law of diminishing returns make it unattractive.
6. Drudgery is an evidence of the crucial nature of the activity. Drudgery is removed by improving productivity. This also reduces the cost. Measurement of productivity of every operation therefore brings out areas needing development.
7. Any project must have a well defined "user population". The specification of this population defined the boundaries within which we have to find our solution. Our sights should always be fixed on this population for all decision making.
8. We often get confused by the issue Capital Vs. Labour is the Human Resource and time. Money is only a token of assets built up in the past through human resource and time + natural resources. Our choice of technology should be based on what combination of available resources produces the fastest growth of assets.
9. We should not be biased by luxury vs necessity arguments. Electricity was a luxury 100 years ago, now it is a necessity. If something has the potential to make an impact on the quality of life, S & T can take up the challenge to bring it within the range of every one's purse, and make it a necessity.
10. Finally we should select a project, that has a reasonable chance of success. This is necessary for morale as also for keeping open the flow of funds.

The criteria of success of the project is in its success in implementation – the success in the market place not an laboratory test results. S & T is a hard task master. Unless all the "nuts and bolts" are properly tightened it does not yield results. The information system is the nerve centre of any S & T program. It is not often realised that the information system is as important for the selection of the problem as for solving it. The foundation of any information system is the source and quality of information. If we are going to solve the problem of the rural society then this section of the society will be the ultimate source of our information. It is a fact that at present this source is not capable of giving relevant information in usable form. Such information now comes from estimates and is usually old, obsolete, incomplete and often unusable. The first requisites for our information system is therefore a population educated in the methodology of science viz. trained to observe, measure, record, classify, compare and interpret simple information. This in my opinion is the true

scientific temper. If this is absorbed by even a section of the youth in the villages, we could build on that a reliable information system that will define, quantify and document all "problems" perceived at the village level. A referral system is then envisaged, whereby these defined problems go to an appropriate S & T establishment, where the level of knowledge and the skill match the challenge posed by the problem. Backing up this referral system should be a computerised information storage and retrieval system, that collects and updates on a continuing basis, technical and economic information, performance indices and make this available to anyone on demand.

Such a system has been elaborated and is under consideration of the Govt. of India. If and when accepted, it will be possible to bring before the scientific community a range of problem, along with reliable background data, so that they can pick up challenging tasks of relevance to the rural society.

I have no doubt that when the awareness of opportunities for the application of good science spreads among the scientific community, the complexion of the scientific research in our country will change to bring greater benefits to our own rural societies. Let us remember that Louis Pasteur laid the foundation of microbiology by helping to solve the problem of rural France – wine making. Similarly investigation of the causes of malaria in India led Ross to world class research. Embryo transfer in cattle, tissue culture, new plant strains through genetic manipulation, new techniques for ground water exploration and development, meteorology and a host of other fields hold promises of significant impact on our rural economics.

A key component of the above scheme is to educate and develop the human resource – the rural youth and to bring them into the mainstream of Science and technology. For this we have tried the following strategy. 1. Work in live situations – clear targets and continuous feedback. 2. Train tutors in villages, who then teach others – second order tutors. 3. Take simple problems first and "grow" with experience. For this our model is the following: Education to be the cutting edge of Development * Learning by Doing * Multiskill training * Problem solving orientation * Education integrated with community service.

Towards this end we have evolved a "Rural Technology" course program that gives a broad spectrum technical education and gives access to the world of modern technologies, to the rural youth. This course is now recognised by the Board of Secondary Education, Maharashtra and is also given as a one year course to school drop-outs and three years course for VIII, IX and Xth std in the formal schools.

A quick run through the slides will give an idea of the kind of skills and services the program covers.

Site : Pabal, is a village of about 3000 in a drought prone area of Pune District.

Not too near, not too far, about 53 kms. to the north, but 20 kms away from the nearest highway.

1. Water – map reading, understanding geology is basic, Geophysical testing can be demystified and village youth can be used to give a useful service to the farmers – water prospecting.
2. Workshop skills are very strategic in the modern age. Welding, drilling, grinding turning are not only needed for repairs and maintenance but also to develop the inventive ability and uncover talent in the youth.
3. Energy and Transport : Diesel cart as a farm vehicle for transport, pumping and agricultural operations are some of the projects undertaken.

4. Welding forms such a key operation that trainees have brought their own material, built a welding transformer, for less than Rs.2500/- and taken it back to their village to start their own workshop.
5. Engineering drawing is an important component of training. It stimulates visualisation and is the universal language of technology.
6. Low cost housing and sanitation is another subject of training. All the campus structures are experimental and erect through trainee and staff effort. Steel frame houses with forroccement panels is one design in low cost housing. Geodesic dome structures covered with forroccement is another alternative. The steel kit for this is available for Rs.2845/- for the 280 sqft dome, (completed costs 10,000) Low cost sanitation forms part of the construction practicals.
7. Agriculture includes post control, drip irrigation and use of hybrid seeds.
8. Animal husbandry : Poultry is the main theme here, besides cross bred goats and cows. Trysem courses are also held. In the poultry training chicks are reared in deep litter and the cage system and the profit is shared by the trainees. Special modular 100 and 200 bird poultry houses have been design and tested for small poultries. Artificial Insemination in goats is practiced (collection of semen + insemination).
9. Knitting and sewing attracting a number of girls. They also get health and child care education, if part of the Rural Technology course.
10. All staff live on the campus and eat together. This is part of their education. The staff have a weekly seminar on technical subjects and have a review meeting for work planning and budgetting.



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