Reflections on science and technology for rural development
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- My wife, Vimala, and I would like to thank all of you. Your presence here shows the concern and regard you have for me. Our very special thanks to the Organisers of the Seminar for the time and effort they have spent – as they say -- far beyond the call of duty.
- In a sense this workshop is a tribute to the key features of ASTRA's approach that have been validated.
- First and foremost is the fact that all social needs are not answered with technological solutions. Specifically, the needs of the rural poor are filtered out and not addressed by the science and technology establishment. And therefore special efforts have to be mounted to tackle these needs.
- Then, there is the importance of identifying felt needs. In industrial R and D work, these needs are communicated through the market mechanism. But, in the case of rural work, one is invariably dealing with sections of the population that do not have the purchasing power to articulate their demands through the market. Our rural studies of buildings, energy, water, etc., proved a powerful platform for our technology development work.
- In this process, the extension centre proved crucial, as hoped, as an entry into rural life. We would have been seriously handicapped had our effort depended on quick hit-and-run village trips or hearsay or "conventional wisdom" regarding what was required.
- We also foresaw the interdisciplinary nature of the challenge, which could be addressed only because ASTRA had transcended the discipline-constrained character of departments.
- Finally, we rightly appreciated that success required first-rate science and technology backed by the best scientists and engineers.
- But all these successes did not come easy. My attempt at working in rural areas quickly revealed my serious shortcomings and handicaps. I was born and raised in a city and therefore knew virtually nothing about life in villages. I received westernised schooling in a catholic institution in Bangalore and advanced university education in London and therefore found it difficult to understand traditional attitudes and the ways of thinking of illiterate people. I belonged to the elite, being the son of a professional, and found it difficult to see the world through the eyes of the poor. I was male and therefore my gender-sensitiveness, notwithstanding my three feminist daughters, left much to be desired, particularly regarding the thinking of rural poor women.
- Fortunately there was one woman, my wife Vimala, who corrected me when I strayed. She was tower of strength, a bastion of support and a keeper of values. She was also a great asset – one villager was overheard asking "Is

this person genuine?" to which the other replied " He must be genuine; he has brought his wife." A related point is that there has to be the spouse's support if one embarks on unconventional ventures.

- It was not clear enough to us that women are crucial not merely in theory but in practice. There are several reasons for the resulting emphasis on women.
  (1) Women are the main beneficiaries of good development (or sudevelopment) and the victims of distorted development. Hence, an anticipation of how interventions would affect women is essential for rural development plans, programmes and projects.
  (2) Women are crucial actors in several rural activities such as fuelwood gathering, cooking, fetching water, backbreaking agricultural operations, etc. Hence, their enthusiastic participation is vital to the success of projects.
  (3) Women can play a major role in micro-enterprises where they have established an outstanding record of timely repayment of small loans and utilisation of these loans to raise the living standards of their families.
  (4) Women are better investors and planners than men are. When a woman has the capacity to invest, one of her first concerns is children, so women are prepared to invest in things men won't and don't consider. Thus, the decisions of women take into account the long-term and the next generation, a natural consequence of their linkage with children. They are prepared to sacrifice immediate gains for long-term benefits, i.e.; the discount rate used by women is lower than that of men. Since it is precisely such a view that leads to sustainability, women are naturally endowed to be the implementers of sustainable development.
- Unfortunately, ours was an overwhelmingly male effort, barring important exceptions such as Shailaja and Nirmala and Svati.
- By and large, our focus was on the generation of technology even though commercialisation and dissemination of technology are essential for technologies to spread through the economy. In extreme cases, it was naively believed that R & D was enough and that somebody will disseminate the technology. But technology dissemination is an altogether different ball game from generation, requiring understanding of economics, financing, institutions, management, stakeholders, etc. In fact, for the dissemination of technology, complete hardware plus software packages are necessary
- Further, there was excessive reliance on government agencies for technology dissemination. There was inadequate appreciation in the '70s of the power of the market for the allocation of materials, money and men. And in the '90s when the pendulum swung to the other extreme and the market became the mantra, there was little understanding of the limits of the market. The point is that the market does not bother about inequity, the environment, self-reliance and the long-term, in fact any externality not in the balance sheet.

- It was invariably forgotten that ***individual initiative subject to local community control*** is a distinct third option (apart from government and the market). Whereas in the well-known "Tragedy of the Commons" where individuals pursuing their private interest destroy the commons, in the "Blessing of the Commons", the price that an individual/household pays for not preserving the commons far outweighs whatever benefits there might be in ignoring the collective interest. In other words, ***there is a confluence of private interest and collective interest*** so that the interest of the commons is automatically advanced when individuals pursue their private interests.
- There must have been many examples of "Blessing of the Commons" contributing for centuries to the survival of Indian villages countering the centrifugal forces tearing them apart. These examples would include village tanks, common lands, woodlots, etc. It is important to discover, understand and utilise such examples for the design of rural development projects.
- In the matter of dissemination, the crucial importance of entrepreneurs was not appreciated sufficiently. Entrepreneurs are the agents of dissemination that take on the burden of spreading technology. An example of entrepreneurial success is the local call/STD/ISD telephone booths, which have proliferated all over the country because the investment is within reach of many homes and the operation of the technology is simple.
- Large programmes such as the Grameen Bank of Bangladesh have unambiguously testified to the crucial role that women can play in micro-enterprises. It is now clear that these projects are succeeding because they are overwhelmingly based on women. The innate entrepreneurial capacities of poor women have been demonstrated in a number of ways: the success of micro-credit and micro-enterprises rose dramatically when poor women, rather than men, became the main targets. What is more, in the case of poor women, their application and use of the credit for income-generation was in general extremely effective.
- The success of women's dairy and livestock co-operatives points to the potential of womentrepreneurs. Similarly, projects that have given poor women leadership roles in the management of basic community services like water, sanitation, housing, health and education have shown that women can usually deliver better results, at lower cost and with less corruption. In short, poor women's managerial and entrepreneurial skills have been validated in diverse contexts, where opportunity, resources, training and leadership have been transferred to them. Thus, women must not be viewed merely as passive beneficiaries; they must be viewed as potential managers and entrepreneurs.
- We attracted faculty by offering them technical challenges, which also constituted moral challenges. But moral challenges are not sufficient. For young people who have not established themselves, career incentives are important. We did not devote sufficient attention to the establishment of appropriate reward systems. There was far too much demand on devotion

and commitment. The situation was aggravated by the fact that most technologies required a seven to ten year gestation period to go from concept to penetration of the economy. Professor Jagadish with his 30-year work on low-cost housing is a rare gem.

- An organisation has to earn active interest from the environment by sustaining the delivery of outputs of relevance to the environment. ***Relevance*** is therefore the first crucial requirement of a sustainable institution. Relevance is not measured merely by the quantity of outputs, but also by the quality of these outputs. Relevance is inevitably, intimately and inextricably dependent upon excellence of the organisation's outputs. ***Excellence***, therefore, is the second crucial characteristic of a sustainable institution. The achievement of excellence earns for the organisation national and international recognition (that society will accept as an independent external review of the organisation). Relevant excellence also ensures excellent relevance.
- Unfortunately, ASTRA did not pay enough attention to mechanisms for peer review and quality control. Work that is relevant is not ***ipso facto*** excellent -– just as there can be third-rate work on conventional technology, there can be third-rate work on rural technology.
- The threat to excellence can come from a wide variety of tricks that are used to circumvent and subvert the quality control system. Foremost among these are the following:
  - avoiding publication in peer-reviewed journals and instead courting the local lay press and its non-specialist columns;
  - courting generalist bureaucrats instead of interacting with technical peers;
  - steering clear of technical conferences;
  - never making performance transparent with detailed reports;
  - publicising funding as a proxy for technical achievement;
  - presenting proposals as if they have been implemented and plans as if they are accomplishments.
- It is fashionable nowadays to talk of stakeholders and the importance of achieving win-win situations. But this may not always be possible and there may be irreconcilable conflicts between vested interests on the one hand and the masses on the other. A major challenge is how to characterise and function in the situation.
- Another important issue is self-reliance/empowerment, i.e., the power and ability to shape one's own destiny. Empowerment is central to rural development. Self-reliance does not mean self-sufficiency or being isolationist; it does not preclude either imports/exports of human resources, materials, products and processes. However, one of the most fundamental lessons of development is that policy-making and its implementation are more effective if they are in close touch with people on the ground. The

long-term benefits of involving local people in the process of development far outweigh the short-term efficiency savings of using outside experts. The need for self-reliance has increased in the age of globalisation. In fact, in a globalising world, we need to be more vigilant to make sure the interests of the local population are supported in a sustainable fashion, and not used for the short-term benefit of a few in the boardrooms of industrialised countries or in the mansions of the local elite.

- A major challenge is to ensure that self-reliance is an integral component of sustainable development. Unfortunately, a serious obstacle is the three-legged definition of sustainable development that is popular among global efforts. Unfortunately these efforts, particularly those concerned with climate change, rest content with a handicapped definition that is restricted to economic efficiency, equity and environmental soundness. Of course, rulers who deny their people control over their destinies would be most happy with such a crippled definition of sustainable development that excludes self-reliance/empowerment. But without people being in control over their destinies, their societies will not be sustainable over the long run. Sustainability requires the four legs of economic efficiency, equity, environmental soundness and self-reliance/empowerment.
- Outsourcing is a major threat to self-reliance. Beware of outsourced projects for which the agendas and interests lie abroad and the outsourcing is to take advantage of the lower salaries of the outsourcees and their familiarity with the local situation.
- The timing of interventions is of crucial importance. We worked for almost a decade on Integrated (Energy) Resource Planning or Least-cost Energy Planning. Our contributions were path breaking and have gained international recognition. The technologies identified 20 years ago in our least cost plans – compact fluorescent lamps, solar water heaters, wood gasifiers, wind generators, surplus electricity from sugar factories – are now commercial, though doubts about every one of them were vociferously articulated. But the integrated resource (least cost) plans have been completely ignored by the government despite the fact that they are cheaper, quicker and more environmentally sound. Why this failure? Perhaps because the appropriate institutions for least cost planning have not been established even though the summation of the demands of the separate ministries/departments for the various technologies leads to high cost plans. Despite its convincing basis and logical appeal, least cost energy planning is far ahead of the times. The timing is not ripe.
- Finally, I would like to your attention a dilemma that many others and I faced. After a little achievement in our work on rural technology, we got invited to international meetings. We were invariably a great success not because there is anything great about us but because we were often the only invitees/participants who had an understanding of rural life. So it was

because of acting locally that we were able to contribute to global thinking. The invitations multiplied so much that there was a real danger of us becoming globetrotters wandering from one international meeting to another. It is necessary to strike a balance between global and local action. In doing so, it is worthwhile remembering **Antaeus,** a giant in Greek mythology, who was the strongest man provide his feet were firmly on earth.

- I hope that I have convinced you that there is great deal to be done re: science and technology for rural development. Unfortunately my innings is over with regard to physical participation in work. But I am with you in spirit and I wish you all the very best.