# SCIENCE MOVEMENT FOR SOCIAL ACTION

# A STUDY OF A FEW EXPERIMENTS AND PROGRAMMES

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# PREFACE

The experiment of planning and development so valiantly undertaken in the country under the enlightened and spirited leadership of our late Prime Minister Pandit Jawaharlal Nehru, certainly initiated the process of planned, sustained and people prone type of development. However, not withstanding Pandit Jawaharlal Nehru's lofty conceptions and philosophies the programmes came to be largely implemented by bureaucracy at different levels; from Central Secretariat to lower most village levels. It is a patient fact that various segments of bureaucracy were not particularly well tuned as well as groomed for carrying this task to fruition.

By and large it can be said that the various programmes of development never really became people's programme and as such various measures were suggested to overcome this lacume. Apart from various social welfare agencies, though quite a few of them worked or rather preferred to work under State patronage with all its trappings. Therefore, it is indeed a very heartening and spectacular, one might say, phenomenon which took place on the Indian scene viz. a group of scientists feeling impelled to address themselves to this task a) by emphasizing a role of science b) by making science available to the people and c) making it a people's science movement. Apart from these groups there were several other groups of scientist who came up to convey the message of science to the common man, not only to teach him what is science, but to relate science effectively to his day-to-day life so that there would be an improvement in his

life and living conditions. Whether it is science education or putting across message of science to everyone or to utilize the insights of science to improve living conditions, there is no doubt that this effort was motivated by a high sense of idealism and actuated by ideologies.

Science came to be an extremely important adjunct of various voluntary groups who are generally styled as non-governmental organizations. Science which was normally confined to natural science was integrally linked up with social sciences and every effort was made to inquire into and improve the relationship between man, nature and society. In doing so some radical experiments were also made such as to make people accept certain key resources like water as a common property. Similarly special efforts were made to improve the academic performance of dis-advantaged and dis-privileged students or to include new groups of actors who formerly were left high and dry of any kind of development whatsoever.

Basically this is a study of the role science can play when it is truly oriented to the needs and aspirations of the common man and particularly to demystify science so as to bring it within everyone's reach and competence. In addition to this by evolving people's science movement continuous demands were made on science and scientists to play a useful role in improving the conditions of the people. Utilization of science with an avowed social purpose constitutes the crux of these various experiments.

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## INTRODUCTION

Even before discussing what is meant by Science in this context a few words above movement would be in oider. As is well known every movement has to have ideology : idealism, organization and institutionalisation which are absolutely necessary for sustaining any movement. Of course every movement must necessarily have a body of programmes to be implemented. Moreover, programmes need to be revised in order to keep pace with the changing environment : demands of the people and the infrastructure of resources which would be available resources are not only material but essentially human. It is certainly well known that however, laudable the programmes may be much depends on who implements them and how. There has to be a flexibility of programmes and even the personnel put in charge of carrying out such programmes should have a flexible approach in the sense that they must be very sensitive to the recepient's perception and experience as well as demand which must be taken into account. Other wise such programmes will tend to be run in a purely bureaucratic style, defeating the very purpose. It is also said that the programmes should be geared to social transformation : social change. However, social change and transformation present a very tall order. Generally social change is defined as change in the core social institution and even more so their inter-relatedness. However, what is expected in the context is not really this kind of transformation or

change but simply a process and programme of enabling the poorer sections of our population to participate in various activities, particularly income generating activities. So many times the concept of development is rather un-critically employed. However, development will have no meaning whatsoever if a large section of our people are left out not only of the process of development but even more so deprived of the fruits of development. In short, what is meant is the facilitation of income generation for every one, no matter whichever class, caste or local he belongs to. Without earning any income it is obvious that any kind of consumption would be impossible. So many times one hears about the lack of purchasing power in the hands of poor people, so that even if food grains and other necessities are available in the market they are not in a position to avail of those. The same could be said about clothing and shelter. Of course, in modern society where one's earning capacity depends on the education and training he has received, all those who are deprived of requisite education or in a way debarred from access to the necessities, comforts not to luxuries of life. It is a patient fact in India there is a dual labour market, as a result of which majority of the people are kept away from jobs which are prestigious status giving and high income yielding. Leave aside the black market to which majority of the people do not have any access even for necessities of the life including education. There is dual economy in operation. Therefore, the most important aim or goal of social transformation and any movement aimed at attaining it will have to make sure that every one gets at least minimum amount of

income which will allow him not only to feed himself and discharge his family responsibilities but also to lead human existence. Instances are galore about sub human existence of people to which they are pushed by dual market and of course by system and practice of bondage.

Generally, people tend to equate revolution with movement. Of course, removal of poverty and the helping of marginalized group : landless labourers, women, scheduled caste, scheduled tribes and other deprived and dis-advantage section of population are lifted up so that they get over the stigma of being marginalized. Yet, marginalization is much more comprehensive and insidious because it reduces such sections to a sub-survient existence. And perhaps that is why it is fondly felt that a revolution would once for all put an end to the misery of such people, even more so to make sure that the society would be misery-free. Those with such inclination and conviction tend to look upon Science as providing a panacea for all the ills of the society. Science is naturally equated with rationality and it is felt that by adopting a rational approach all the problems of the people and society can be resolved satisfactorily. Of course, there still remains the question of who is going to utilise science for resolving the problem ? Further still what is the concept of science ? Is is going to be a privilege and monopoly of a minority of the people ? If not, how can it be made available to every one and of course in what form and shape ? This necessarily introduces a pedagogical problem. The usual concept of science has to be considerably broadened so as to make

science user friendly. By and large there exists a certain degree of fear about science and even more so about the scientists. Both science and scientist have so far stayed away from the common so that quite contarary to the very aim of science, it is mystified, inaccessible and fear instilling. Therefore, the very first aim of any science movement would be to demystify science by making it available to all and sundry by making use of the locally available resources. Otherwise, if one were to make a fetish of very sophisticated instrument and the use of a language not easily comprehensivable to common man. people would shy away from science. Not only that but the value of science must be demonstrated in its utilization for solving day to day problems. For example, fixing a water pump, providing safe water supply, repairing any kind of equipment : in short to acquire a minimum degree of control over one's situation.

## THE ROLE OF VOLUNTARY AGENCY - THE NON GOVERNMENTAL ORGANISATION

Pandit Jawaharlal Nehru, India's first Prime Minister, put much store by science and as such created a network of science laboratories in order to conduct advanced scientific research so as to keep pace with advanced nations. Nehru also talked of a scientific culture and nature although how to create it and particularly make it available to those outside the main stream of education remained problematique. This is precisely why "science" had to be redefined, revised and made available to every one. In short, there was an urgent need for developing parallel science. One is reminded of dual labour market, dual economy and now dual science. All the same this kind of "dual

science" is very necessary for the common man and that is why this task can only be undertaken by voluntary groups. Since science has to be redefined and extended. It would require the acumen and energies of such scientist who would both have the capacity to do so, energy and time to spare and of course sacrifice their career "as prestigious scientists" who would flock the corridors of power. In short a special breed of scientist is required. Science movement as it has been developed in India is essentially both conceived, developed and manned by such scientist. In the 1930's there was considerable debate about the nature, role and responsibility of science and scientist. J.D. Bernal and several others distinguished scientist applied their mind to this problem and asserted forcefully that there can be no science without society and therefore, science must be essentially used for society. This means a change in the very conception of "traditional science" which was meant for dominating rather than serving people. Even as of now, hierarchy tends to be observed amongst natural sciences - mathematics and physics occupying pride of place, relegating disciplines like botany to lower order. Obviously natural science tended to lord over social sciences and humanities. On the other hand if one were to accept the broader concept of science which put it centrally in society and for society, such arbitrary notion of science has to be discarded. In fact, it has been properly realized now that science has to be understood in the light of social reality - various social, economical, cultural, and political arrangement and therefore, cooperation between natural sciences and social sciences is a

must. This can be effected only by forging organic linkage between the two. All this can be attempted only by voluntary groups and individuals constituting such groups. During the last 35 years or even more, different scientists have chosen to join or rather constitute such groups, with, the avowed purpose of redefining and utilising science for furthering the cause of the common man and this particular phenomenon labeled as science movement for social action. Various doubts has been expressed about the viability and efficacy of such groups - non-governmental organizations but we will not enter into that discussion right now.

Science movement as it has developed in India ranges from a revolutionary fervour to down right practical use of science and technologies for changing the lot of the people and also to educating people, in this new science so that it becomes a part and parcel of day to day experience. In this context mention should be made of imparting science to health education to children in school so that they would convey that message to their elders. Like wise science and technology is used from storing water and making it available for every one so as to earn his living, by imparting skills for the improvement of one's economic resources and thereby to create confidence as to how to handle the stranger - urban people, government funcationaries, officers in charge of banks, trade and commerce etc. Therefore, the concept of science has been extended and is all pervading. There is hardly any doubt that this is an ad-mixture (organic) of the material and the moral. Rationality and ensuing control over

the situation is to be shared with everyone rather than monopolising it for one's own selfish gains is the underlined philosophy. No wonder that science and science movement in particular is designed for transformation. One might ask the question as to what is the nature of transformation ? Is it radical and revolutionary ? Does it aim at changing the very structure of social relations? Or does it enable the disadvantaged groups to not only their earn living but also lead a life of self respect and dignity ? In a way as stated earlier right from, nothing short of a revolutionary upsurge to modification of reality so as to make it palatable and even profitable for everyone are the stated objectives of science movement.

## Typology of science movement studied here

The Kerala Shastra Sahitya Parishad has been engaged for the last 35 years and more in evolving and spreading a science movement which is fired by Revolutionary Ideology. In fact, it is openly stated that their purpose is to encourage activism which would squarely challenge the existing social, cultural, economical and political arrangements. And that is why this experiment mainly concerns itself with the training, education of workers (in the movement) and conscientisation. With this end in view various programmes and activities are undertaken, which will be described later. This particular experiment deals with urgent and important issues as they arise from time to time, for example, the silent valley project, environmental pollution and so on.

Homi Bhabha Science Education Centre, Bombay has been mainly concerned with science education for students coming from disprivileged groups. In order to impart science education to such children, a municipal high school at Tardeo, Bombay was adopted by this group of scientist hailing from Tata Institute of Fundamental Research so as to make science text books readily understandable to the students by re-writing them and also to create interest in scientific experiment by throwing open physics, chemistry, biology laboratories to these students all the 24 hours of the day. Since all these students came from disadvantaged families - slums where the parents were not educated and as such were not in a position to offer any guidance to their wards. It was felt that by resorting to this course of activities proper and healthy interest in science would be created in the minds of the students so as to rule out fear and suspicious of science. As a matter of fact, after a few years of the conduct of this experiment, the performance of students was evaluated specially for science subject and it was found that the outcome was very re-assuring not only in subjects pertaining to science but also in respect of acquiring some proficiency in English language and of course, a measure of self confidence in conducting themselves in the class or even outside.

Maharashtra Association for Cultivation of Science, Pune

A group of scientists decided to adopt a few villagers round about Pune so as to concentrate on health education, changing of sanitary and environmental conditions of the people and also to offer some technical help in changing the living

conditions, particularly by making safe water supply available. With this end in view, a health workers were posted in these villages so as to monitor this programme and to study its impact. This was done primarily through school children who were trained to observe the norms of hygiene, sanitation and health not only in schools but also in their homes as well as educating their parents. Basically this is a programme of health, education and nutrition. Various students working for their M.Phil or Ph.D degree in the field of nutrition, biometry, molecular biology etc. were given research projects to work in these villages. Co-operation of medical doctors was also enlisted who would go from one village to another once a week so as to offer proper advice and suggestion regarding health and illness.

## Pani Panchayat

An engineer who was considerably concerned about persistent drought conditions in Purandar and Saswad Talukas of Pune struck a brilliant and novel idea of encouraging, enabling people particularly small farmers or for that matter even landless labourers to organise themselves in a group so as to ensure 1) storage of water, 2) distribution of water in terms of social equity to everyone so that everyone could earn a living. The engineer concerned Mr. Vilas Salunke after a careful study of topography, rainfall and any other sources of water came to the conclusion that every drop of water should be and can be stored so as to be utilized by the people of the villages. In addition to his engineering skill, he displayed exemplary skill in persuading and organising people of these villages to form groups

so that water will be stored and distributed equitably. In order to bring this project to fruition Mr. Salunke left no stone unturned so as to persuade and convince governmental bureaucracy and banks to provide necessary credit facilities. Of course, he exhorted villagers to provide 20% of capital needed for such construction mostly, in cash or failing which in kind. Thus this experiment is not only a scientific and technological one but a socio-political experiment, which is both innovative and challenging.

## Bharatiya Agro Industrial Foundation

Being a disciple of Mahatma Gandhi, Shri Manibhai Desai thought it fit to concentrate his attention and energy to improve the lot of rural people. With a view to do this, he posted himself in Urulikanchan. He was convinced that unless a source of ready income was generated people could not either listen to any moral or spiritual advice and therefore, he concentrated on providing people with an assured sources of income by improving the cattle which they possessed. Cattle breeding programme by using latest knowledge and equipment both from India and from abroad provided a starting point of his activity. However, the gamut of activities undertaken ranges from cattle breeding to seri-culture. Of course, several programmes were undertaken such as water shed management, development of nursery, social forestry, poultry and so on. So as to put money in the pockets of the people. While the starting point is essentially economic the main purpose underlying this activity was to train people to become self sufficient, self respecting and dignified. These

various activities were spread from usual villages to interior tribal belts. While doing so, latest scientific and technological devices were availed of and of course developed so that locally people themselves could see the efficacy of such devices. In addition management technique was employed so as to take care of the economic viability and profitability of every activity. This is a wide ranging programme, providing people with a source of income and at the same time injecting social change through Balwadi teachers, and field and extension workers. Clever use has been made of children also to convey and convenience new messages to their parents and community. Technological and economical development as well as education and training have been very intelligently utilized for effecting change in these villages. Of course, no attempt is made to challenge the existing order but every attempt is made to prevail upon the existing resources, wherever they may be, to help the villagers to improve their conditions.

## RAISONDEDRE OF SCIENCE MOVEMENT

The various 5 years plans as floated and implemented by the Govt. of India and the various steps taken were expected to promote development so as to at least meet the basic minimum need of the common man such as drinking water, health facilities, employment, education etc. However, in reality with every plan completed newer and newer problems have come up, particularly that of un-employment and non-availability of minimum resources needed for keeping body and soul together. This is reflected both in un-employment figure which are mounting and also in the incapacity of the people to satisfy the basic minimum needs. Neither the growth of food supply nor the pace of industrialisation has been adequate either to provide sufficient employment and even more so to create purchasing power. The bigger projects like construction of dams and heavy industry either in the public sector or private sector have not been enough to provide employment and purchasing power. In short, the trickle down theory has not only not worked out, that but the Govt. is not even sufficiently aware of the tragic reality which is some times covered by pseudo development. The very nature of development has been im-balanced which is reflected in the regional and sub-regional im-balances. While as a nation, we always refer to the North South differences and discrepancies in our own country there are several such differences, discrepancies which have not been properly attended to. This state of affairs is generally ascribed to faulty planning and even more so the tardy and reluctant implementation of various programmes of

development undertaken by the state. Moreover, hardly 20% of the schemes reach the people for whom they are intended. And that is why there is persistence of poverty and deprivation. On the other hand the increasing pressure of globalization would render majority of the people into unskilled workers. Of course, even among some regions as well as sub-regions this spectrum is already looming large. For example, Marathwada is a backward sub-region of the advanced Maharashtra, particularly Western Maharashtra. It is also complained that people do not participate in the various development programmes sponsored by the Govt. Several studies point a finger in this direction. As far as the urban sector is concerned, quite a few feel that there is nothing for them to participate in because the programmes are decided in an ex-party fashion and even more so implemented in a very perfunctory fashion. As regards the rural sector the less said the better and therefore, supreme need for the voluntary organizations. That is why various science movements and experiments listed above have to play a significant role in at least alleviating the sufferings of the people. It is fashionable to raise several questions about the need and advisibility of such experiments. It is generally felt that the problem of poverty can be solved only by working with the rural poor. However, there are forty percent people staying in urban areas quite a few of the urban population are poor and need various kinds of programmes for their uplift. Lack of employment and the requisite scheme for satisfying ever increasing needs means new strategy because the new kind of assignments turn many into unskilled and even un-employable. Late Shantanurao

Kirloskar used to say that the product of many engineering colleges are not only un-employed but also un-employable (for want of requisite training and skills). There is also a tendency to belittle small programmes and experiments and it is also argued that small programmes would not make any dent on the existing problems. Therefore, the usual dilemma between the micro and macro approach is also advanced. However, what is micro and macro can be a matter of proportions. Moreover there is a tendency to underplay technical approach which again is erroneous. Both technical and human approach are necessary at the same time. It is important to establish linkages which like-minded organizations and activities in the country and even may be outside the country. Technical know-how from whichever source from which one may get it as a must. Usually emphasis is placed on designing programme in terms of the 'felt-needs' of the people. However, as in economics, supply creates demand. If new programmes are made available to the people, once they see the profitability of such programmes, they take to it avidly. Initiative and innovativeness is extremely important for initiating and developing newer and newer programmes by which people can learn and profit. While it is very important to train and equip the insider to take up and implement the programmes which were originally introduced by the outsiders, there is no doubt that certain kinds of technical and professional expertise may rest with the so called 'outsider'. It is here that a proper mix of local and outside division of labour is needed. As the entire development theory points out there is no such a thing as a proven model of development that can hold good for different

kinds of environment and circumstances. Then again there is the usual criticism that the various action groups provide only a foot note to the entire task of development. In addition to initiating and implementing programmes of development for the most needy and neglected sections of population, various modalities are developed which are reflected in the conduct of such programmes. The basic concern for creating purchasing power through which many other schemes of development and change can take place is certainly well known. Even while initiating programmes for creating self employment there is no doubt that technical expertise and to certain extent leadership is provided by the agency which initiates such programmes. It is generally argued that any programme in order to take roots and be effective must be a people's programmes. However, what is not generally realised is the inability of the common man even to conceive of a programme which requires a) identification of resources - material and human b) getting access to such resources and c) to have the expertise to transform these resources in units which would provide self employment d) to derive skill for marketing of the products produced. This is exactly why help from external agency is very much required, at least initially, if not, more or less permanently. Of course, this involves the usual problem of the donor and donee relationship which can be easily tackled if the people in such agency in charge of the programmes are fired by idealism and are prepared to offer their services to the people in the shape of the programme. Even though it looks as if the agency offers the services, without involving the local people such services would mean nothing. It

is a truism that whatever is offered free is not valued and therefore, people have to be made to pay for such services rendered. Then the relationship becomes mutual and the usual syndrome of dependency can be avoided. Even while technical advice comes from outside it has to be internalised by the local people for whom it is meant so that for running a programme they do not have to depend on the external agency. This necessarily means training of the people on the jobs not once for all but from time to time. Training is again based on the philosophy of relationship of equality between the trainer and the trainee, which has to be eventually established. Therefore, the usual top down relationship can be averted. There can be no denying that the work of agencies is meant to be a substitute for the inputs to be made by the state. All the same such work creates a new perspective and model for at least communication and dissemination, if not, emulation. The spread effect of such models as they get developed in course of time is certainly well known and in many cases it transcends regional and state boundaries. Therefore, the initiator of a programme have to be continuously prepared to interact with all others who display such interest. In fact, they have to play the role of trainers. In a way offering services and training are two sides of the same meddle. Sometimes, people feel that training and giving services are two distinct kinds of work, which is not so. It is some time complained that social action groups tend to stem the tied of the revolution. Even a cursory understanding of any movement would enables us to appreciate the importance of the process of institutionalization, which necessarily reduces the revolutionary

fervour and programmes. Inevitably there develops a certain amount of routinization. Moreover, a purely revolutionary programmes may not or would not have any concrete material services to offer to the people. Particularly when the attempt is to serve the marginalise and poorer sections, one can not be depend on philosophy alone, some material input has to be necessarily provided. Social action groups play a positive role in India of which science movement is a very eminent example. By its emphasis on rationality and the capacity to manipulate the situation so as to be helpful to the common man or even to the poorer sections science movement, certainly plays a catalytic role. While the inputs provided may look only material such inputs set in motion various trends of social change which would affect the existing pattern of relationship. e.g. the landlord and the tenant, the rich and the poor, the status of women, children and of course, not only identifies but accepting new actors and leaders. As we shall see later, even women who were widows or deserted play an important role, which becomes acceptable in a traditional setting, which in itself is an important measure of social change. There can be no doubt that action groups and particularly science movements play a significant role of providing enlightment to the people, not only by sticking to the cannon of rationality, but thereby opening the gates of social change. One of the major indicators of social change is the new capacity of the common man to fight against inequality and injustice. In a way therefore, if people start questioning the traditional patter of authority and power this would really spell important social structural change. This can

be achieved a)by education and b) even more importantly by providing the wherewhitl of resources so as to make the people independent. As a matter of fact, the traditional dependency pattern is full of domination whether it be landlord tenant relationship, employer employee relationship, father son relationship, husband wife relationship and of course money lender borrower relationship. If people become economically independent and can find their way to augment their income by devising various methods of production and even more so develop sufficient mastery over post production processes such as marketing, then the traditional structural would certainly get a jolt. This is precisely what a science movement is about. And it is in this sense that science movement is looked upon as an important agent of change, even though it may be confined to smaller units.

The typology of science movements and the variety of experiments and programmes give us an idea not only of its variety but even more so of its supplementary or rather complementary nature. In fact, these experiment are not to be treated in any way as competitive and mutually exclusive. Any good programmes which has been developed over the years ano has been proved to be successful has to be communicated to others so interested. What is needed is a clearing house instead of an individual and unique programme which can not be imitated by others. It has been stated at the outset that every movement requires an ideological basis, no matter the variation in actual programme undertaken. Thus whether the programme tries

to educate people or offer them the different kinds of services a firm ideological basis has to be properly appreciated, without which a movement can not emerge or even more so sustain itself, that is why the statements about ideology and the attendant programme of action of different science movements under study is verbatim provided here. In a way such a statement enables us to appreciate the nature of the programme and also its achievements, with certain limitations.

## PSM IN THE INDIAN CONTEXT

"The genesis of the concept of a People's Science Movement (PSM) in the Indian context is a very recent one. Science based education groups and their activities have been numerous in the country and one of the major areas of focus of these groups was the popularization of science through the medium of the mother tongue. Some of those who pioneered in this effort and made significant contributions were persons who were themselves eminent as scientists.

"However, the impectus and inspiration for science based social activities came not from a mere desire for dissemination of information on natural sciences but largely from the disillusionment of concerned intellectuals, mostly in the younger age group, with the official thinking and action in alleviating mass poverty and unemployment and its concomitant degradation of the human condition. During the `sixties this disillusionment found expression in several groups of educated youth and intellecltuals opting for voluntary work in the spheres of non

formal education, health and rural development. Some of them did try to understand and raise questions on the social and economic structure of the Indian society and attempted to grapple with the issues relating to political economy of development. At the political level, the debate on the nature of the Indian ruling class and the strategy for a revolution in the Indian society became much more intense. However, the pursuit for ideological purity more often resulted not in the strengthening of the progressive and democratic forces in the country but in its fragmentation and dissipation. As social and economic problems accumulated, the 'seventies witnessed a much more intensified turbulance in the political process of the country.

"One of the positive aspects of the experience of the last two decades was the realization that any attempt at fundamental change in the Indian society would need the active involvement and participation of the poorer and voiceless majority. This perception about participation and the need for identifying issues in terms of the experience of the people gave an activist orientation to the varied and often enlarging voluntary work in the area of development.

"Groups engaged in science education and dissemination became conscious of the new challenges. From acquiring and disseminating knowledge to applying it with a view to change society meant the realization of a more active role for the intellectual community than was understood hitherto. It is in this context that one should examine the use of the medium and idiom of science for social activism.

"One of the earliest groups to use the word science in the activist sense was the Kerala Sahitya Parishat (KSSP). A fairly long period of interaction with the people brought to its work the need for using science in the broadest possible sense embracing all branches of human knowledge thereby stressing the essential unity in nature. This understanding also brought to the fore the artificial and partial nature of the compartmentalisation of human knowledge into several branches without consciously trying to understand the essentialunity and complimentarity in them. As experience showed, there was a natural science content for every social issue and a social science content for every issue in `science and technology'. Imbibing and inculcating the method of science to understand not only the physical reality but the social reality as well and attempting to find solutions to social problems is what gives science an activist role.

"In trying to project deliberately the role of science in such a framework the attempt is also to demystify the notion that science and scientists have an autonomous realm of existence making their intellectual pursuit unhampered by the mundane and murky social issues and problems. It is to underline and emphasize the relationship between science and society in shaping the lives of the people that the slogan `Science for Social Revolution' was launched by the KSSP. While this slogan has a mobilizational appeal and should serve as a reminder at every stage of activity, it is not intended to mean that the practice of science will by itself ensure a social revolution.

"On the contrary, it is the understanding of the KSSP, that there are a variety of forces in the society which work for social revolution. While these forces have their mobilizational and organizational strategies and ideological frameworks, there exists a space for all those who believe in the power of science and practice it to fill the widening gap between the `haves' and `have nots' : those with knowledge and those without. In the immediate Indian context, equipping the poorer masses with the power of knowledge of the social and natural forces governing their lives is as important, and basic as the attempt to improve their lot through redistribution of material wealth and income. In fact the two can not be separated, one compliments the other.

"Translated in operational terms, a People's Science Movement has to fight two trends in the Indian society. The feudal structure not only in the social and economic spheres but also in the cultural sphere needs to be effectively countered. Fighting against superstition, myths, obscurantism, communalism, fatalism, etc. has to be contained with greater vigour because all these forces are so deeply entrenched that mere economic change alone may not be able to erase them. At the same time, a mere rejection of these forces without understanding the socio-economic compulsions of depending on these feudal structures and values will not do. How can science impart a new direction and a new sense of purpose in this fight ?

"An equally dangerous but less talked about sphere in which another struggle has to be waged in the total acceptance of the so called modernization thesis. `Development' is the term coined

for this purpose. The power of this new faith to bring about misery to the poor is as strong as, and sometimes even greater than, the feudal forces. Creating modern physical structures have often been equated with development. Increased production is the sole objective here. Who benefits by this increased production, how is it distributed, at what and whose costs are these undertaken, whose power is enhanced are questions often underplayed and then ignored in practice for the sake of increasing the total pie. Several examples of the misery brought about by this can be cited. In recent years, exposing this dimension of the so-called development process has been due to the work of many voluntary groups. As an illustration, one has only to look through the pages of The State of India's Environment 1982, produced through the co-ordinated efforts of several voluntary groups. That not only redistributive issues have suffered but even the explicit objective of increasing production has been only very tardily attained has come as an eye-opener to both official and non-official protagonists of this approach.

"Caught in this dilemma and having to steer and alternative course for progressive social transformation is the major challenge facing the PSM in the Indian context. In trying to chalk out a new course it has to combine the best elements in one's tradition and the accumulated fund of human knowledge the world over. What is to be rejected is neither 'tradition' nor 'modernity' but all those elements which stand in the way of human progress towards a more civilized form of social life.

Such a transition will not be complete without the participation of the people. If such a participator process has to be initiated the absence of the scientific method and the widening gap in human knowledge has to be narrowed down. It is in this process that the PSM see its role. The dynamics of this process is such that 'learning' leads to 'action' which in turn leads to furthering and enriching the process of understanding. The ways and through which entry points this process has to be initiated will be largely dictated by one's immediate social environment.

"While initiatives were taken by different groups at different regions, mostly at the micro level, an opportunity for bringing them together in a common forum under the banner of PSM was created only in 1978. Between the first convention of PSM held in 1978 and the second in 1983, five years have elapsed and it would be interesting to ask ourselves whether the second one was progression from the first. The answer would be both yes and no. Yes because during this five year period there has been an intensification of the interest in initiating a PSM in several parts of the country. The awareness on the concept of a PSM has also been spreading. This has resulted in a number of fresh initiatives, both by existing and new groups. Many of the groups have been in contact with each other. A concerned effort was made in Maharashtra where a number o f small groups have come together under a common forum called the Lok Vignyan Sanghatana. Though not calling themselves a PSM group and perhaps not well known, there were other serious and committed groups like the Uttarakhand Sangarsh Vahini (in Uttar Pradesh) whose activities

correspond broadly to the content of a PSM. In a sense, one may speak of the creation of a `space' for PSM activity in India. This space is likely to enlarge and the growing interest of a large number of younger generation of intellectuals bear witness to this trend. It is in this sense that one may be tempted to view the period as one of progression.

"In terms of organizational efforts at creating a network of PSM groups in India, there is not much that one can claim. Some of the groups which attended the first Convention did certainly enlarge their range and depth of activities while some others remained where they were and yet some others either ceased to function or had to considerably reduce their level of activity for several reasons. Moreover, the groups were at different stages of evolution and this certainly came in the way of thinking about a co-ordinated network throughout the country. Therefore, the current Indian situation viz-a-viz a PSM is one of a large number of disparate groups. Shifting them to identify a pattern one may find that there are :

"(a) Groups of concerned educated persons, often of the younger generation, who undertake certain amount of activity at the local level. They may not necessarily be able to ensure the participation of people in the region. It is more of a process of `learning' and and `declaring' for those involved.

"(b) Groups of concerned educated youth, often from the region where they work, and who along with the local people are

engaged in activities which have a direct bearing on the immediate socio-economic and cultural context.

"(c) Groups that are mainly urban-based around centres of learning and research, and engaged in debating the various facts of science and society arising out of their concern for the contemporary Indian situation.

"(d) Groups that have been able to spread their activities to encompass a cross section of the people in the State as a whole and through a variety of methods and responses of problems, beginning to acquire the character of a movement.

"Since a categorisation of the groups partly explains the difficulties involved in the creation of any kind of a national network in the organizational sense. But then the question is " Is there any inherent virtue in having an organizational network Both the 1978 and 1983 Conventions felt that there is no particular virtue. In fact, some of them expressed caution in hurriedly putting together some kind of organizational network. This fear and suspicion of formal organizations emanates, it seems, from the experience that formal structures often retard flowering of new ideas and initiatives and might get bogged down in matters of detail as well as of organizational control. The overriding concern of a large number of groups was to keep the channels of communication and contact alive and vibrant so that a natural process of consensus on objectives and a broader philosophical perspective develops. This is as it should be and the time for any co-ordinated attempt is when the reasons for it

are compelling for the progression of the PSM in the country. What is important at the moment is to sensitise an increasing number of groups and individuals by keeping the debate going.

## THE KERALA SASTRA SAHITYA PARISHAT

### A People's Science Movement ?

"The KSSP is a `Science Movement' in Kerala. Sometimes we refer to it as `People's Science Movement' which is perhaps too presumtuous on our part. As an idea is 25 years old, as a body of persons it is 20 years old, as an organization it is 15 years old and as a movement it is 10 years old. Today it has a few hundred active cadres, a few thousand formal members and several more sympathisers, it has local, educational-district, revenue-district and state-level organizations. Its activists include doctors, engineers, lawyers,scientists, teachers, government employees, trade union workers, agriculturists, and unemployed youth.

"During these years the activities of the Parishat have spread into varied fields of human endeavour. Some are well under way while some others are in the initial stages. Most activities are educative, a few are agitative and some are productive.

"Public attention was focussed on this movement during its fight to save the unique Silent Valley forests and to expose the unscientific and wasteful electricity and irrigation policies pursued in the State. it takes part also in the fight against irrational drug formulations and harmful drugs and their high

prices,it is leading the fight against the Birla's Pulp Factory at Mavoor, Calicut, which is criminally polluting the air and water around.

"Today it is widely known all over India because of the very successful Sastrakala Jatha held every year from October 2 to November 7. The Jatha attracted thousands of people during which books and pamphlets worth Rs. 4 lakhs were sold. The children's science monthly of the KSSP, Eureka (for the age group 8-12) has a circulation of over 25,000 copies. The Eureka Talent Test attracts over three lakhs of boys and girls from about 6 thousand school in the state.

"Often we have asked our friends from outside Kerala :

1. What is the motive force or philosophy / ideology which sustains the enthusiasm of workers and drives them on ?
2. What is the attitude of the `Establishment' towards KSSP ?
3. What is the attitude of political parties ?
4. How is that such a `movement' has taken shape only in Kerala?
5. How is the movement financed ?
6. What is the impact of the movement on different facets of Kerala society ?

"These questions have given us opportunity for introspection.

Today the Parishat has a more or less well definable ideology epitomized by it slogan : "Science for Social Revolution". However, we should hasten to add that the Parishat was not built upon the foundations of a previously defined ideology. It started functioning in an attempt to `popularise

cience among the masses'. The present ideology is the evolutionary product of its activities and experiences. It evolved through science jathas, several thousand lectures delivered on "Nature, Science and Society", study and discussion on the "Wealth of Kerala", agitation for better and rational health care system and against environmental degradation, fight for rational energy, irrigation and industrialization policies, and research on contemporary problems of development.

"We consider that science is not value free, it can and will have partisanship. Thus viewed, KSSP too is not impartial. But in whose favour are we partial ?

"There is a minority with ownership and control over resources and a majority without any of these advantages. However, the picture of a rich minority and poor majority is not a static one. There is, we believe, a process of differentiation taking place whereby the rich are becoming richer and the poor poorer. Kerala society, or for that matter Indian society, is not a homogenous one. Parishat is partial towards this poor majority. The relation between these two groups always is,it believes, antagonistic to each other since the motion of one group is the recoil of the movement of the other group.

"The `social revolution' which the Parishat wants to help bring about is one in which these impoverishment and enrichment processes are reversed and where there is a forward motion of the entire society.

"Confidence in such an ideology, evolved through their own experience, provides the necessary motive force of workers. The political consciousness and alertness and the high level of literacy in Kerala might be some of the contributing factors of the growth of this movement. The geography of the State, its smallness and accessibility to every nook and corner, might have also contributed. However, we do not think that the absence of these factors are sufficient to preclude the development of such movements elsewhere in India.

'Establishment', as an impersonal entity representing the status quo, has always been hostile. There are, of course, friends everywhere, always ready to help. The fluid nature of the political situation in the State could be one of the reasons for this. On a number of occasions, Government has given us funds for specific activities like distribution of books to rural libraries, organization of seminars, setting up of an audio-visual mobile unit and a Science Centre. The attitude of political parties towards the Parishat has been generally friendly, though none of them would agree in toto with its activities and ideology. It is very difficult for anybody to take an open anti-science attitude. However, it remains a fact that political parties avowedly based on religious or surreptitiously working for the interests of the rich minority can not endorse all the activities of the Parishat and they do offer resistance in certain situation.

"Publication of magazines, books and pamphlets is the main source of income for the Parishat. This is supplemented by

occasional grants (as mentioned earlier) given by Government and other agencies for specific purposes.

"It is very difficult to judge the real impact of the movement on Kerala Society. Frankly, we do not know how to measure it. Moreover, being inside the movement we would find it difficult to do so. However, we can at least qualitatively discern the impact of our activities. So far, the techno-bureaucrats of the 'Establishment' had a monopoly of scientific opinion formation in the State, as also elsewhere in India. We have been able to give them a rude shock. Pollution and ecology, the malfunctioning of the health care and educational systems have become topics of discussion in trains, instreets, at bus stands, in schools and in colleges and also in many public forums. In this sense, we may claim that we have generated a great deal of public attention and debate on issues which we think are not sufficiently brought up before the people.

## HISTORICAL DEVELOPMENT

"(a) Formative Years

As a concept of organised science popularisation programme, we can trace the history of KSSP to Sastra Sahitya Samithy formed in 1957. The group then formed took such lofty decisions as to translate and publish Darwin's "Origin of Species". But very little could be done at that time. Founder members became otherwise busy and the Samithy ceased to function.

"The present organization of KSSP was formed in 1962 at the initiative of a handful of persons which included some of those

who originally floated the Sastra Sahitya Samithy. The main concept of KSSP, then, was that of a forum of science writers. The printed word, through articles in periodicals, was the principal medium for popularisation of science. The membership of the organization was generally restricted to science writers, and demands for publication of popular articles and books on science were addressed to newspapers and publishers.

"Even in this limited objective there was an element of novelty as well as of challenge to tradition. In it one can notice the reverberations of a changing society. In the predominantly feudal set up of our ancient society, the language of knowledge (and of science) was Sanskrit; with the British conquest of India, this was replaced by English. However, the multiplicity of languages in the country led to the continuation of English as the medium of instruction and administration even after the British left the country. The science writers, who initially organised KSSP, were raising, in a sense, the battle cry against this attitude. They were demanding that science should be handled through one's own mother tongue. This demand for importance of Indian languages is related to several older movements. It is related to the national liberation movement and the struggle against feudalism. The leaders of our freedom movement were arguing for linguistic provinces even as early as the thirties. When KSSP demanded that science should be handled through the medium of Indian languages, it was only echoing this felt necessity for the society.

"The socio-political environment in Kerala helped to a great extent the development of this idea. The social reform movement initiated towards the close of the 19th century by Sree Narayana Guru exhorted the socially disadvantaged sections of the society to take up education as a means for overcoming social disabilities. Several of the struggles of the 'backward' communities in Kerala were related to their demand for right to education. The Library Movement and Teachers Movement in the forties of this century reinforced and spread the importance of education in social reforms. These movements were further strengthened by the peasant struggles in Malabar and the growth of a strong radical political movement throughout Kerala. All these factors have made it conducive for the emergence and growth of a Science Movement in the State.

"From an all-India context changes in the economy and society were taking place especially after 1947. Capitalism and industrialisation were growing at a faster rate. The inauguration of planning with Five Year Plans led to the establishment of scores of scientific and technical institutions throughout the country. The link between science and technology and economic development was being stressed, both by politicians and experts. 'Science' was becoming important, more and more people were willing to listen to it. The formation of KSSP coincided with this period.

"The relationship between the growth of regional languages and capitalism can be easily demonstrated. Newton lived in a period when capitalism was fast growing in England. Initially he

used to write in Latin, the language of scholarship in those times. Later he switched over to English. It was Immanual Kant who wrote the first science books in German. Both of them are considered as orthodox scholars. Still they broke the un-written law of orthodoxy and began to write in common people's languages. The growing bourgeoisie was encouraging people's languages against Latin. It is under their influence that Newton and Kant wrote in their own languages.

The KSSP came into existence as a necessity of the times.

"The formation of Sastra Sahitya Parishat (Malayalam) at Bombay by a few scientists working at the Bhabha Atomic Research Centre was a turning point for KSSP. With the help of SSP (M) Bombay, KSSP started the publication of Sasthragati, then a quarterly. This was the beginning of the publication activity of the Parishat. It began to change, gradually from a forum of science writers. Simultaneously the SSP (M) Bombay started work on adapting the glossary of technical terms (Paribhashik Sabha Sangrah) from Hindi to Malayalam. It did a herculean job of preparing a glossary of technical terms in Malayalam with the help of KSSP containing about forty thousand words. "The fourth annual conference of KSSP held in Trichur in 1967 adopted a Constitution for the KSSP and it was registered as a society under The Societies Registration Act of 1869. It may be noted that it is only after 10 years of existence, first as a concept and then as activities, that the organization took a formal shape.

During 1967 another event, which was to become a turning point in the development of scientific literature not only in Malayalam but also in all other Indian languages, took place. Dr. Triguna Sen became the Education Minister at the Centre, and for the first time recognised that the Central Government had responsibilities not only towards Hindi, but also towards other Indian languages. Each State was given Rs.10 million for the development and production of text books for teaching at the university level. On the initiative of Sri. E.M.S.Namboodiripad, then Chief Minister of Kerala, this amount was utilised to set up a State Institute of Languages in Trivandrum. The Institute was set up with personnel recruited largely from the KSSP. This led to two consequences : firstly, a concentration of KSSP activities at Trivandrum, in addition to Calicut, and secondly, a period of live collaborative activity of KSSP and the State Institute of Languages. This helped, on the one hand, to stabilize the Language Institute and put it far ahead of all other similar institutions in the country and enabled the KSSP, on the other hand, t spread in different parts of the State. The first publications of the Language Institute, Vijana Sabdavali and Manavika Sabdavali were largely the result of the work done by KSSP during 1967-'69. Several dozens of seminars, symposia and workshops were organized under the joint auspices of KSSP and the Language Institute. A number of workshops were conducted to translate books from English to Malayalam.

"The KSSP began publication of its second monthly, Sastrakeralam, in 1969 for the age group 12-16 followed by a

third one called Eureka in 1970 for the age group 8-12. The publication of these two magazines and the joint activities with the Language Institute resulted in increased contact with the sphere of formal education. A few books were published by KSSP during this period. Science 1968, Science 1969, Parichaya Kosham (introducing science writers in Malayalam) and a comprehensive bibliography on science books published in Malayalam. More and more school and college teachers began to join the activities of the Parishat. The membership began to approach four figures. The membership from 1962 to 1967 was only 30 or 40. In 1968 it was already over two hundred.

"Thus (to recapiturate), the formative decade, 1962 to 1972, saw the following development :

1) An initial phase of formation, 1962-67 : There was only a loosely knit grouping with membership spread throughout the State. This however, helped to underline the all Kerala nature of KSSP from the beginning. The main centre of activity was Calicut and seminars and symposia were the major forms of activity. The target group was the public in general and the medium resorted to was the printed word.

2) Development of an organizational structure : The period 1967-72 witnessed the development of an organizational structure. A constitution was adopted, the organization was registered as a society, and local and direct level organizations and committees were set up. It also saw the spreading of activity to schools and colleges. The spoken word became as important as the printed word.

3) Qualitative change in the composition of membership : From 1967 there was also a qualitative change in the membership. In the beginning the members were mainly engineers, scientists, college teachers and a few prominent social workers with social commitments of varying degrees. In the second phase, 1967-72, more and more school teachers and persons from other walks of life began to join KSSP, with more active commitment and willingness to spare time for organizational work.

"(b) Into the Streets :

Already by the end of what we have characterised as the formative phase, a major new feature of KSSP's activities was beginning to take shape. In 1971-72, after the eighth annual conference at Eranakulam the delegates went in a procession shouting slogans on science, to a public maiden where a senior Professor of Chemistry gave a 90 minute speech on chemistry in day to day life. The public, relaxing in the nearby parks, were surprised and delighted to hear chemistry from a maiden mike. Next year, a one day jatha was organised on the occasion of the 9th annual conference at Thiruvalla. Three car jathas which included professors and principals of Engineering, Medical, and Agricultural colleges converged at Thiruvalla. On the way they were given receptions at several places, where they gave lectures. They found common people extremely interested in science. More importantly, they saw themselves, as frogs in abysmal wells of blissful ignorance of people's problems and perceptions.

"Thus began the massive mass contact programme of KSSP which was to become one of its most important activities. The Bharathiya Vijnan Patrika Samithi, an organization of science periodicals in Indian languages sponsored by the Council of Scientific and Industrial Research (CSIR) suggested that the first week of January every year may be planned as Science Week; KSSP responded. It planned one thousand lectures on "Evolution of the Universe, Man and Society", from 1 to 7 January 1973. More than 1200 classes were held. This was later to become one of the major continuing programmes of KSSP as well as to lay the basis for its understanding of scientific attitude and method.

"In the meantime involvement of KSSP in non-curricular activities in schools became more widespread. The State Government has been trying to organise and activise 'science clubs' in high schools, through circulars and orders, but without much success. School teachers involved in KSSP took up this work as a campaign and in two years, 1973-74, about 1500 high schools had science clubs, all of them affiliated to KSSP. Under various schemes many of these schools have been provided with kits and audio-visual aids. But for various reasons they were all under lock and key. The 'open the kit' campaign which KSSP launched at that time has been only partially successful. However, from this period onwards school teachers were to become the mainstay of KSSP.

"(c) Introspection and into the villages :

1974 should be considered another turning point in the history of KSSP. Many activities in the KSSP working for the

past 6 to 8 years, were gradually becoming conscious of the fact that things were moving only at snails pace, that their work was having little impact on the society, that the gap between science and society was becoming very large, that confining themselves to educational institutions with occasional outbursts of seminars and campaigns limited their scope. A process of introspection went on for some time with occasional discussions. Gradually it become obvious that unless we face and address ourselves to the economic problems of the society, our efforts were bound to be extremely superficial. In Kerala, like anywhere else in India, economic activity is predominantly agricultural and agro-industrial, and hence rural. So far KSSP had been functioning mostly in urban and semi-urban centres. As a result we conceived a programme, in which one hundred activists of KSSP would take, 10-12 day's leave during the summer holiday, go to a village, stay there, study the economic, social and cultural life there, identify the S&T elements in them and operationalize the KSSP activities on that basis. This never materialized. But the idea spread and the concept of Rural Science Forum emerged. Since then this concept has undergone substantial changes. However, this marked a significant change in the perceptive of KSSP.

The eleventh annual conference held at Trivandrum accepted 'Science for Social Revolution' as the slogan of KSSP. By then KSSP had come to use the term 'science' not in its narrow disciplinary context of identifying with bio-physical sciences but in its fundamental sense of embracing all fields of human knowledge. This was in response to its attempt to understand the

link between th physical and social realities. At first we had only a very vague and hazy idea of what this `social revolution' should be. All of us agreed that the majority of the people lived in wretched conditions, that it was possible to improve their lot, that they were fighting, in their own way to emancipate themselves and that `science' should help them in this struggle for a better tomorrow. We felt that we should discuss in detail and share our experience and our aspirations. But formal executive committee meetings were not suited for this purpose. Thus was born the idea of `workers camp' which became since then an important role in forging that feeling of brotherhood and enthusiasm among the workers of KSSP, which is perhaps the most important source of motivation for all of us. The community life with its stoic simplicity and the total involvement temporarily forgetting the external world, has always been an exhilarating experience.

"(d) Philosophical Orientation

In 1976, we planned to repeat the mass lecture programme but in the form of study classes with a different title, "Nature, Science and Society". About 100 activists were given two day's training based on specially prepared notes. There was much enthusiasm as well as a feeing of challenge in conducting classes on a topic to which the common people were never before exposed. The socio-political climate also was exceptionally convenient for involvement of teachers en mass in this campaign. During the period from January 1 to 31, 1976 nearly 12000 classes were conducted instead of 3000 as originally planned. `Science in

History' by J.D. Bernal was one of the main sources on which the text for the classes was prepared.

"Organizing this campaign gave us a opportunity to develop our own understanding of the history and philosophy of science, which gave more meaning to our task of developing a 'scientific' attitude among the people. Also, we were gradually becoming aware of the potential of campaigns to focus the attention of the common people. So we planned our next campaign towards the end of 1976 and beginning of 1977. It was realized that the campaign should focus on the immediate economic environment and comment on the existing economic process and development activities. For this purpose, a book was designed and written by a term of experts drawn from specialised and advanced institutions of research and learning in Trivandrum. Some of the members of these institutions had, by then, become activists of the KSSP. The book was titled as "Wealth of Kerala". Apart from offering a critique of the existing process of economic development, it attempted to provide an alternative approach and perspective for economic development of the State. This has been widely acclaimed as one of the best books ever published in this field and it has seen through several editions. Preparations for this book and the subsequent campaign were steps towards another field of activity.

"(e) Diversification

KSSP had, by this time, become quite well known. Its activists included engineers, technologists, doctors, educators, environmental scientists, economists - in fact serious students

of all subjects. We were in constant touch with the people and had a sense of commitment. We had to respond to issues relating to development of energy, irrigation, education, health and pollution control. What we had to say was listened to seriously at least by a significant section of the public as well as decision making groups. We found ourselves collaborating, in our way, with the State Planning Board in carrying out economic surveys and in formulating Plan proposals in certain key sectors. In any serious discussion or workshop or seminarian education there was representative of KSSP.

"Our knowledge on the resources of Kerala, and their utilization, combined with the unique nature of our team work led to different specialised studies. However, we should, add here that these studies were not taken up on our initiative but in response either to request from people in the respective areas or as a result of the public controversy, as in the case of the Silent Valley Project. Viewed in this sense, the studies may be referred to as products of our action research. The first such study was the ecological consequences of water control projects in Kuttanad. Before from Kuttanad during our annual conference held in Kottayam in 1978. We also published a report on the Silent Valley Project, which is now widely known and which made us also known far and wide. Other studies include pollution in Mavoor (Calicut) and Punaloor (Quilon) which also led to agitations and campaigns. We also took up the campaign against harmful and useless drugs in the fight for better health care system. Following these activities an Environment and Health

brigade was formed. All these demanded more and more cadres with higher levels of intellectual equipment. Thus we began a regular internal training programme which we call cadre training programme.

"The Shastra Samskarika (Science Cultural) Jatha of 1977 was yet another landmark. It lasted 37 days, from October 2 (Gandhi Jayanthi) to November 7 (October revolution and the birthday of C.V. Raman), travelled 11,000 kilometers, partook in nearly 900 receptions and addressed nearly half a million people. That was an unforgettable experience. The entire Parishat worked for it. The slogans shouted were powerful and musical. It was this experience which was later to lead to Sastrakala Jathas, a regular feature from 1980 onwards. Science in its broad sense is taken to the people through the media of (a) the printed word - books pamphlets and posters and (b) arts - slogans, skits, street plays, folk arts etc. The Sastrakala Jatha is a massive effort, involving the effort, of several thousand members and sympathisers of the Parishat. Besides being an occasion to propagate printed material worth several lakhs of ruppes, it also helps to recharge the workers, to recruit new workers and to identify new areas of activity.

## MAJOR ISSUES TAKEN UP BY KSSP

"(a) Nature, Science and Society

This is a course of lectures leading to the development of a historical and philosophical sense of science. Depending on the availability of time the essential aspects of this series can

be conveyed in three hours to twelve hours. It can be extended into a full year course also.

"After introducing the idea of matter, substance and object (increasing degree of concretization) as well as elements, a description of the universe, from fundamental particles to far off quazars is given. The essential point stressed here is that every thing is in motion, there is nothing without motion and that motion is the mode of existence of matter. Then two questions are raised. What is time ? and what is space ? After analyzing our understanding of both space and time it is concluded that space and time are specific ways of understanding motion of matter, and that they can not be separated from matter and its motion. There is no space or time without matter. The concept of matter-space-time continuum is thus established. Afterwards, the question of the origin of universe is analysed and since 'origin' means prior non-existence and since 'prior' (i.e. time) can not exist without matter we come to the conclusion that the question is absurd, that the UNIVERSE always existed.

"Later we follow the course of evolution of the solar system, the formation of living things from the non-living, the evolution of living begins, the transition from ape to man, the role played by labour and collective life in this transition, the evolution of human society through the paleolithic, bronze and stone ages, from primitive society to slavery, feudalism, capitalism and socialism. The corresponding growth in science and technology too is analysed. Here again, in the realm of social reality, motion i.e change is emphasised.

"(b) Scientific Outlook

The phrase `development of scientific world outlook among the masses' is a much repeated cliche. KSSP also repeats it. Naturally one should expect the question : what is this scientific outlook ? Our own understanding of the scientific outlook is derived from a study of the historical development of science tracing the origin of botany in fruits and root gathering, zoology in hunting, of material sciences in tool making,of dynamics in primitive weapons, and so on. In the early times `science' was synonymous with daily life experience. Hence, direct intervention with nature, was the beginning of all knowledge. However just as we created the abstract `tree' from the concrete mango, jack and tamarind, the abstract `bird' from crow and eagle, those raw experience are abstracted leading to new forms of intervention with nature. This means : from practice to theory and from theory to higher forms of practice. Practice is the starting point. This understanding forms the foundation of `scientific outlook'.

"(c) Science for Social Revolution

This is the slogan of KSSP. What does that mean ? A short outline has been given in the introduction. First and foremost, in involves a critique of science in India today.

Every country has a `science policy'. India too has one. The Policy could be explicit or implicit. The explicit elements of India's science policy are well known. They are common sense conclusions. One need not elaborate them.

But the dynamics is not governed by the external, the explicit, but by the internal, the implicit. Material resources and incentives, and recognition by peers in lieu of the public are the essential requirements for growth of scientists and hence of science. The realities of these two factors form the basis of the 'implicit' policy. To put it in concrete terms, these means :

1) Funds, equipment, promotion, power etc.and
2) Publication in respectable foreign journals and/or governmental recognition through awards and appointments.

Above 90% of research funds in India is expended through Departments of Atomic Energy, Space,Defence, Agriculture and CSIR 'Laboratories'. How do the scientists in these laboratories and departments formulate their research problems ? Most of them obtain it from international publications, frontier areas of research in advanced nations, who in turn get their problems from the requirements of their economy. Indian scientists are more versed with the problems of advanced nations than those of India. They can not be blamed for that. It is but a reflection of the Indian society, which can be broadly divided into (a) a rich, high technology, high consumption minority and (b) a poor, low technology, low consumption majority. The former identifies itself with the people of advanced countries in its outlook and requirements. It owns the means of production in this country; it controls the state apparatus; it dictates, implicitly and sometimes explicitly, through provision of material resources and recognitions, the S&T of this country. The problems of the poor majority, except that of food, are alien to rich minority and to our scientific community.

"The characterisation of Indian society as poor and rich is very much a static one. There is a process of impoverishment and, its converse, enrichment going on. So one can say of a group that is getting impoverished or facing the threat of impoverishment, and of another group that is continuously getting enriched. The former constitutes the majority, the latter, which controls the means of production and the organs of state forms a very small minority. As long as this remains so, the character of S&T too will remain as it is today with all the epithets we can shower on it : elitist, foreign-oriented irrelevant, etc. The bulk of the scientific community will either be preoccupied with exotic frontier research or degenerate into clerical scientists. The motivated minority can either engage in some forms of microlevel activities, hoping, that someday these will become useful and that till then they will ameliorate the conditions of a few at least, or they can consciously mould themselves into crusaders against the prevailing unscientific and unjust society. In adopting the second alternative there is a danger of donning the attire of a Don Quixote. This should be avoided. It is in this connection that one should look into the slogan `taking science to the people'.

"It is unnecessary at this stage to dwell at length upon the social origins of science. We are well aware of it. We are not taking to the people something from outside. Science is within the society but has been alienated from the people. It should go back to them and in their hands turn into a weapon in their fight to transform the society. It is futile to suggest an alternative

approach to &T in general. For the past decade and half or for even more time we have been suggesting `alternatives'. It has been no more useful than reciting Gayatri mantra every morning. At the moment we should be interested in finding out what the scientists and technologists can contribute to the struggle that is being waged by the people. They can not afford a detached attitude. They have to get firmly involved in the problems of the overwhelming majority of the people and in their struggle to gain control over the means to solve them. This does not require large physical resources. Moreover, the resources that are put in their control can be and should be utilized for this purpose. This will involve unique forms of struggle both within the walls of the `laboratory' and outside. This struggle, however, should and will give them immense satisfaction. In the process, they would also learn to derive as much satisfaction from the recognition by the people as from recognition by `peers' for contribution to frontier science.

"This is not to denigrate `frontier science'. There are many frontiers. At least a few scientists should be interested in `frontiers' of relevance to the people. They may be jeered at. Taking science to the people is often considered as an `unscientific' or `nonscientific' activity' it is not considered a revolutionary activity either, which in reality it is. In the hands of the people S&T can become a powerful weapon, as powerful as it is in the hands of their oppressors. The KSSP views the arming of the people with this weapon as its responsibility.

"(d) Energy and Development in Kerala

KSSP had the occasion to study the overall energy situation in Kerala, the conclusions of which are being discussed at various levels. Unfortunately, the energy planners of the State are oblivious of the critical situation. We came to the conclusion that at present Kerala, with no known reserves of coal or oil, is a highly energy deficient state, that the concept of plentiful hydro-energy is in fact a myth, that domestic energy position is becoming more and more precarious and that the concept of electrical energy as a commodity to be sold for profit is wrong. When KSSP predicted a shortage of electrical energy as far back as 1975 the policy makers and officials of Electricity Board laughed at it. Today Kerala is experiencing a 40% cut in electricity consumption due, mainly to the short sighted policies of the concerned agencies. We had advocated large scale import of coal from the coal quadrangle of India, establishment of coal fired thermal stations (the accompanying problems of pollution technology) and argued for the establishment of coal dumps and briquetting plants at various centres and massive propagation of higher efficiency coal burning and wood burning stoves for domestic purpose. But the State Electricity Board is still dead set against coal stations and the government has not understood either the economics or the ecological importance of higher efficiency wood-burning stoves. The KSSP is going about, in its limited way, propagating them. It has conducted domestic energy consumption studies with practically no expense which but has gives sufficiently accurate data. The projection of electricity demand it has made is being proved to be more accurate than those

projected by KSEB. KSSP maintains that for the next 20 years at least, till solar energy becomes really commercial, Kerala has to import coal or fall back in its industrialisation drive. KSSP is opposed to nuclear power plants for two reason :

"1) today they are unreal and costly, the `technical' problems are too many, it involves much extended period of construction and the energy is much more costly than from coal burning thermal stations and,

2) with such a high density of population as in Kerala, the consequences of a major nuclear accident is unimaginably high.

"(e) Irrigation

After its people, the most abundant wealth of Kerala is water. With an average of 3000 mm of annual rainfall the steeply undulating topography can be considered either a boon or bane, depending upon the way we see it. Study of the experience of the construction and utilization of major irrigation projects in the State has led us to the following conclusions :

1) They have not served the purpose of providing irrigation water at the required places, at required times and in required quantities. This is due to two reasons (a) necessarily non-uniform agricultural practices causing management difficulties and (b) consistent overestimates of projected benefits and exclusion of its adverse effects.

2) The average capital cost of irrigation projects that are completed so far works out to Rs. 30,000-40,000 per hectare, which is incredibly high.

3) Aggressive hillslope management has led to deforestation, soil erosion, floods and droughts. Therefore, the future prospects are extremely dark.

4) The most urgent need of the day is to make an all out effort at afforestation of hill slopes, terracing, reducing runoff and increased reliance on ground water storage.

5) Minor irrigation schemes for tapping either surface or ground water can be managed better and are, definitely much cheaper. They can be executed and implemented in a decentralised framework saving considerable time and resources.

6) No new major irrigation projects should be taken up, those projects in which only less than 20% of projected capital investment has been expended should be shelved for the present and all the available resources should be pooled for local irrigation projects (local being a more meaningful term than minor)

"(f) Ecology

KSSP has become known all over India and abroad because of the stand it has taken on the Silent Valley Hydroelectric Project. Our stand on this project as well as on any other project, may be stated in the following way :

1) The cost benefit analysis made by promoters of projects has a tendency to underplay costs and exaggerate benefits. It is in the interest of the nation to have a 'devil's

advocate' to face the issues squarely and focus public attention.

2) Much of the hidden social costs is either neglected or underestimated. The adverse effects of this are not marginal.

3) There should be an Environmental Impact Statement accompanying each project, which can be debated publicly. There is neither sufficient expertise nor realization of the necessity for such studies in the various departments of the government.

4) Though there is much talk on the dangers of hillslope deforestation there is no realization on the part of the government as to how serious the situation has become.

5) Timber is big money. Unemployment is very high. Big money can purchase unemployed starving hands to work for it. Food today is more important than ecological stability of tomorrow for the unemployed and the starving. Educating and agitating for tomorrow is a very difficult task. However only the people, conscious of the ecological implications, can save the forests, no governmental agency can save them.

"On the Silent Valley Project our stand has been the following :

1) The Silent Valley is biologically one of the richest and the oldest and the least disturbed tracts of forests in the whole of India.

2) It is the largest contiguous stretch of forest in Western Ghats which can be protected.

3) The amount of energy that can be obtained from it is quite small.

4) Irrigation potential of the project is exaggerated.

5) Energy and water for the local population can be made available much quicker and surer as well as cheaper from alternative sources.

6) Therefore, this project should be taken up as one of the last-hydro electric projects in Kerala, and even then only if absolutely necessary. In the meanwhile more detailed study of the flora and fauna of the region should be made.

"(g) Pollution

Though Kerala is not an industrialized state even by Indian standards, its industrial area, Alwaye-Cochin belt, is one of the most polluted regions in the world. It is nearly a decade since we had started campaign against pollution. The State machinery, such as the Kerala State Board for Prevention and Control of Water Pollution, is known more for its inaction than for anything else. Only where the affected people have resorted to united action some results have been achieved. A classic example was that of the Chaliar river, which was polluted by a pulp factory at Mavoor owned by the Birlas. KSSP joined the struggle of the local people, conducted a study of the nature and cause of pollution and unleashed a major campaign against the polluting

activity of the factory. People became familiar with the scientific and technical aspects of the pollution and this gave strength to their struggle. They could not be misled by the factory any more. The struggle was only partially successful. But, it has raised more fundamental problems of employment and other dimensions of industrialization. People are now agitating against pollution in several other places. Due to lack of sufficient cadre, KSSP is not in a position to give continuous local leadership to them. However, people are getting more and more conscious about pollution and the reasons thereof.

"(h) Education

With more than 60 percent of its cadre drawn from the field of education, coupled with continuous contact with students, it is but natural that KSSP has something to say about education. Based on its varied experience the KSSP has prepared a 'Document on Education' dealing with the system of education up to the secondary school level which is now being discussed at various levels. The major issues raised in the document are :

"1) The purpose of education is to develop the personality of the individual to the fullest extent so that (a) he/she should be able to discharge effectively and efficiently the functions entrusted to him/her by the society and to contribute to the onward march of the society and humanity, (b) he/she should be able to appreciate the cultural heritage of his/her people and humanity as a whole and (c) he /she should be able to resist and defeat forces which come in the way of realization of the above two projects.

2) Present education does not serve this purpose. Instead of helping the development of the society it alienates the student from productive labour as well as from his/her own culture.

3) Teaching methods destroy every initiative in the student. Examinations are so designed as to weed out the poor and the 'backward'.

4) The value concepts imparted are anarchic. It is an education to live in and to perpetuate a competitive society. Our society is in transition. Education, instead of helping it, opposes this transition.

"In the document we have tried to develop a methodology for curriculum development. We have suggested a new structure, composition, and examination system. We have strongly advocated the mother-tongue as the medium of instruction and deprecated the growing tendency of 'mummy-daddy' schools in the private sector and the immense harm they are doing to the children and to the society. When we emphasize the role of mother-tongue as the medium of instruction, we are not unaware of the need to learn other languages, both Indian and international. The former emphasizes the development of the mental faculties of the child while the latter is intended for communication, interaction and building up of fraternity with people from other parts and countries.

"(i) Health

KSSP has been active in the field of health for the past four or five years only. Obviously the greatest health problem is poverty. Food is the best medicine we can give to the poor. Majority of the ailments arise from inadequacy of proper food and unhealthy living environment. One of our activities in the field of health has been holding health camps. This is not intended as an ameliorative measure but more as an educative measure. We have conducted several dozens of camps and hundreds of doctors have participated in it. Apart from organising health camps, a number of our publications deal with people's health. The active cadre of KSSP has a few doctors in it. We are in touch with Medicos Friends Circle, VHAI and other groups working in the field of health. Based on our experience, our approach to people's health may be summarised as follows :

"1) Health care delivery does not mean provision for treating the unhealthy, but to keep entire people physically and mentally healthy.

2) Health care should be recognised as a basic right of citizens - it is not the charity of the government or other institutions.

3) Health care does not and should not mean only hospitals and drugs.

4) Today, the modern health care system in India is controlled by the multibillion dollar multinational drug companies.

Our hospitals and health programmes are markets for their products.

5) The people have to wage a war against these companies to save themselves from harmful and useless drugs, which have been banned in most of the developed countries.

6) Health of the people can be assured only through the combined and co-operative efforts of Health, Education and Public Health Engineering Departments. Preventive and social medicine can not be allowed to be made a mockery.

7) There is a wealth of medical knowledge in traditional systems, especially in Ayurveda. They should be integrated and made one with the system of health services. The vested interest of both, practitioners of modern medicine and of Ayurveda, should be fought against.

8) Today Kerala is producing one doctor for every 900 new born children. It is high time we shifted the accent from doctors to para-medical staff, especially nurses and other health workers.

9) Medical education has to be thoroughly reoriented to incorporate the above aspects.

"KSSP has made use of the medium of people's arts to propagate these ideas. But it is quite aware of the fact that the fight against the multinational drug companies, which is what the fight for a genuine health care system really is, will not be a simple one or peaceful one. It is heartening to note that the

medical and sales representatives' association is with us in this fight.

## "RELEVANCE OF KSSP AND PSM IN INDIA

Half the world's total poor people, who are also illiterate people, live in India, which claims to have the third largest man power in science and technology. The conscientious amongst us feel a terrible moral anger and want to do some thing. But doing 'something' in plain anger will not result in anything but self-destruction.

To understand that poverty and squalor of the majority ar the necessary outcome of the existing economic system based on excessive consumption by a minority, competition and private profit, we do not require any scholarly research. Those of us who are discussing these problems have understood this. However the majority of the people in India d not understand this. They are ignorant of the natural and social laws which govern their lives. Once they become aware of these laws, their fatalistic world outlook will change into a scientific one.

"Two factors influence such a change; first, the knowledge of the laws of nature and society; second, participation in the productive activity of the society. The first is obtained from science and the second from life experiences of those who engage in productive labour. One of the functions of mass organizations is to help its members to collectively analyse and organize their experience and to arrive at valid conclusions therefrom. Those

who are not members of such organizations (and those in organizations which have not developed this analytical capacity) are still prisoners of their own world. Ignorances of the laws of nature and society makes it difficult for them to analyse their own experience. They should have correct knowledge of the situation in which they are and act according to that knowledge. Some persons think that they are leading the people out of poverty. This is wrong notion. The people at large have to save themselves. Individuals can not save them. All such attempts have only pushed the people into deeper suffering. KSSP has given itself the task of helping the people to understand their own physical and social environment, the various forces and counter-forces present in it and thus enable them to analyse the situation for themselves - physical environment is important because it interacts strongly with the social environment. Due to historical reasons it has become the responsibility of PSM's to give leadership in this integration. KSSP is conscious of this.

## SCIENCE AS SOCIAL ACTIVISM - KERALA SASTRA SAHITYA PARISHAT

Homi Bhabha Centre for Science Education, Bombay

"Many scientists at the Tata Institute of Fundamental Research, have been concerned with the problems of improving science education in the country for many years. They have been participating on a voluntary basis in several activities such as school science exhibitions, lecture-demonstration, curriculum development and teacher training programmes, both in the metropolitan area of Bombay and in some selected rural areas of

the country. It soon became clear that these efforts which had a trend setting character were well received.

"With a view to converting these individual and voluntary efforts on a formal footing, a centre called the Homi Bhabha Centre for Science Education was established in May, 1974 at the Tata Institute of Fundamental Research under grants received from the Sir Dorabji Tata Trust.

The main objectives of the Centre are :

1) To conduct research in curriculum development with special emphasis on identifying factors that hinder the universalisation of education and on designing, testing and evaluating methods to overcome these factors.

2) To develop methods of teacher training and to prepare instructional materials useful for teachers

3) To prepare, test and publish textual and non-textual materials for pupils to help them develop an enquiring mind and an aptitude for science.

4) To generate simple and inexpensive experiments designed to nurture resourcefulness, an eye for detail and an ability to interpret experiences.

5) To develop teaching aids including audio-visual aids, demonstration experiments and charts.

"The Tata Institute has been collaborating with the education department of the Bombay Municipal Corporation, since

1969. The collaboration involved, among other programmes, a curriculum development project for improving science teaching in standards V, VI and VII, which was organised for three years 1970, 71 and 72.

"The collaboration with the Bombay Municipal Corporation continues. The corporation has very kindly made available to the Centre a wing on the third floor at the Nana Chowk Municipal School, situated at Nana Chowk, Bombay 400 007.

Most of the activities of the Centre described in the following pages are housed at Nana Chowk Municipal School.

"The Centre has launched a curriculum development programme for standards VIII, IX and X in collaboration with the Bombay Municipal Corporation. Under this project, orientation courses are offered to science teachers to help them handle all branches of science effectively. Modern concepts in Physics, Chemistry and Biology are discussed in detail to enable a graduate trained in one discipline to teach other disciplines as well. The project covers all the 49 secondary schools of the corporation.

"The laboratory of the centre is open to the Municipal School teachers for conducting experiments and for designing a suitable experimental programme for their schools.

"The Centre has agreed to provide academic leadership for organising six Resources Centres established in different municipal schools. Each centre caters to eight or ten secondary schools situated near the Centre. Teachers from these schools

spend one afternoon every fortnight at the Centre. The activities of the Resource Centre include content lecture / discussions organised by subject experts, lecture demonstrations, development of diagnostic testing procedures to evaluate student performance periodically and a programme for identifying and nurturing talent.

"The corporation has provided the necessary library and laboratory facilities to equip these centres.

After evaluating this particular programme, it has been found that the students from school, most of whom were first generation learners of science, improved their performance in science subjects e.g. those who used to get about 35 percent marks started getting more than 75 percent marks after the conduct of this particular programme. In scholastic terms, this enhancement in the performance of students is extremely noteworthy.

"A vast majority of the student population in India consists of first generation learners, a large drop out rate, a curriculum that is not directly relevant to the environment and daily life of the students, coupled with lack of facilities in schools, reduce considerably the effectiveness of science education programmes at school level.

"The Centre has launched a curriculum development programmes for standards I to VII in collaboration with the Sane Guruji Vidya-Prabodhini, Khirode, in the rural areas of the Jalgaon district. The main aim of the project is to develop a relevant

curriculum taking into account the existing text-books, the physical facilities normally available in rural schools and the academic qualification of an average school teacher.

"Fifteen schools have been selected in the Yawal and Raver Talukas of Jalgaon district. The schools are located in small villages where agriculture is the only source of income. A school situated in a tribal area at Pal, a village located in the Satpuda mountain range, is also included in the project. Orientation courses are organised for the teachers to introduce them to the new methodology of teaching science.

"The new methodology emphasizes development of certain attitude like keenness of observation, an eye for detail, ability to question, curiosity, willingness to seek experimental solutions to a problem, ability to innovate, ability to relate science with daily life and resourcefulness.

"The methodology takes into account the constraints under which an average rural school teacher works. The experimental programme is designed with essentially zero cost experiments using material available anywhere.

"The orientation programmes are supported by a follow up programme consisting of monthly meetings of the teachers and regular visits to the schools by members of the Centre and teacher educators from the Sane Guruji Vidya-Prabodhini.

## HOMI BHABHA SCIENCE EDUCATION CENTRE, BOMBAY

## MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE, PUNE

"MACS is a non-governmental, fully autonomous institution, registered under the Registration of Societies Act of 1860.

Its activities mainly focus on the promotion of Science, on encouraging high standards in post graduate education and on research and developmental activities for the benefit of human kind and the Nation.

Science for the Service of Society is the Motto.

### HISTORICAL

"The MACS owes its origin to the intensive efforts made, during 1944-46, by towering luminaries of Pune - the late Dr. M.R. Jayakar, the late Wrangler Dr. R.P. Paranjpye and the late Dr. S.P. Agharkar, who had just retired as Chose Professor of Botany the University of Calcutta.

"They decided to set up a Science Institute under the Association, for conducting research and post graduate education in biological sciences, to meet major problems of social relevance and for service in the cause of national welfare. Dr. Jayakar was the first Chairman of the Association, and Professor Dr. Agharkar, the first honorary Founder-Director of the Research Institute.

The Past-President include :

Dr. D.N. Wadia

Dr. R.P. Paranjpye

Dr. D.R. Gadgil

Wrangle Dr. G.S. Mahajani and

Dr. P.V. Sukhatme. The late Maharani Chimanabai Gaikwad of Baroda was Patron.

## AIMS AND OBJECTIVES

The major aims and objectives of the association are :

* Promote science and technology for application to problems of social relevance and national welfare.
* Maintain an Institute, or Institutes, to cater to the above objectives.
* Publish scientific books, monographs, journals
* Promote and popularise science, disseminate knowledge from research in pure and applied science : set up science libraries, museums; organise conference, symposia, seminars, lectures, exhibitions.
* Take other steps for the furtherance of the Association's objectives.

## Governance

"MACS was, until recent revision of its Rule and Bye-laws, governed by a General Body, assisted by a Council, and an Executive Committee.

## Membership

"Includes Foundation Members, Life Members, Benefactors, and Honorary Fellows, Admission of members is by invitation, not by application.

## The Research Institute

"The Institute was in its early years, generously helped by the Indian Law Society's Law College, and by the Gokhale Institute of Politics and Economics, both in Pune. The former offered space for the Association in its basement (1946-1966) for carrying out its research activities.

"The Department of Science and Technology (DST) of the Government of India, in 1966 took the Institute under its cover, and it now fully funds the Research Institute.

"The erstwhile Government of Bombay kindly donated a 5-acre piece of land in Pune (where the Institute's laboratories stand now.) and a 20-acre agricultural research farm at Hol (Taluka Baramati, Dist. Pune) some 80 km. south of Pune. The DST gave grant for an additional 19-acre research farm area, also at Hol.

"In the early years of the institute, a number of eminent retired scientists were responsible for starting research in their respective areas of specialisation :

Prof. S.P. Agharkar - Botany

Dr. G.B. Deodikar - Genetics and Plant Breeding

Dr. S.L. Ajrekar and Dr. M.N. Kamat - Mycology

Dr. G.W. Chiplunkar - Geology and Paleontology

Dr. Bagal - Entomology

Dr. P.M. Wagle - Microbiology

Dr. N.V. Joshi - Chemistry

Dr. P.V. Sukhatme - Biometry and Nutrition

These activities later developed into 8 Departments of the Institute.

"The past Director of the MACS Research Institute were :

The late Prof. Dr. S.P. Agharkar (1948-60); the late Dr. Deodikar (1960-80); Dr. K.R. Surange (1981-85); Dr. S.H. Godbole (1985-87); Dr. A.D. Agate is the present Director

## Current Activities of MACS

"MACS is operating Mushroom Project which spread cultivation of oyster mushrooms in rural urban areas. It offers a Home Garden Course which has proved very popular and have led to hundreds of well groomed home gardens in Pune city. In 1991, a monthly series of Lectures on important new topics in science, was started in collaboration with other science organizations such as Marathi Vidnyan Parishad, Pune Vibhag. Jidnyasa and the local Chapter of INSA. In addition to these lectures we plan to organise a series of lectures on Science and Society as well as on Nobel Prize in Science. As a part of attracting young students to science. MACS is supporting the activities of Exploratory in which President V.G. Bhide is playing a leading role.

## The Present MACS Governing Body

| | | |
|---|---|---|
| President | : | Dr. V.G. Bhide, FNA |
| Vice President | : | Dr. A.B. Joshi, FNA |
| Hon. Secretary | : | Prof. B.K. Kale |
| Hon. Treasure | : | Shri V.G. Pendharkar |
| Members | : | Dr. R.A. Mashelkar |
| | | Dr. J.V. Narlikar |
| | | Dr. R.D. Deshpande |
| | | Dr. K.K. Kshirsagar |
| | | Dr. R.G. Kakade |
| Ex-officio Member | : | Dr. A.D. Agate<br>Director<br>Agharkar Research Institute. |

## CURRENT RESEARCH

### Genetics and Plant Breeding

- Breeding of high yielding, disease resistant wheat varieties
- Breeding of high yielding soybean varieties with high oil content.
- Developing disease resistant grape varieties.

### Botany

- Study of Sacred Groves of Maharashtra
- Ethnobotanical studies of the Western Ghats
- Rare and endangered plant species
- Palaeo-floristics of Deccan Intertrappean Beds

### Mycology and Plant Pathology

- Taxonomy of Indian fungi and lichens.

- Cultivation and collection of edible mushrooms
- Post-harvest fungal diseases

Chemistry

- Pheromones and antijuvenile hormones
- Environment-friendly chemical for dicot weed control

Biometry and Nutrition

- Nutrition and adolescent growth
- Slum undernutrition
- Bioavailability of micronutrients in Indian diets

Zoology

- Normal and abnormal development processes at cellular and molecular levels.
- Role of cell surface and cytoskeletal components during embryonic development

Geology and Palaeontology

- Cretaceous deposits of Indian Peninsula and the Andaman Islands.
- Coastal marine Quaternary deposits, including the Andamans.
- Biostratigraphy on the basis of palynology and molecular palaeontology.

Microbiology

- Processes to treat agricultural, industrial and mining wastes.
- Production of fuel/value-added chemicals / precious metals.
- Physiology of micro-organisms.

## SOME SIGNIFICANT ACHIEVEMENTS

- MACS-9 and MACS-1967 durum wheat varieties for rainfed cultivation, and MACS-2496 aestivum rust-resistant variety for irrigated cultivation were released by the Government of India, Central Variety Release Committee.
- five Soybean varieties released by the same Committee, they cover 70% of the area under soybean cultivation in Maharashtra.
- MACS-57 is the first variety in the country bred for summer spring cultivation.
- A unique study of Sacred Groves in the Western Ghats, floristic studies and identification of endangered species.
- The only lichen research centre in India (20,000 collection)
- Cultivation technology of oyster mushroom extended to rural / urban areas.
- Synthesis of Citral for attractingg honey-bees
- Stochastic modelling to data on energy-protein balance in human adults. It led to a hypotehsis underlying homeostatic mechanism of requirements.
- Demonstrted impact of educational input in health intervention programmes for rural children.
- Mutagenicity assessment of environmental contaminants and identification of antimutagenic compounds.
- Taxonomic revision of marine Cretaceous rock formation of Peninsular India.
- Taxonomic revision of Paalichnology of Mesozoics of Peninsular India and Baratang Island, Andamans.

International data bank set up for cultures used in biohydrometallurgy and biogas production.

- Cost-effective, energy-conserving microbial leaching processes for copper and manganese extraction deployed in the field.
- Microbial removal of chromium in automobile industry effluents.
- On-site treatment process developed for dyestuff / pharmaceutical industries effluents.
- Discovered unique co-enzyme system in methanogens.

## THE AGHARKAR RESEARCH INSTITUTE

The Institute, founded in 1946 as the MACS Research Institute, has now been renamed as the Agharkar Research Institute (RI) in honour and memory of the late Professor S.P. Agharkar. The ARI is an autonomous research institution, fully funded by the Department of Science and Technology (DST) of the Government of India.

The current research activities encompass biological sciences and focus on three broad areas : Microbial Sciences, Plant Sciences and Animal Sciences.

The ARI is also a main research centre under three All-India Co-ordinated Research Projects of the Indian Council of Agricultural Research (ICAR). Wheat Breeding; Soybean Breeding and Grape Breeding.

"The ARI has an agricultural farm, located at Hol, near Baramati, about 80 km south of Pune, for experiments on crop plants and for multiplication of seed of improved varieties.

The ARI has a distinguished faculty, modern infra-structural facilities, well-equipped laboratories, a guest. house and a students' hostel. It is affiliated to the University of Poona, and to the Mahatma Phule Agricultural University (MPAU), Rahuri, Dist. Ahmednagar, Maharashtra, for postgraduate research in biological sciences. Till data 85 M.Sc. and 150 Ph.D postgraduate degrees have been awarded.

"A number of research schemes, funded by DST, CSIR, ICAR, ICMR, DBT and DNES are being operated. The ARI accepts consultancy and sponsored research projects from public and private undertakings.

"We are glad to inform you that a video film entitled

**TOWARDS A HEALTHY VILLAGE**

Documenting the experience encountered during a DST funded research project "Improving living conditions in villages" carried out under the guidance of Prof. P.V. Sukhatme, is ready for viewing.

The fascinating film is aimed at foucssing the attention of researchers, village workers and rural development planners to the fact that symptom oriented approach can not be the way to combat poverty or undernutrition. While diet and disease are both important components of health, diet can be fully effective only if the diseases is kept under control. This inevitably calls for improving the living conditions in our villages. The film highlights the fact that merely creating facilities such as building latrines or installing bore wells is not the answer. Ultimate success lies in educating, motivating and involving rural people through the stimulus of appropriate social action, so as to inculcate healthy habits.

(A.D. Agate)
Director,
MACS Research Institute

Duration of film : 26 minutes

Prices (Inland) : Rs.400/- and $35 for outside India (exclusive of postage)

For your copy contact : Director, MACS Research Institute
Law College Road, Pune 411 004,
India.

"This organization was founded by eminent scientists with active support from other intellectuals and important personalities in Pune and Bombay. Initially the aim was to pursue research in Natural Science discipline such as Botany, Zoology,Chemistry. However, there is an important Department now of Nutrition and Biometry. What is most significant is that under the leadership of Dr. Sukhatme and his colleagues. about ten villages have been adopted round about Pune so as to disseminate the knowledge of science. This activity is conducted at two levels : one is to help the villagers to obtain safe water supply by building water tanks for storage and of course the other is to ensure chlorination and the safety of water supplied through these storage tanks. Then again biogas and its utilization for street lighting, if not for consumption at home, has also been initiated. Apart from these services, which are rendered to the residents of the villages, of course, by making them contributed for the cost of such services, Technical advice and help is given free. What is most significant is the looking after the education of school children to ensure habits of cleanliness, sanitation and hygiene. There is a trained health worker who is posted in each village to make sure about the standards of health, sanitation and hygiene practised by the children and also there is a medical doctor who visits each village at least once a week so as to offer both advice and help. The school children are divided into various groups and are made responsible for attendance at the school of the children in each group as well as their observance of habits of cleanliness, sanitation and hygiene. The compound of every school is not only

kept spick and span by the students and the teachers but free plantation of trees has been successfully undertaken. One may say that preventive measures to arrest epidemic and particularly all kinds of illness arising out of in sanitary conditions and unhygienic practises has been ensured. In addition of course to this activity, various research students such as those studying Microbiology, Nutrition, Biometry etc. do their field work in these villages and thus make available the relevant scientific information which is of practical use in solving day-to-day problems of the people in the villages. This activity of the MACS has enlisted good support of people from within and particularly when there is a retired army personnel staying in village, his contribution in enlisting co-operation of the people must be mentioned. As mentioned earlier, MACS only provides technical advice and service and the people in the villages have to pay for the cost of construction as is needed, in each case. It is true that the MSCS gets grants from the Department of Science and Technology which makes it possible to undertake such activity on a regular basis, of course, with the help of dedicated scientists. Here is an example of what scientists can do to tackle the problems of the villagers by facilitating application of science for resolving day-to-day problems such as safe water supply, proper latrines, etc.

"This particular experiment brings out the importance of constructive work such as children's education and also the provision of para-medical services to the community, in addition of course, to taking care of safe water supply as well as biogas

to the community. A judicious mixture of education and services seems to be a very important input which can help people to acquire the required degree of self-reliance. Of course, education of children is a long term investment which can show results in years to come, but without such investment, the expected improvement and change in the health habits of the people may not come about. Similarly, making people self-reliant by raising their own resources is also very significant, so that the traditional relationship between donor-donee does not exist. It has been a confirmed finding of many a study that donor-donee relationship is not congenial for making people self-reliant and as such effective partners in development.

Maharashtra Association for the Cultivation of Science, Pune

Gram Gourav Pratishthan, Shetkarinagar - Khalad
Taluka - Purandhar, Dist. : Pune
Maharashtra (India)

# PANI PANCHAYAT

(Dividing line between Poverty and Prosperity)

November 1983

PREAMBLE

"The Gram Gourav Pratishthan, Naigaon, Taluka Purandhar, Dist. Pune, has been working in the field of Rural Development since last 7-8 years. A number of persons from various walks of life have been visiting the work done by the Gram Gourav Pratishthan and have expressed deep satisfaction about the new approach put forth by the Gram Gourav Pratishthan, in Soil-Water-Manpower management and socio-economic development, particularly in drought prone area of Purandhar Taluka. the work done by the Gram Gourav Pratishthan is unique in the sense that without any publicity or show it has been working for the rural upliftment through a small group of devoted personnel. The work done so far may not be a dazzling performance; but it is a grass-root work for the people in the drought-prone area. The people had practically lost hopes of their betterment. But now they can face natural calamities. The people who visit the works of Gram Gourav Pratishthan are naturally curious to know how this transformation has been brought about. The same has been explained in this note.

"Substantial areas of our country periodically experience drought leading to considerable loss of agricultural production and live stock wealth, besides causing untold misery to the people inhabiting these areas. In Maharashtra State, 7,000 villages in 87 Talukas or blocks in 12 districts have been identified as drought prone by a Fact Finding Committee appointed by the State Government in the year 1973 and Purandhar block of Pune District is one of them. "Large sums have been spent by

the Government for providing relief after occurrence of droughts. Such expenditure has not helped to the required extent to solve the basic problem of increasing the productivity of these areas and thereby reducing the severity of the impact of droughts on the human and cattle population. To develop these areas and thereby reduce the impact of the droughts is a challenging task.

"Though the average rainfall of the Maharashtra state is 1070 mm, its pattern is not uniform, the average rainfall in the drought prone areas varies from 250 mm to 500 mm. Besides being in-adequate it is very erratic, untimely and not assured every year. This area generally experiences drought once in three years and severe drought and acute scarcity once in ten years.

"It is, therefore, not possible for people of this area, particularly for marginal and small farmers, to sustain on the rainfed agriculture. This has forced a large number of them to migrate to cities like Pune and Bombay, where conditions of life in the slums are hardly any better, or to become agricultural labourers or share croppers on the farms of rich farmers, in areas where there is assured water. There are about ten thousand people from Purandhar block alone working in various textile mills in Bombay.

"These people are living in the Saitan Chowki area of Bombay. They live in filthy, cramped quarters popularly known as 'gala'. Each gala is approximately 12' x 15' (with a makeshift mezzanine floor) and around 30-40 people live in it in shifts of eight hours. In a gala each person is provided space measuring 2'x5/2' to spread his mat and sleep.

## ORIGIN OF GRAM GOURAV PRATISHTHAN

"In Maharashtra 33 percent of the total cultivable land is affected by drought. This population of the affected villages is about 150 lakhs, almost 1/3rd of the total population of the State. Only 12 percent of the land is irrigated and only 15 percent of the population is covered by it. Thus sectoral planning at the national level has resulted in socio-economic imbalances and patches of prosperity. It, therefore, poses a basic question of planning for the remaining 85 percent of the population and their 88 percent of dry land.

"There was a severe drought and scarcity in 1971-72 in Purandhar block. There was no drinking water and fodder in a number of villages. The affected farmers not only sold their cattle at throw away prices but also gifted them to those who could look after them, instead of witnessing their slow death due to starvation and thirst. They also started migrating to nearby towns and cities.

"Shri V.B. Salunke, an engineer and the Managing Director of Accurate Engineering Company had an occasion to travel in the drought prone areas in Purandhar Taluka in the year 1972. The severity of drought, and the plight of the people moved him. He decided to fight famine and thought of finding out permanent measures to face recurring droughts. In 1972-73 Shri Salunke approached the Collector of Pune for starting productive works in the scarcity area and helped the Government organization in preparation of plans and estimates of percolation tanks costing

Rs.5 lakhs in about two weeks. One such percolation tank was constructed near the village Naigaon. Shri Salunke selected Naigaon for further experiments in rural development and started working earnestly on soil and water conservation measures.

"In 1974, Mr. Salunke established a charitable trust called "Gram Gourav Pratishthan" at Naigaon village in Purandhar taluka in Pune district, with the following aims and objectives :

1) To provide initially relief to the farmers of the Purandhar taluka by improving their economic conditions and to remove the cause of recurring droughts.

2) To create facilities to raise their social and economic conditions to attain welfare of the people in this Taluka.

3) To conduct research studies in socio-economic conditions, so that the urban interests will be linked with the process of creating integrated rural development.

4) To do all such lawful things as are conducive or incidental to the attainment of all the above aims and objectives.

"He selected this village for two reasons : Firstly, it falls in the area which is worst afflicted during the droughts. Secondly, the Trust could get 16 hectares of land on lease to carry out experiments on his ideas of fighting the drought. The people of Naigaon gave belonging to the village temple.

"The intention behind carrying out the experiment was to find out a permanent solution to overcome the recurring drought.

It was important to understand what risks were involved in the new approach before asking the villagers, whose existence was too precarious, to take any themselves.

"The investigation revealed that the precipitation received during the south-west monsoon (between June and September) in Naigaon usually fluctuated between 250 mm and 500 mm. The precipitation received from north-east monsoon (October November) comes in heavy concentrated dosages. Most of it runs off in seasonal streams and rivers, in the absence of any water conservation work to retain it.

## EXPERIMENT AT NAIGAON

"The 16-hectare land is situated on micro-watershed. During the heavy rains a precipitation from about 200 acres run off from this watershed. To impound this water a percolation tank of the capacity of a million cubic feet of water was constructed within this land. While this was being constructed the fields were contour bunded, levelled, stones removed, ploughed and an open well dug at the base, on the downstream of the tank. A pump of 7.5 H.P. was installed at the well to lift the water up to a height of 40 ft, (say about 13 mtr.). The rising main of RCC pipes about 300 metres was laid under ground by digging trenches to the distribution chambers.

"For five long years from 1974 onwards, Mr. Salunke and his wife Kalpana carried out experiments in water and soil conservation; designing of low-capital-cost community minor irrigation for eight months in a year (i.e. Lift Irrigation

Schemes); possibilities of regenerating scare water by building small check bunds on nullas below the main percolation tank, the theory that water in the tank above or used on the fields at higher elevations would percolate into the ground and raise the water table in lands at lower elevation; irrigation techniques and management; different cropping patterns, to see which would yield the optimum income and food; use of improved varieties of seeds; use of fertilizers and insecticides to improve agricultural production.

"Out of the 16 hectares of land 9.60 hectares were brought under protective irrigation, 2.40 hectares under afforestation and the remaining 4 hectares came under the percolation tank, well, field bunds, tract and infrastructures.

"When the above experiments were being carried out by the Trust on the barren land, the farmers of Naigaon village showed little interest. They were not only sceptical but were sure, that it was a futile exercise. But soon the experiment proved a success. When the villagers saw that 200 quintals of food grains were produced on 24 acres of land under experiment, whereas 40 acres of their own hardly produced ten quintals, they flocked around Mr. Salunke, requesting him to start similar schemes for them.

"Besides producing record food grains, the farm has generated ful time employment for fifteen people and supports fifteen animals. 4000 trees on the rocky rimland and 2000 fruit trees along field bunds are thriving. In addition, a three

quarter acre has been brought under Thomson Seedles grape vine. Some decades ago Purandhar Taluka was famous for horticulture. Today there are only a dozen of orchards that produce guavas and custered apples.

"The one million cft. of water stored in a small percolation tank at Naigaon has proved quite sufficient to irrigate 2.43 hectares in kharif, 8.20 hectares in Rabi and 0.5 hectares in the summer or about 11.00 hectares in all.

"The trust has been supported, besides Mr. Salunke's industry, by individual philanthropists, other industries in Pune and Bombay and has received some donations from Novib, Netherlands, Church's Auxiliary for Social Action and Peoples Action for Developments (Maharashtra), all supporting voluntary rural development schemes.

**PANI PANCHAYAT (WATER COUNCIL)**

"In 1980 Mr. Salunke decided that time had come to move forward for economic transformation of the villages. He first started with Naigaon by seeking the involvement of the poor farmers in establishing a series of community minor lift irrigation schemes, building upon the experience he had acquired with the experimental farm.

"The various experiments carried out at the experimental farm have conclusively proved that, with proper methods of water conservation and careful distribution, half an acre of irrigated land would reasonably sustain one person. Thus, a family would

have a maximum of 2.1/2 acres of irrigated land. Here came one of the key ingredients in the rural transformation; the allocation of water not in the proportion with land holdings but in proportion with the number of people in a family unit. This revolutionary concept is the key to altering the "refraction effect" of technological inputs.

"Had Naigaon followed the usual traditional practice of allocating water in proportion with land holdings, the result is easy to predict. Those with moe land would have benefited more. Since water in a drought prone area is the key to a more productive agriculture, this advantage would have been multiplied down the line in terms of the ability to use other technological inputs to increase productivity. Hence, the usual pattern would have soon emerged in Naigaon, as it has in so many othe well intentioned rural development schemes throughout the country.

"With irrigation, small farms intensively cultivated, would achieve higher levels of productivity than larger farms lss intensively cultivated. Therefore, the overall agricultural production in the village economy would increase more through the strategy of allocating water to a large number of small farmers rather than to a small number of large farmers.

"Another key elementin the plan was its financing. When the lift irrigation programme started in Naigaon, a formula called 20/40/40 was followoed, that is, the beneficiaries put in 20 percent ofthe capital cost, the Government another 400 percent as subsidy and the Trust the remaining 40 percent. (Interest free

loan, to be repaid in five years) The Government gave subsidy from a programme called Minor irrigation extension programme 2 to 4 hectares, which was later withdrawn in April 1981.

"This was another revolutionary approach of the scheme. When the Government sets up irrigation system, the beneficiaries do not contribute anything towards the capital cost. They pay water charges and in most cases, the water is misused and benefits reach only to a select few.

"It has been noticed from the expenditure incurred by the Government on major and medium irrigation projects that, it has spent on each beneficiary family anything from Rs.8,000 to 16,000. On the other hand, the Government spends anything up to Rs.30,0000 on an individual in Bombay in order to provide civic facilities. Whereas, to provide community lift irrigation facility to an individual family it costs only Rs. 6,000 per hectare. In view of this the Government was requested to contribute 80 percent of the capital cost as subsidy to such schemes. The 20 percent contribution by the beneficiaries remained unchanged. But the proposal though accepted on paper, has not borne any fruits, on account of impracticable procedural requirements.

"From the socio-economic consideration, the modalities of Pani Panchayat for sharing water, the scarcest resource in a drought prone area and the main input for increasing the

agricultural production are, therefore, as follows :

1) Only group schemes are undertaken and not schemes for individuals. This fosters community spirit.

2) The sharing of water is on the basis of the number of members in the family and not in proportion with land holdings. Half an acre per capita, maximum of 2.1/2 acres. The land in excess of 2.1/2 acres is to remain under rainfed condition. The principle of equity is thus incorporated and imbalance is avoided.

3) The rights of water do not go to the land, but to the individual beneficiaries for increasing their own agricultural income. If the land is sold, the rights of water revert to the Trust.

4) beneficiaries share 20 percent of the cost of the lift irrigation project, according to their share. People's active participation and stakes are thus ensured. The balance of the 80 percent will be given by the Trust,as an interest free loan to be repaid in five years, from the donations received. After the scheme becomes productive, the Government will be requested to reimburse the 80 percent or part thereof, which may or may not be accepted.

5) The beneficiaries of the project themselves are to administer, and operate all its aspects. The leadership, capability and skills of the rural people are thus recognised and enhanced.

6) Crop such as sugarcane requiring more frequent watering and consequently more quantity of water is not to be grown. This will enable to bring more area of seasonal crops under protective irrigation. Thereby more number of people will benefit than otherwise.

7) The landless can also share water, so that they gain full employment in the village itself by becoming share croppers to farmers having more land. This will check their migration to cities.

## IMPLEMENTATION OF LIFT IRRIGATION SCHEMES

"Initially the farmers were required to be motivated to accept the norms of Pani Panchayat,because of the revolutionary ideas of sharing water on per capital basis, i.e. 1/2 acre per person with a ceiling limit of 2.1/2 acres and contribution of 20 percent of the capital cost. These concepts were new to them. But, after a couple of schemes for the motivated groups were completed, the sceptical attitude of the people of Naigaon was soon dispelled and more and more groups of people came forward. Today there are eight schemes operative in Naigaon (See Annexure 1).

"Farmers of the surrounding villages soon came to know of the most enviable transformation that was taking place in Naigaon. They started visiting Gram Gourav Pratishthan and the completed schemes at Naigaon. Some of them started asking enthusiastically if such a scheme would be taken up for them also. By now all those who came to Gram Gourav Pratishthan had

come to know of the norms of the Pratishthan, and therefore no more explaining of the norms or motivating them was required.

"Today there are 36 schemes in hand for which Government subsidy was received. Out of these, 25 are operative (Jan. 83), 11 schemes though almost completed, ave been commissioned for want of electric power connection. Two schemes are in various stages of completion. Even if they are completed they would not be commissioned as getting power connection would be a problem.

"12 fresh schemes are taken in hand for which the Government subsidy is not available. Out of these, there are operational. The remaining are under various stages of completion and are going to meet the same fate as mentioned earlier in regards to power connection.

The details of the various schemes are enclosed (Annexure 2)

SOCIO-ECONIMIC CHANGES

"In each village dry land cultivators are in majority. On an average they constitute 90 percent of the village population. A community lift irrigation scheme is beyond the means of a dry land farmer. As mentioned earlier, in the schemes of Pani Panchayat a beneficiary has to contribute 20 percent of the capital cost of a project. He does not have the means to raise this amount. Therefore, most of them take a share of water much less than they are entitled to.

"Many of the beneficiaries have raised their contribution of 20 percent with great sacrifice. They had to part with whatever

little valuable things they possessed. Some sold their cattle, some their sheep and goats, some untensils of the house and in a couple of cases they even sold a very meagre quantity of gold from the "Mangalsutra" (a necklace worn by the married woman whose husband is alive), the only valuable possessed by the family.

It is just not possible for a family to subsist only on dry land agriculture. Many from Purandhar block had therefore, to migrate to cities like Bombay and Pune. The Shepherd community leads a nomadic life, returning to their fields only during the monsoon to produce whatever little grain they could. This has been the pattern of life of the dry land farmers for generations.

These circumstances are both a curse and a blessing. A curse because of the hard conditions of life which the lack of water imposes, but a blessing in that most of the families have some land. In other words, the critical constraint in this drought prone area is not land but water.

The beneficiaries of the schemes comprise of all classes high and low. It has brought in a social change. They no more think in terms of individual gains but consider community or collective gains. There is an accommodating spirits in them. Some anti-social activities in which some people indulged have come to an end, as they have no idle time, because irrigation has given them full time occupation.

The beneficiary shepherd are no more leading a nomadic life. They have permanently settled on their lands. Those having their

fields at distant places from their village are now living in their fields by constructing thatched huts, so that they can spend more time on agricultural work. This has forced the children to foot the distance to come to the village school, besides giving a helping hand to their parents in their spare time.

A couple of groups have ever solved their drinking water problems, through the lift irrigation system. This has saved the womenfolk a lot of time and labour, which they can now devote to work on the fields.

In one case (Rabawadi) they have even gone in for community horticulture. In fact scheme, one of the beneficiary has leased for Rs.3,000/- his two acres of land to the group for grape orchards. The produce will be equitably shared by each individual of the group. These are some of the social transformations.

Economics achievements are equally striking. An acre of land which hardly produced 50 kg of grains is now producing 400 kg to 500 kg of food grains.

rior to the commencement of the Lift Irrigation Schemes, it appeared that the people had lost all the hopes about improvements in their conditions and a feeling of helplessness had prevailed. But since the commencement of the schemes people have regained self confidence. With assured supply of carefully rationed water, though only for eight months, the farmers have been able to raise fine crops of onion, vegetables, cereals and

even fruit like grapes. This not only made a better life possible, but brought it within their reach.

As a sequel to the transformation, many farmers who had migrated to Bombay returned to Purandhar and are back on their farms. It may still be a trickle, but a process of 'reverse' migration has started. If Pani Panchayat schemes are set up with the support of the Government, the trickle can become flood. The slum and pavement-dwellers who now defile the atmosphere in Bombay would once again become productive citizens.

Water, which is a critical input in increasing the agricultural production, is a scarce resource in a drought prone area. The available quantum of water can be optimised to benefit a large number of farmers, provided the principles of Pani Panchayat are followed.

Crop planning assumes great importance in economic uplift of the poor farmers in a drought prone area. The farmer has to strike a balance between cash crops and other crops. When it comes to a cash crops, there is a tendency amongst the farmers to go in for sugarcane, when some source of assured water is available. But they fail to appreciate that comparatively it requires more water, generates less employment, derives less income and benefits less number of farmers. This may be seen from the enclosed sketches. (Annexure 3/1 to 3/4).

To give a general idea of the economic transformation that has taken place among the farmers, whose lift irrigation schemes are functional, we have chosen two schemes, namely, Pilanwadi,

which has a perennial source of water and Babawadi at village Pisarve, which gets water only for eight months in a year. Their economic statistics are given in Annexure 4 and 5. It may thus be noticed from these details that there is a great hope of fulfilling the aspirations of poor farmers through the schemes of Pani Panchayat.

MANAGEMENT OF THE SCHEME

It is comparatively easy to start a community minor lift irrigation scheme. But it is very difficult to manage it after completion. There are a number of minor irrigation co-operative societies operative in Maharashtra. But unfortunately many of them have come to standstill, mainly because of their mismanagement.

The Trust has already taken over an obsolete scheme at Akola in Sangola tehsil of Solapur district, in which the Central Bank has already sunk more than Rs.40 lakhs. The project has been made functional by the trust and is also being managed under its auspices. Similarly requests have started coming in from some other obsolete co-operative society's lift irrigation schemes.

When Government subsidy under the fund "Minor Irrigation Extention Programme 2-4 hectare" was granted, it was not laid down that each of these schemes should form a co-operative society. But now the Government insists on forming a co-operative society in case a subsidy from IRDP is to be availed. However, not much of subsidy from IRDP can be obtained as each block or taluka has been doled Rs.6 lakhs to meet the requirement

for its comprehensive development, which includes, besides minor irrigation schemes, daily, afforestation, cottage industry, poultry, etc.

Pani Panchayat would like to administer these schemes itself, because the experience of the co-operative society is unsatisfactory. The wealthier and more important or influential members of the group get appointed to the key posts. The consequence is the usual "refraction effect" of magnifying economic and social disparities.

To provide management structure for each of these schemes, a manager or a group leader is elected by the beneficiaries of each scheme. A suitable `Patkari' or a water distributor trained for the duties is appointed by Pani Panchayat. He is usually from a neighbouring village, not directly involved in the scheme itself. This person is paid a modest stipend of 200 rupees a month and assures day-to-day fair allocation of water to all its beneficiaries. In these bodies all the families participating in particular scheme take part equally. Every Sunday group leaders participate in the meeting of Pani Panchayat. They in turn hold meetings of its members once a fortnight.

## LAND-WATER-MANPOWER MANAGEMENT TRAINING CENTRE

In order to ensure that the schemes of Pani Panchayat do not meet the fate of some of the co-operative lift irrigation societies, it has been decided to create a cadre of well trained extension workers from rural dropouts aged 15 to 20. It is intended to admit 30 students each year for a course of two years

and they will be absorbed in the expanding programme of Pani Panchayat. The syllabus will include the following :

1) Use of modern science and technology to increase maximum agricultural production with minimum water.
2) Water and soil conservation
3) Agro-engineering
4) Lift irrigation schemes
5) Water distribution
6) Crop planning
7) Crop diseases
8) Use of fertilisers and insecticides
9) Marketing
10) Storage
11) Prevention of diseases among human beings and animals
12) Horticulture
13) Afforestation
14) Maintenance of pumps and motors
15) Keeping of accounts

The Training Centre besides training the extension workers will also run periodical short courses for the group leaders in management of the scheme and for the beneficiary farmers in all aspects of agricultural practices.

The establishment of the training centre is going to cost about Rs. 19 lakhs. It will be a residential centre.

## LIMITATION

A voluntary agency working for the rural development, however dedicated it may be, can not achieve much, unless it has got the backing of the Government. Unfortunately the Pani Panchayat lacks it. The efforts of Pani Panchayat in getting the "community minor lift irrigation scheme" established has been quite frustrating and enervating. Some of the limitations from which the programme of Pani Panchayat suffers are as under :

1) The Government subsidy is available to marginal farmers (less than 2 hectares) and small farmers (less than 4 hectares). A farmer in most parts of Maharashtra is a genuine small holder, but the land records (from 7/12) prepared long ago do not reflect the actual present position. Many a time the lands are in the name of the eldest member in the family, whereas in actual practice the lands have been divided amongst sons and grandsons.

   The procedure laid down for updating the revenue records is so cumbersome and vexing that most of the poor farmers are perplexed to tread on that path. There is, therefore, need to evolve a simple and quick procedure in this respect.

2) In case digging of an open well or a bore well on Government land is involved, permission of the Revenue department is required. Similarly, for use of explosive to dig an open well, licence of the Home branch of the collector's office is required, without which the explosives can not be procured. It is frustrating to obtain them. It takes months and months to complete these formalities and correspondingly the project is delayed.

3) For lifting water from reservoirs, the permission of the Irrigation department is required. Normally permissions to lift water is granted according to the total area under command of the project, lifting of water to the extent of 1% from the Reservoir, 5% between dam and pick up weir and 5% from the command area. In the case of M.I. Schemes the Irrigation Department expects that there should be no water left in the reservoirs at the end of March. But in actual practice there is abundance of water left, as possibly, it is not used to its limit. Under such circumstances there is need to relax the rule. Even when legitimate permission is obtained,inordinate delays take place.

4) It is equally difficult to get electric power connection to the completed lift irrigation schemes. The M.S.E.B. applies a yard-stick of revenue return for each scheme. This is, it must get a return of 20% on the capital investment. Otherwise it does not sanction a power connection. To improve the plight of the marginal and small farmers, this rule will also have to be relaxed.

Even where the condition has been met, it takes considerable time to get a power connection. There is a requirement not only to make a special allotment of funds for the provision of power connections to the schemes of Pani Panchayat, but also to provide them within three months from the date of application.

In the new 20 point production oriented programme announced by the Prime Minister, top priority has not only been given for increasing irrigation of dry land agriculture, but it has also been mentioned that it would be carried out on the principles of Pani Panchayat. It was also mentioned by the Government that additional funds are being allotted to IRDP so that the states which are effectively implementing the schemes should not be starved of funds. This being so, there is no reason why the beneficiaries availing lift irrigation schemes through Pani Panchayat should not get subsidy. To bring early relief to poor dry land farmers, the Government should make a separate allocating to the schemes undertaken on the principles of Pani Panchayat.

## EXTENSION SERVICES

The agricultural production can not be increased by provision of water alone unless inputs such as seeds, fertilizer and insecticides are used. Small farmers usually do not use fertilizers in correct quantum. They hardly use any insecticides, mainly because of financial inability. In order to make him use these ingredients, it was felt essential to start an extension service, which will provide him the above three ingredients at a comparatively cheaper rate and close to his farm. Three such shops have been opened. The response from the beneficiaries to avail this service has been very encouraging.

Most of the farmers have expressed a desire to open a co-operative bank of Pani Panchayat, in which they could deposit

their money and in return could avail the benefit of extension services. They feel that otherwise the money earmarked for the inputs would be spent on other items of low priority. The proposal of formation of a bank is being examined.

FUTURE PLANS

Pani Panchayat aims at employment of 25,000 people who are struggling below the poverty line, in a period of ten years, in Purandhar taluka. It has a proposal to cover all the hundred villages of the taluka by undertaking 600 community minor lift irrigation schemes, which will bring under protective irrigation land mass of 25000 acres at an outlay of Rs.100 crores. This target has been set on the basis of the results of the study of the ongoing schemes of Pani Panchayat. It is, therefore, not an unrealistic proposal.

Once the problem of the basic ingredient, that is, water is solved and the agricultural production of the beneficiaries is increased, other ancillary projects of rural development would be undertaken. There will be dairy, social forestry, horticulture, animal husbandry, health, adult education, marketing etc.

When all the 50 projects taken in hand become productive, marketing of the produce on collective basis would be undertaken. It is proposed to sell the agricultural produce directly to large consumers such as canteens of industries in Pune.

As mentioned earlier, it is proposed to open a co-operative bank for the beneficiaries so that all the extension services

would cater only for seeds, fertilisers and insecticides. Later, when the extension services provision becomes self-sufficient its scope will be enlarged into departmental stores, which cater for all the needs of the farmers.

DEMANDS OF PANI PANCHAYAT

1. Acceptance of the principles of Pani Panchayat by the Government

The Government should accept in principle their normal responsibility of making available irrigation facility of half an acre on per capita basis,to the maximum of two and half acres per family in consonance with the Government's family planning programme. This can be achieved by having community minor lift irrigation schemes on a large scale. Where the farmers avail of community minor lift irrigation schemes on the principles of Pani Panchayat, Government should provided 80 percent of the capital outlay as a subsidy and the balance of the 20 percent should come from the beneficiaries; crops requiring water more frequently such as sugarcane should be prohibited, water rights shall be to the individual family and not to the land brought under irrigation to avoid speculation.

2. Provision of electric power connection

It is not possible to start agricultural production on the completed schemes, unless electric power connection is provided within a reasonable time. The Maharashtra State Electricity Board should, therefore, provide such connections within three months from the date of application. The formula of revenue return should not be made applicable to community schemes. It is

estimated that the Electricity Board will have to meet, on an average, approximately 20 percent of the capital cost of a scheme. The Government should, therefore, make a separate provision for the schemes of Pani Panchayat or for any other voluntary agency engaged in a similar programme.

3. Grant of 80 percent subsidy

Keeping in view the future plans of Pani Panchayat, the Government should sanction Rs. 50 lakhs (80 percent) for 50 irrigation schemes each year. It is even accepted that the Government may carry out a comparative study of the programme of Pani Panchayat and then take a decision on the continuation of the aforesaid subsidy.

4. Flow irrigation tanks vis a vis lift irrigation scheme

The western part of Purandhar block gets a good rainfall, whereas the eastern part receives hardly 375 mm as the area comes under rain-shadow. In case a study of the rainfall and run off in the Purandhar block is carried out, it will reveal that there is still considerable scope to store water. Taking into consideration the large magnitude of future community lift irrigation schemes, the maximum number of water storage tanks should be constructed by the Government. It should, therefore, reconsider its policy of having flow irrigation watertanks. The flow irrigation schemes may also be run on the basis of 1/2 acre per capita for social equity.

In Purandhar block average run off from rain water is 820 CuM. Out of this, it is possible to utilise about 520 lakhs of

CuM water for Lift Irrigation schemes, on equitable share basis. The rest can be made available by flow canal.

The condition of allowing to lift only one percent of stored water directly from the irrigation tank may be relaxed and if the records show that the balance of water at the end of March is sufficient to grant permission to the extent of more than 1% such permission may be granted.

According to the estimates of the Government about 500 lakhs of CuM of water is available under ground. Taking into consideration the availability of water underground and the run off, a master plan for all available supplies should be made. The Government should, therefore, direct the Irrigation Department to revise the Master Plans. The planning for the best utilisation of water wealth, during the next ten years, capital investment and gestation period, should be determined after taking into consideration the experience of the people.

5. Re-charging of water tanks

There is an estimated run off about 5000 lakhs of CuM of water from Nira water, which is yet to be harnessed. At present this quantity is drained to the sea. For the utilisation of this water Government has set up "Nira Watershed Development Board". The board has planned on paper to make available 1500 lakhs of CuM of water for irrigating 11,800 hectares of the block, through traditional flow canal system. The project is going to cost approximately Rs.12 crores. This is not going to solve the problem of even ten percent of the people of Purandhar block. On

the contrary, it will widen the disparities amongst the farmers. Instead of concentration of irrigation in a small patch, Government should consider diversion of this water into the neighbouring valleys. The conservation of water in projects of small magnitudes will benefit an area of 30,000 hectares on the basis of 20 hectares per 1 lakh CuM.

6. **Re-orientation of power supply**

At present 9 MW of electricity is being produced at Veer Dam and it is even possible to increase this capacity. By using this electricity, if 1000 lakhs of CuM of water is lifted to a maximum height of 100 metres to re-charge the various water storage tanks, by linking them, it will irrigate 20,000 hectares for eight months. If ten percent of this area, i.e. 200 hectares are brought under horticulture, it will aid in minimising if not eradicating the drought conditions.

In case the above proposal is accepted by the Government, the beneficiary farmers are even prepared to bear 20 percent of the capital cost, that the Government would incur to lift run off water, as a 'Development cess'. And when the scheme is completed they are also prepared to defray the expenses that will be required to operate and maintain it, along with the electricity bills, under the guidance of Pani Panchayat.

7. **Impact of the demands**

In brief the benefits that would accrue from the above mentioned demands would be as follows :

1. In case 2000 lakhs of CuM of water is made available during

the next 15 years in Purandhar block, 1250 CuM water per capita can be made available.

2. The total outlay at the current market rate would be Rs.40 crores. That means a capital investment of Rs. 2500 per capita for a population of 1,60,000. It is much less than the amount spent by Government per capita in providing flow irrigation system through big and medium dams and in which there is no contribution of the beneficiaries.

3. Today per capita income from agricultural production is Rs.400 per year, which will go up to Rs. 12,000 and it will not only provide full time employment to all on their own fields, but also meet requirement of their needs.

4. This will bring an end to drought relief, Government doles and bring the poor farmer above the poverty line.

Before we connect the river Gang to the river Cauveri, let us first connect the river Nira to the river Karha, both in Purandhar block and bring an end to the poverty of this block.

## CONCLUSION

Pani Panchayat is not just for irrigation and equitable distribution of water. It is a philosophy that can bring about a complete socio-economic change among the poor farmers. It has a tremendous potential for rural reconstruction and can prevent the migration of young men and women from rural areas to urban centres.

## THE MAN BEHIND THE PROJECT

This is an account of an endeavour aimed at mobilizing small and marginal farmers for exploiting water management potentials, with equitable distribution among them as the basis. The endeavour is associated with the names of two organizations, Gram Gaurav Pratishthan (GGP) and Pani Panchayat (PP) established and working under the leadership of Mr. V. Salunke, now known as a crusader for the cause of poor farmers in Maharashtra. Gram Gaurav Pratishthan was established with a view to making experiments in agriculture in the drought prone areas of Maharashtra. Successful experimentation led Mr. Salunke to initiate a movement, popularly known as Pani Panchayat, involving hundreds of poor farmers who are struggling to establish informal cooperatives in order to exploit potentials for water management wherever available. The movement is confronted with all kinds of problems and difficulties. Since it has wider developmental implications its study is deemed essential.

An understanding of a project, initiated and carried out by one individual, is better understood by knowing this leader, his strivings and perception, and his world view. The present study, therefore, begins with whatever the Centre known about Salunke and with information considered relevant to the project.

Salunke was born in a lower middle class family. He was brought up in a city environment and had only a causal acquaintance with rural life. He was a bright student and even while in school, had shown keen interest in doing social work. In this eight standard, he came across an announcement appealing

for students to participate in a national programme of literacy training in the rural areas. Along with a friend, he cycled to a nearby village three miles from Sholapur to explore what he could contribute in this field. Meeting a small group of people gathered in the village temple, Salunke and his friend offered their services should the villagers wish to learn to read and write from them. To the surprise of the two school boys, the people from the village showed their appreciation and readiness. It was Salunke's first encounter with the villagers.

Late evening classes were then set as the villagers had no time to spare during the day. Fifty persons had gathered on the very first day. For Salunke, his friend, and the villagers it was a unique experience : never before had the two boys faced and taught an audience of elder persons nor had the villagers had "teachers" so young to train them.

The work undertaken by Salunke also involved fund raising to purchase necessary equipment like writing slates, etc. The total amount required was estimated at Rs.300. Salunke first approached the district collector who, impressed by the boy's sincerity and enthusiasm, contributed to the fund raising campaign. Within a short period, he was able to collect the needed amount.

Salunke conducted his classes regularly. Within a few days the number of adults attending the class increased to one hundred. Singlehandedly, Salunke coped with the demands of his task even when his friend who earlier joined him had left. In

four months, the villagers learned to read and write. A test was conducted by the district educational officer in which all the adults were declared successful. For Salunke, it was reward enough.

The event was a rich and fulfilling experience from which Salunke drew his first lessons in development work. He realized that concrete actions can reap concrete benefits for the needy rural villagers and can enlist the required cooperation and assistance of officials. The experience also impressed upon him the significant contributions which the urban educated can give for the development of rural villages.

The next occasion which demonstrated Salunke's ability to perceive needs and his ability to act on them was when he entered a prestigious engineering college. As a student leader, he undertook the task of constructing a swimming pool for the students and developing a lawn in the college garden. It involved considerable work right from planning the projects, raising funds, to implementing the plans. Within a period of one month from the day of construction, the projects were completed. The tasks showed not only Salunke's zeal to do service work but also his capacity to get work done through proper organization.

After his graduation from the engineering college, Salunke established his own industrial plant in Poona and earned a good name in industrial circles. Becoming an industrial magnate and a millionaire was now within his reach. By this time, however, he was already actively involved in helping find solutions to the

social and economic problems of the society and had ceased to think only of his own prosperity. He took the initiative to establish an organization - Forum for Industrial Technology (FIT) - for pooling together entrepreneurial talents of small industrialists with a view to developing solution to the technical problems confronting the industrialised city of Poona.

1972 was a turning point. Famine had gripped the entire state of Maharashtra. Total failure of monsoons for two consecutive years created a serious drought situation in the countryside. Farmers and labourers alike were facing starvation. The government promptly geared up the administrative machinery and started relief works with a view to providing employment and minimum income to those who were in need of earning their livelihood through other kinds of work. There was, fortunately, on shortage of food stocks with the government. What were more needed were off-farm employment programmes. The works undertaken then were mostly related to road construction, works which had immediate productive value were few.

Salunke and his wife set out to study the conditions in the State themselves. They visited a number of places and were grieved to find hundreds of men, women, and children involved in strenuous stone breaking works under very hot weather conditions. No sheds were provided for them; potable water was meagre; grains supplied were of poor quality and of low protein value. The villagers lost no time, even in mourning in case of death in a family, as missing a day or a few hours of work meant loss of income. Pregnant women at times, worked till the last hour

before delivery and joined work immediately after a day' rest. Nevertheless, wages received were barely adequate to meet their subsistence needs.

Having observed the conditions of the villagers, Salunke saw the need to find viable alternatives for road construction programmes that would improve the productivity of land thereby strengthening the agricultural base of rural villages. Convinced that famine was not inevitable, Salunke believed that programmes aimed at raising productivity rather than stone breaking projects should be given priority. After surveying the region covering Purandhar Taluka of Poona District, he concluded that the available irrigation potentials were not fully exploited, that there was scope for impounding rainfall water at several sites within the village and that equitable distribution of the impounded water is possible. He envisioned that such a scheme would not only increases land productivity but would also generate employment on a large scale and more or less, on a permanent basis.

Salunke approached government officials to discuss his proposed scheme. Though cognizant of its benefits, the local officials informed him of the constraints on the part of the government to undertake the project. A major constraint was the shortage of technical personnel to conduct survey work and plan preparation. As there was no machinery to undertake such schemes, the government could only implement stone breaking projects during periods of drought.

The village labourers favoured the scheme when Salunke discussed it with them. At Shedgewadi in Purandhar Taluka, labourers undertaking nalla bunding and related works expressed satisfaction with the benefits they were getting from these projects. Soil conditions had improved, the works helped stop soil erosion, and water was being impounded. The increase in water supply had induced higher productivity and enabled farmers to also plant second crops.

Further convinced of the viability of his scheme, Salunke approached the authorities of the Engineering College at Poona to request the assistance of senior students in undertaking small irrigation projects. When the college authorities finally agreed, he submitted plans of the projects worth Rupees five lakhs to the government. Under his direction, the projects were implemented. Salunke also selected ten young labourers then involved in stone breaking works and strained them for project implementation. Within three months, he had proposed projects worth Rupees thirty lakhs which were immediately taken up for implementation. Along with his irrigation schemes, Salunke also undertook the task of completing the construction of a percolation tank at Naigaon with assistance from the "food for work" programme of the Churches Auxiliary for Social Action (CASA). In the latter project, 500 tons of wheat and 60 tons of edible oil were distributed among 500 workers involved in the programme as part of their wages.

Against the backdrop of the existing framework of local government planning and project implementation, with its own sets

of rules, regulations, and various other constraints, Salunke's works underscored the role of voluntary organizations, their capacity to conceive and implement innovative schemes and contributes significantly to the development of rural villages.

Salunke was later offered the Chairmanship of the Western Maharashtra Development Corporation by the Government of Maharashtra. The Corporation was to work for the integrated development of the region. Accepting the post with enthusiasm, he hoped to be able to explore potentials for development and accordingly prepare and implement plans to facilitate the development process in the region. However, he soon realized the limitations for effective work within the bureaucracy and was convinced that the process of development can not be initiated from the top but from below, with adequate support at the village level. He noted that the bulk of the government's resources were allocated mainly for urban-based projects and industrial development. Not only were the rural areas accorded inadequate attention; further, the distributive aspect of development, however limited, in these areas was not sufficiently considered.

Salunke left the Corporation with a commitment to continue his works in the village and mobilize the people for well-planned schemes geared to improve the rural condition. An opportunity came handly when a retired engineer, also Salunke's distant relative and therefore familiar with his ideals and activities, invited him to Naigaon (see Appendix). The villagers offered him 40 acres of land on which he could build a small house and conduct his experiments in dry farming. It was "devasthan land",

i.e., a land owned by the village community, income from which was to be used to maintain the village temple. It was a practice to lease out this land at a minimal rent of Rupees 400 per annum. As it had no source of irrigation the lessee then used it for cattle grazing. By way of rent, Salunke offered Rupees 1,200 for which the villagers readily agreed. In 1974, he got the land on lease for 50 years. It was to be Salunke's training ground. His objective was to demonstrate the possibility of converting it into a productive and profitable farm. A good deal of experimentation enabled him to work out an ideal farm budget within the affordability limits of ordinary farmers. Salunke's activities at this farm were to pave the way for the development of the Pani Panchayat.

PRINCIPLES

After the experimentation phase of first five years the small groups of beneficiaries started coming together by 1878. They were given the following guidelines of equitable sharing of water by the GGP.

1) The available water would be allotted to beneficiary members at the rate of half and acre of irrigation (20R) on a per capita basis with a maximum of 2.1/2 acres of irrigation (1 ha) in a family.

2) All the members would have to contribute 20% of the capital cost in cash initially. It was expected that 50% of the cost would be available as subsidy from Government and the balance amount of 30% would be provided by the GGP as an

interest free loan to be returned in five equal installments.

3) Due to the severe scarcity of water the heavy water duty crops like sugarcane, plantation, turmeric would not be eligible for irrigation.

4) The access to water would be based on the number of persons in the family and not in relation to the rights in land.

5) The beneficiary members have no right to sell the water rights. If the land of the beneficiary is sold there would not be an automatic transfer of right to water.

6) Landless persons would also get the access to water on the basis of which he could enter into an informal lease in arrangement for the exchange of land with somebody who has more land.

We may note that by April 1981 the facility of subsidy from Government was not available from Government plan schemes and later on the GGP had to revise the original formula of sharing costs. Thus it became necessary for the beneficiaries to contribute 30% of the capital cost out of which 20% had to be provided in case and the remaining 10% could be contributed by the members by way of voluntary labour (Shramadan). The balance amount of 70% was contributed by GGP as an interest free loan in such a situation to be paid back in three years.

# A NOTE ON BAIF'S APPROACH AND ACHIEVEMENTS

## 1.0 BACKGROUND

### 1.1 Socio Economic Context :

Nearly 75% of the Indian population lives in villages. The major portion of this rural population constitutes the disadvantaged segment of the society which is incapable of meeting even the basic minimum needs of living. The rural population has access to vast natural resources in the form of cattle, land, plant and water. Unfortunately, the quality of these resources has deteriorated quite considerably. The deterioration in the quality of resources, unremunerative production-marketing system and declining marketss for traditionally produced goods have led to lower rural incomes as the rural population which depends on them for survival does not get rewarded adequately.

These lower incomes coupled with other factors (probably consequential) like illiteracy and lack of facilities like health, sanitation, education, drinking water, housing, communications etc have adversely affected with the standard and quality of living of the rural poor. It is evident that the standard of living of these people needs to be improved quite substantially to ensure national economic growth with social justice and minimization of disparity.

The rural population, though steeped in poverty, has tremendous grit and will to survive aned is willing to learn and work. However, the deteriorated quality of natural resources available in the rural areas results in a very low level of productivity. It is difficult for the rural poor to sustain on these resources and they eke out a living at the bare subsistence level. This makes them more and more vulnerable to exploitation by the well-to-do sections of the society.

This situation can be effectively remedied by making available opportunities for gainful self-employment in the vicinity of the hamlets where these rural poor live. The generation of such gainful self-employment opportunities is possible only if the resources of land, plant, livestock, water etc are upgraded by

injecting modern science and technology, so that they can sustain the population in the area.

Moreover, mere availability of resources does not lead to their optimum utilisation to provide gainful self-employment. It is, therefore, necessary to take up human resource development through training and orientation for a proper transfer of knowledge, skills and techniques. This can help the rural poor to utilise with confidence the augmented and upgraded available resources optimally.

## 1.2 BAIF Genesis and Philosophy :

Mahatma Gandhi, Father of the Indian Nation and a great socio-economic and political sage, had full comprehension of the political economy of the country through the fact that the Indian village population is the foundation of Indian democracy. He always implored that India will be strong and stable, only if the villagers are strong and stable. Naturally, village development was the cause which remained ever so dear to his heart and it is of significance that one of his experiments in the emancipation of the Indian villages got off to a start at Urulikanchan in 1946, under the dynamic leadership of Shri. Manibhai Desai. Over two decades, considerable development work was undertaken in and around Urulikanchan in diverse areas such as Land Development, Agriculture, Water Resource Development, Cattle Development, Organisation of Co-operatives, Human Health and Human Development. The experience gained from the Urulikanchan experiment led to the concept of the Bharatiya Agro Industries Foundation (BAIF), a no-profit development research foundation, with the goal of undertaking a nation-wide development programme backed by appropriate technologies.

BAIF established in 1967, is now involved in a very big way in the field of research development and training in five states of India. Thus was born a voluntary organisation with faith in Man as the sheet anchor of its basic philosophy. The rural poor constitute the focal point for BAIF's activities and relevant advanced technology - the means.

BAIF is committed to provide instruments of gainful self-employment to the deprived strata of the rural population through intervention of relevant scientific and technological advances. This objective is being achieved through selection, optimal use and adaptation of the appropriate technology to local needs, extension (delivery) to operational area(s), innovative management practices and a blend of Social Leadership with Technical and Managerial Expertise.

## 1.3 Salient Features of BAIF's Approach :

BAIF has evolved a unique approach to rural development. The salient features of BAIF's programmes are summarised as :

1. Formulation of need-based and tailor-made programmes with people's participation.

2. Family oriented programme delivery.

3. Programmes based on upgrading local resources and skills through injection of science and technology.

4. Decentralised working pattern with requisite flexible approach.

5. Accountability and result-oriented time-bound implementation.

At the outset, while initiating its programme, BAIF went in for the Cattle Development activity which is broad based and has a tremendous potential for jump in productivity through appropriate technological inputs. The programme was initially launched in selected locales where the rural population was found responsive to newer ideas and where the available infra-structures facilitated introduction of the new concept. When the concept was demonstrated and accepted in key locations, the programme caught on even in backward and remote areas. The programme is in operation in diverse socio-economic areas of the states of Uttar Pradesh, Rajasthan, Gujarat, Maharashtra and Karnataka and has since been accepted by the families belonging

to different strata of the rural society, inclusive of landless labourers. BAIF's delivery system is, thus, available to all who are keen to participate in the programme but is objectively directed to the disadvantaged sections.

BAIF's programmes do not work on patterned ideas but have a built-in flexibility. This helps to deliver various activities and technologies to match the needs and priorities of the rural families, utilising the resources available with them. While in some areas the development work was initiated with the Dairy Cattle Production activity, in others it got off to start with Water Resource Development or Horticulture or Afforestation.

## 1.4 Operating Mechanics of Delivery System :

Over a period of about two decades, BAIF has developed a unique delivery system capable of bringing the latest advances in relevant technology to the doorsteps of the rural families. Moreover, the operating mechanisms of this delivery system makes possible a need-based and participatory working pattern.

A Field Development Research Centre forms the grassroot unit of BAIF's delivery system. Each such Centre is manned by a technical functionary trained in various activities and appropriately oriented to BAIF approach. The Centre has an operating area of about 7.5 km radius, covering about 2000 families in 12-15 villages. The Centre-in-charge is mobile on wheels within this area and delivers the programme component at the doorstep of the family. He functions as change-agent in his area of operation. The first task before him is to find the 'entry point' for taking up development work. He establishes and maintains a close contact with the families from the very beginning, so that a need-based and tailor-made mix of programme-components can be taken along to each family.

The Centre-in-charge receives a strong programme

support from the Area Officer, who co-ordinates the working of five centres.

BAIF's Development Research Stations located at various campuses provide referral services to the Centre-in-charge whenever he faces some intricate operational problems. The schema of the operational mechanics of the delivery system is illustrated on the following page.

## 1.5 Research & Field Programme - Their Linkages :

BAIF's research programmes are carried out at a number of development research stations located at BAIF's campuses in different states of India. The research stations receive a strong support from BAIF's premier institutes - BAIF Research Institute of Cattle and Agricultural Development (BRICAD), Urulikanchan and BAIF Research Institute of Animal Health (BRIAH), Wagholi.

The research areas are chosen in response to the field needs and the findings and developed technologies are in turn applied in the field. This linkage is evident from among the few achievements as follows :

- Problems of lower reproductive performance among cattle prompted research studies in trace mineral status of land, forage and animals. This led to identification of mineral deficiencies and formulation and production of mineral mixtures suitable to specific geographical areas.

- For the first time a field milk-recording system was instituted which formed the basis for evaluating the performance of the cross-bred cows, produced at the farmers' door and the genetic potentials of BAIF's home-born bulls. This led to adopt sound cattle breeding policies through the field programmes.

Inadequate availability of conventional feed/fodder and the resulting scarcities called for a research programme for studies on hardy drought-resistant fodder species, and treatment of agricultural wastes to produce economic feeds.

The package of practices for various unconventional fodder varieties and the technology for processing of agricultural waste(s) have now been transferred to the field.

Degraded wastelands can be used through selection of suitable varieties of plants. Research in this direction led to a identification of Subabul as a suitable multipurpose plant, which can also improve fertility and soil structure This plant has now been widely disseminated in the field.

Conventional biogas technology is constrained by high capital costs and large dung requirements. This prompted research to improve the volumetric efficiency of the digestors and use of alternate feed stock. The results are now on way for application in the field.

The higher productive cross-bred animals require proper health cover and protection. It was, therefore, necessary to understand the disease prevalence pattern and develop suitable vaccines. This led to devising a suitable Disease Control Programme involving work on various animal vaccines. The vaccines have now already been made available to the field areas.

The availability of biofertilizers for leguminous crops was severely constrained by hackneyed production technology. This necessiated development of large scale production-concentration-delivery technology. Freeze-dried biofertilizers are now made available in all parts of the country.

All research findings and technologies developed at BAIF's Development Research Stations are standardised and packaged for field application through an intimate interaction with the field centres. These centres and their operational area, inclusive of all the participating families, thus, form BAIF's Social Laboratory. Feedback on research findings and new technologies flows from the social laboratory to the research stations to make possible the necessary refinement in the technologies. The scheme of the linkage between development research and field programme is illustrated on the following page.

## 2.0 PRESENT STATUS

### 2.1 Field Programmes :

BAIF's Rural Development Programme commenced in the year 1969 with the establishment of cattle breeding centres for upgrading of the indigenous low-producing and late-maturing non-descript Zebu cows, owned by farmers, with frozen semen of high producing and early-maturing exotic breed sires.

BAIF, thus, enjoys the distinction of being the pioneer in applying the frozen semen technology for the improvement of livestock resource in rural India.

BAIF cattle breeding centre covers approximately 1000 households owning 2000 breedable local cows distributed in a group of villages within the radius of 10-15 kms. A very important and practical feature of this activity is that the farmer's cows are inseminated at their door-step and intensive door to door programme-promotional activity is undertaken.

Equally important feature of the BAIF service is that the farmer is given timely guidance as to the care of the pregnant cow, new born cross-bred calves and management of highly productive cattle. Cross-breed cow born out of BAIF programme commences milk

production at around 30 months of age and yields approximately 2500 litres of milk per lactation. The males are found to be good draft bullocks for haulage.

The programme manned by hand-picked trained field functionaries has been made to reach out to more than three lakhs rural families. More than 100000 cows are bred each year with about 40000 cross breds being born. This programme, over the years having proved its economic worthiness, is naturally poised for expansion and needs to be injected with a complement of recent advances in reproduction bio-technology.

To augment the supply of fodder for the improved cows, a methodology of utilising uncultivated wastelands, water conservarion and runoff water harvest has been evolved by adopting a non-traditional approach. It hs been demonstrated to the farmers. BAIF has identified fast growing, drought tolerant species of trees and grasses to meet the needs of fodder, fuel and timber within the villages.

In order to take the benefits of animal health cover to the doorstep of the farmers, a well-knit field programme of Animal Disease Surveillance and Control has been launched in western Maharashtra. This programme needs to be expanded by taking it to other operational areas.

The problem of persisting rural poverty, attributable to lack of gainful self-employment and degraded resource base, ismuch more acute among tribals who have continued to constitute an oppressed and deprived society. Accordingly, BAIF gave a reconstruction approach for the socio-economic development of tribals in Vansda in Valsad district of South Gujarat. This programme encompasses more than 1500 families in about 15 tribal villages and is well-knit with wastelands development programme, where each family has in its care one hectare plot on a usufruct basis. The programme lays accent on integral action-oriented approach, embodying livelihood components like agriculture, horticulture and forestry, together with human health package, inclusive of potable drinking water.

## 2.2 Development Research :

Benefit to the common man is the touchstone of all relevant Science and Technology. Appreciating the importance of developing relevant and appropriate technology and injecting it at the grassroot level, BAIF has taken up a programme for scientific and technological research in relevant areas to develop instruments of gainful self-employment for rural poor. The results of this research become available for application to the field through BAIF's strong network for technology transfer. The feedback from the field reaches to BAIF's Research Scientists for further research. This strong linkage with the field areas makes BAIF a unique Research Foudantion.

The BAIF Research Institute for Cattle and Agricultural Development (BRICAD) at Urulikanchan constitutes an excellent infrastructure to produce, process and deliver necessary inputs. These comprise standardised, packaged and deep frozen semen coming from disease free exotic/cross-bred bull of different blood levels, and non-conventional cattle feeds being developed through animal-plant research on delinking animal from land - yet another breakthrough achieved by BAIF. The research programme at BRICAD is planned with an eye on harnessing the latest technology by using agro-byproducts and agro-industrial wastes as well as exploring the agro-service role of the microbes in the development of wholesome economic feeds.

A farm extending over 200 hectares supported by sattelite farm lands provide research and development base for fodder and forage plants, capable of yielding optimum results from arid lands suffering from water inadequacies and agro-climatic adversities. The widely accepted and extensively propagated plant - Hawaiian Giant - the Subabul-bespeaks BAIF's untiring efforts. Research on other trees/plants, which can take to soils with limited fertility is being actively pursued. To come upto yet another challenge of barren and denuded forest lands; degraded idle and unproductive looking wastelands, BAIF has gone in for effective land-use programmes. Technologies embodying agro-forestry, energy plantation, fodder production and soil conservation have been demonstrated through sturdy

drought-resistant species of trees. Some of the notable achievements of BRICAD, Urulikanchan are :

- Performance recording of various genetic groups of cross-bred cattle under different agro-climatic regions and thereby adoption of sound breeding policies.

- Ranking of the exotic breed and cross-bred bulls on the basis of progeny performance and wider use of merited proven sires.

- Demonstration of suitability of different types of cross-bred bullocks for farm work as well for haulage.

- Feasibility of oestrus synchronisation technique to cover larger number of cows for cross-breeding in rural areas.

- Evaluation of agricultural by-products and wastes like Warai bran, Kokum cake, Sugarcane bagasse, Ambadi cake and Hybrid jowar straw and recommending regular incorporation in cattle feed.

- Standardisation of steam processing method for improving quality of agricultural by-products (residues).

- Evolving package of practices for optimum production of Subabul fodder, fuel and timber.

- Investigation of trace mineral status of soil, plant and animal thus leading to recommendation for supplementing iron and copper in the ration of milch animals.

All along BAIF has paid an equal attention to the vital

role of Water Resources Development and Management alongwith Wastelands Development. Thus, a tired and tested watershed planning technique of comprehensive water harvesting, management and distribution has been in operation in several villages to uplift rural economy. For recycling energy, BAIF has installed at BRICAD one of the largest Biogas Complexes in the country. A research programme in biogas technology has also been initiated.

BAIF's dairy cattle production programmes receive an effective health cover parcelled out from BAIF's Research Institute for Animal Health (BRIAH) a leading and ultra modern bio-engineering complex at Wagholi. This unit has been actively engaged in research and development of large scale production technologies of a wide range of Veterinary Vaccines and Pharmaceuticals through the diligent multi-disciplinary expertise provided by the Veterinarians, Microbiologists, Biochemists, Pharmacists and Chemists.

Besides development of newer generation vaccines using 'seed-lot' concept and other need-based biologicals, some of the notable achievements of the Wagholi unit include :

- Indigenization of costlier inputs comprising vaccine potentiating agents like Aluminium Hydroxide gel and purified fraction of saponin, as import substitutes.

- Development of shake culture (fermentor) technology for 3- dimensional growth of micro-organisms.

- Development of vaccine concentration and freeze-drying technology for efficient preservation and long duration storage of vaccines and other biologicals.

- Development of stabilised diluents for reconstitution of freeze-dried vaccines.

- Development of standardised biofertilizers, namely Rhizobia for different legumes deploying fermentor concentration and freeze-drying technologies and sterilised packaging for distribution.

- Standardisation of delivery systems for biological products through innovative cold chains for assured quality upto the user's end.

- With the readily available self-sufficiency of the health products, their use extended to the farmers through motivation and parcelling of health practices embodying a calender of operations.

- Extension of the theme of the expanded animal health field operations through the organisation of Animal Disease Surveillance and Control Programme.

BAIF's team is now engaged in efforts of getting nearer to the field of applied bio-technology, embodying molecular biology and genetic engineering, as related to agriculture and animal health.

## 2.3 NEWER AREAS :

### 2.3.1 Information Resource Centre :

A lot of valuable information/data has been generated within BAIF from research and field operations. In order to organise this information, to facilitate easy retrieval and provide access to latest research /bibliographic information, an Information Resource Centre has been set up within BAIF. The Centre operates through three specialised cells.

Library & Information Services Cell
Computer Cell
Communications and Training Cell.

With dissemination of information as the main objective, these cells also contribute towards the generation and application of valuable data inputs.

## Library & Information Services :

A well equipeed library has been established to generate and provide information on various diverse subject areas such as appropriate technology, community health, irrigation and water management, agroforestry, post harvest technology, renewable energy, wastelands development, veterinary sciences, etc. The following services are being developed.

a. Computer assisted literature searches.
b. Retrospectives searches.
c. Reprographic services including Microfiche paper copies.
d. Information Update : A monthly indexing Bulletin.

## Computer Cell :

The Computer Applications Section has been set mainly to offer software and systems development support to the computer users of different departments and research scientists. The cell assists in system design for various applications ranging from accounts and administration to field research data analysis.

## Communications & Training :

The Communication wing of the Centre has undertaken the production of audio-visuals and training materials useful in promoting appropriate technologies in the rural areas. It also assists the Publicaton Division, who has inhouse facility of Desk Top Publishing.

## 2.3.2 SERICULTURE :

Recent developments in sericulture have shown that it can be considered as one of the top most promising rural industry, particularly with the view of rehabilitation of small farmers, tribals and landless. Sericulture, being a labour-intensive activity, possesses tremendous employment potenital. It also has a very short gestation period and needs limited initial investment. BAIF has therefore planned to take up intensive effort for promotion of sericulture. Work has been initiated in Maharashtra and Gujarat area. Under the programme various applied research studies have also been initiated.

The sericulture promotion activity is being taken up in coordination with Central Silk Board which has launched a massive programme throughout the country.

## 2.3.3 Community Health :

Health is an important component of quality of life. Recognising this as a vital point BAIF has designed its community health activities around core programmes for income generation. The main objective is prevention - of morbidity and mortality through health education, immunisation, improved sanitation, routine ante-natal and under-five check-ups, and growth monitoring of infants. Maternal and Child health care is a priority area.

BAIF has a very strong team of health professionals having long experience in medicine and operating community health programmes. Alongwith the health services various research studies in community health topics are undertaken.

Annexure 1

BAIF INSTITUTE FOR DEVELOPMENT RESEARCH

Main Development Research Areas

A) Agriculture and Forestry :

1. Agro-forestry and Dryland farming
2. Plant Tissue Culture
3. Mushroom / Spawm Cultivation
4. Rhizobium
5. Mycorrhizae
6. Horticulture
7. Forage crop production and evaluation
8. Sericulture
9. Rural processing
10 Silvipasture
11 Cropping systems
12 Plant germ-plasm collection
13 Seed technology
14 Apiculture
15 Vermiculture
16 Post harvest technology

B) Land & Water Resource Development :

1 Water harvest technology

2 Saline soil reclamation

3 Plasticulture

C) Livestock Production :

1 Dairy cattle and buffalo production

2 Semenology

3 Embryo transfer

4 Goat development

5 Rabbit breeding

6 Nutritional evaluation of by-products

7 Crop residue treatment

8 Forage conservation

9 Immunogenetics & Karyotyping

10 Aquaculture

D) Animal Health :

1 New veterinary vaccines

2 New pharmaceutical products

3 Immuno-diagnostic techniques

4 Animal disease surveillance

5 Hormone products

E) Non-Conventional Energy Sources :

1 Biogas technology

2 Biogas microbiology

3 Biomass handling

4 Biomass energy conversion

5 Solar energy technologies

6 Wind mill

F) Human Health & Hygiene :

1 Drinking water technologies

2 Ambulatory health service

3 Community health education

4 Community sanitation models

G) Social and Behavioural Sciences :

1 Baseline and impact studies

2 Technology delivery strategies

3 Development and behavioural changes

## IDEOLOGICAL BASIS OF SCIENCE MOVEMENT IN INDIA

It is rather unfortunate that a discussion of ideology has been caught up between a Marxist frame of reference or presentatism or historism. It would be very pertinent to mention that a formal study of science or inquiries in science were a part and parcel of moral philosophy. However, later on there developed almost a kind of dis-junction between science and moral philosophy, because science came to be emphasized as an essentially value free objective and rationality base endeavour. Such dis-junction became more or less prominent with the advancement of technology based on the application of scientific research. The positivist tradition spelt harnessing of science or manipulating not only nature but also social reality.

According to the Maxist prescription ideology was regarded as an outcome of power relations and of course, ideology was dominated by the dominant and ruling groups. While there was also a kind false consciousness among those who were so dominated in terms of accepting the ideology of the dominant class. Then again ideology has been regarded essentially as a consequence of social, economic and political circumstances. Naturally there can not be a single set of ideology but ideologies would differ from group to group. Even then there is a determinist streak about such formulation. On the other hand human history is replete with several instances of ideology transcending class and group interest. To illustrate the point one can sight the example of values of equality social justice, freedom liberty

etc. These values were not necessarily espoused by the underdogs but generally propounded and propagated by those who did not stand to suffer from the existing order.

Ideology is broadly defined as a system of beliefs - rational as well as moral. If on the other hand science is equated only with the rational and takes a rather specific approach to reality then it will have no scope for any kind of ideology which has social or moral moorings. In terms of the present developments in science not only the system of knowledge but even the whole world seems to be divided between those who are governed by science and those outside the pale of science. In his famous or rather controversial book, C.P. Snow propounded the thesis of two cultures. According to him the world was divided between those who subscribed to a scientific culture and others who did not do so, for want of their capability to do so. An inevitable outcome of such an attitude is obviously elevating science to the highest form of knowledge, not only that but regarding any other kind of knowledge as inferior. Naturally, what was meant was the ensuing domination of science over the rest of life and society. It was argued that life and world had to accept the supremacy of science and as such had to accommodate itself to the demand of science. That is how world was divided between those who were conversant and well versed with science (latest advances in science) and others who were neither conversant nor could keep pace with the latest developments in science. Further, such scientific knowledge came to be reserved and guarded in such a manner as to insulate it from others. This

is one of the reasons why there is a monopoly of knowledge (scientific) and being deprived of such knowledge by large sections of humanity inevitably this has helped to divide the world between the haves and have not - the north and the south. This also means that the twin responsibilities of science is a concept which has not only been forgotten but also discarded. Science and scientist should certainly aware that whatever knowledge they have been able to acquire is because of the numerous facilities provided by society and as such they are not responsible only to a small coterie of scientist but also to society in general, and particularly to those who have not had the benefits and privilege of acquiring scientific knowledge. Scientific revolution manifests grave imbalance, which is critisised from time to time. The obvious example is being that of automic and nuclear devices not to say biological and chemical devices to be used or rather threatened to be used against those who would not accept the domination of nations who possess such scientific knowledge. According to such a view science is linear development and any group or society which has not been able to keep pace with such development has to be treated as subordinate. In short, science is divisive rather than uniting.

## THE LOGIC OR RATHER PHILOSOPHY OF SCIENCE MOVEMENT IN INDIA

Even in the advanced West the primacy of science came to be suspected and questioned during periods of economic depression in particular and also the rise of Nazi power in Germany which had adroitly utilize the conclusions of science for holding the entire world to ransom. Leave aside the whole world, a

particular ethnic group - jews were sought to be exterminated on the basis of the socalled scientific evidence. Then again the atomic bomb and the proliferation of nuclear knowledge and power also meant subordination of a large majority of people to a minority with such knowledge and capability. No wonder that in India a group of scientist got together and seriously pondered over the place of science in human society and Indian society in particular where even literacy was beyond the reach of the common man. Science - scientific knowledge and men of science were well beyond the reach of the common man, not to say problems of common man because science was supposed to be locked up in to scientific laboratories and institutions of higher learning. Thus there was a breach between science - scientist and society. Being impressed by the cannons of science, in a rather mechanical and imitative manner, scientist came to feel that they had hardly anything in common with the rest of the people who could not share the same wave length. To add to the confusion certain concepts like rationality and secularism also created a hiatus between the minority (scientific) and majority.

That is why a group of scientists got together to question this state of affairs and to redefine science or rather question the definition of science so as to take it out of the laboratory and high portals of learning. The common mis-conception that the common man had neither any notion of science nor any use for science came to be seriously suspected. It was felt that science and scientific language in particular are being too much mystified and therefore, there was an urgent need to de-mystify

such science and scientific language. The use of English for imparting science to students made matter worse and therefore presenting science through the mother tongue was given top priority. Science had to be people's science rather than being a privilege and monopoly of only the scientific community. It is from this stand point that a group of scientist tries to furnish scientific knowledge in mother tongue, not only that but in a rather simplified manner so as not to drive away any one desirous of learning science. Moreover science had to be explained in terms of day to day life circumstances and actual problems encountered by the people. Thus instead of science being purely academic and intellectual, science was demonstrated in term of day-to-day needs and problems. That is why entire human and physical environment occupies an important place in the scheme of things. Instead of scientific temper and culture people were made to perceive relationship between cause and event. Science had to be taken to the people in order that they not only acquire scientific knowledge but even more so to feel secured and confident in dealing with "the men of science". This necessarily meant an automatic lessening of even doing away the distance between the common man and the man of learning. In India, men of learning generally are confined to certain grouping and strata, which further stabilizes distinctions. If on the other hand such a distance is reduced it would necessarily mean reduction of social, cultural cleavage. Therefore, this particular group which later on came to develop Kerala Sastra Sahitya Parishat was motivated by a moral ideology to reduce distances between

different groups, if not to annihilate them. In this endeavour this group initiated a people' science movement which had important social and political ramifications.

While the objectives or the goal of the KKSP are very broad and all embracing, the aim and goal as pursued by the Homi Bhabha Science Education Centre is rather specific in the sense that their experiment is confined to help the dis-privileged and deprived section of students to perform better academically so that they would acquire self confidence and self respect. Even then this experiment is fired by the ideology of equity, social justice, human dignity etc. The avenue utilized for actualising these values has been education. Of course, everyone who participated in this experiment had to be morally and intellectually convince about the significance of following such a course of action. In short it meant a total involvement and therefore, though the objectives seems limited and specific there is no doubt that it is motivated by a wider system of values which strives to fight against arbitrary differences and distances. In this experiment too, science was re-written for the benefits of the students so as to remove the fears of students regarding the contents of science, not to say its purpose.

Maharashtra Association for Cultivation of Science undertook programme of village improvement at the instance of some eminent scientist, who had very rightly identified the root cause of India's problems being located in villages. Moreover, it was felt that unless and until health a nutrition of the people

were improved, productive capacity of the people would continue to remain impaired. That is why a programme of health education, sanitation, and hygiene was introduced specially through school children. There was a conviction that if children were properly exposed and trained to follow healthy habits it would be possible to improve their parents and also to convince the elders. Application of scientific knowledge and of course, social concern are the hall-marks of this experiment. Ideology thus, provides the inspiration and scientific knowledge facilitates implementation of the accepted goals. Here also enlisting of support from various people and agencies has meant a kind of moral persuasion.

The experiment of Pani Panchayat is even more radical and broad in its perspectives and ideology. The proponent of this experiment hit the proverbial nail when he astutely analysed the crucial problem of villagers and particularly smaller farmers as being the non-availability of water for cultivation of fields and for that matter even for drinking. Water as a resource was properly identified as occupying extreme importance in the scheme of village farming society, polity and stratification. That is why frontal attack was made on making water available to everyone, ir-respective of his land holding and position in the village. Making water available for cultivation - that is for earning a livelihood meant enabling everyone to acquire and enjoy a measure of self respect and self confidence so that the traditional structure of authority and power would not be acceptable to the people. Further this experiment necessitated

a great degree of mutual understanding and help as well as co-operation amongst everyone so as to make a success of the experiment of not only storing water so as to make it available for the whole year and even more so to distribute it equitably. Water as the resource was very rightly tackled so as to attack the central problem. This meant not only rational analysis and scientific acumen but a great degree of organizational skills. Apart from the technical aspects of the skill what was even more important was a firm ideological moral conviction. The proponent of this experiment was very ably helped and supported by his wife.

Dr. Manibhai Desai, the founder of the Bharatiy Agro-Industrial Foundation was greatly influenced by Mahatma Gandhi in his acute analysis of India's poverty being entirely due to the poverty of rural masses due to unemployment and under-employment. Therefore, a programmes had to be devised to literally put money in the pockets of the people so that they could fit themselves well and naturally be more productive and useful to society. It is with this end in view that the programme was initially started by concentrating on animal husbandry so that people could earn income by selling milk. As an adjunct to animal husbandry, various other scientific projects were undertaken, which included watershed management, social forestry, poultry, seri-culture and so on. Apart from attending to the needs of the rural non tribal people the programme was extended to tribal belt, of course taking into account the peculiarity of the tribal situation. Instead of harnessing the same programme, a situation

specific programme was evolved, which certainly speaks very well of rational outlook. More over the management and organizational skill which has gone into the running of these various programmes display a special mix of Gandhian philosophy and modern management technique, based on monitary and economic calculus. In the development of this programme Dr. Manibhai Desai was able to secure willing co-operation of several experts. He was able to convey his moral concern to his colleagues and that is why in addition to their expertise a sense dedication characterises the entire programme. No wonder, that the participant in this programme have not only benefited but also feel both secured and convinced about the ideological stand point.

## SCIENCE MOVEMENT FOR SOCIAL TRANSFORMATION ?

Even though we have talked of science movement for social transformation, as observed earlier, there is a typology of various experiment undertaken with a view to utilise science in the best possible manner to make it a) user friendly b) useful for generating income c) for transcending certain socio-cultural barriers particularly with reference to science education and personality development in general. If we look at the various experiments, it becomes quite clear that the experiment range from abstract to concrete; from being all embracing to being very specific; from a general approach to experimental approach. If we take the various experiments subsumed under science movement it becomes clear that at the outset a marriage between natural science, social science and humanities is explicitly emphasised. Equally well there is a concerted effort to expand and rewrite

science so as to make it approachable to everyone. To go back to Kerala Sastra Parishat and its work, one is impressed by its quest for abstract and universal propositions although specificities of the situation is in no way lost sight of. That is why special precaution is taken to state emphatically that there is no such thing as a common blue print for a science movement which is intended for social transformation Yet, by appealing to turn their experiment into an all India movement, several groups from different parts of the country were invited to participate in discussion and share their experiences and problems as well as to compare notes. In fact, the idea was to involve as many groups as possible but without a structural imposition of any kind and therefore, every group was left free and independent to chart its own path. The KSSP was expected to provide information and guidance if anybody cared to seek it. That is also why even the KSSP does not have any kind of rigid organizational structure. Moreover as mentioned earlier KSSP is open to all and sundry who care to participate in their work in whatever manner they can do so. For example people working in Accountant General's office go to the KSSP Bhavan after finishing their work in office and help the work of the KSSP by attending to correspondence files, maintenance of accounts etc. All the same the preponderance of scientists can not be ignored. Of course, there is no hierarchy of any kind observed either in the office or in working outside. Besides the office of the President of KSSP is essentially rotating and any one can occupy that. The institute of languages considerably helps in rewriting of science material into Malayalam. Medical doctors,

surgeons, lawyers and anyone can become a member if he is convinced about the aims and goals of KSSP. The idea is to generate action by utilizing science. In order to do so concrete issues are taken up from time to time. Thus after Bhopal Gas Tragedy this provided a significant issue for KSSP to educate public opinion on this issue.

Compared with this, the work of Homi Bhabha Science Education Centre described above is very specific and is addressed to the problem of educating children from the deprived and dis-advantaged sections to learn, if not master the so called difficult disciplines like science and mathematics in particular. In addition, students are also equipped with the knowledge of English language so that they can have access to material written and published in English, in addition of course, to reducing the inferiority complex stemming from the lack of knowledge of English. Even though science education is the central input, a comprehensive understanding and appreciation of socio-cultural conditions which inhibit these students from scoring well in these difficult disciplines is introduced. There is a sustained effort made to a)first identify the problem and b) to rectify such problems. Unlike other experiment, this experiment is conducted in an urban setting or rather in a metropolitan citys i.e. Bombay, where, there are important socio-cultural and economic difference, as a result of which education can not be treated as a homogenous entity.

As regards, the experiment undertaken by Maharashtra Association for Cultivation of Science it is specifically

addressed to village improvement. Knowledge of science is utilised to bring about changes in the hygienic and sanitary practices of people as well as to improve the quality of their life.

On the other hand the experiment of Pani Panchayat, though looking innocuous has revolutionary potential because water which is the most important resource for rural people, particularly for earning their livelihood has been sought to be socially controlled, in a way by making water as a collective resource rather than a private resource. The village structure is brought under a change because as up now, there are very few who have a sustained access to water which enables them to acquire not only prosperity but to dominate over others. If as in this experiment water ceases to be a private resource not to say property, one of the most important instrument of both prosperity and domination can be arrested. That is why, this experiment has quite a novel idea and ideology to offer.

The Bharatiya Agro Industrial Foundation has now developed an all embracing character although initially it was confined to a small place in Pune district. Moreover, as is usually the case, the beginning was small because the programmes started initially by introducing improvement in animal husbandry so that cows by special breeding could yield high amount of milk. This meant assured income for the farmers or those who had kept cows earlier which were basically un-economical. BAIF has developed programmes which are all embracing and have a larger coverage than any of the programmes mentioned earlier. One of the most

important facets of the BAIF programme is that the programmes are both novel and un-competitive. That is how these programmes have been able to reach diverse groups including tribal women. In addition to taking care of changing the rural scene, BAIF activities have been spread to tribal belts with the result that tribals also are being brought into the so called mainstream. By creating purchasing power amongst the various groups the BAIF has been able to initiate the process of social change. Technically speaking BAIF may not conform to the orthodox definition of social movement in the sense that there is no agitation of any kind but only silent constructive productivities activities which has helped change the rural and the tribal scene. Thus the various programmes represent different kinds of approaches, although basically the philosophy underlying all these programmes is helping the poor, the deprived and the dis-advantaged.

## THE KERALA SASTRA PARISHAT

Quite in keeping with the basic ideology and philosophy of KSSP, hardly any mention is made of the names of stalwarts like Dr. Parmeshwaran, Dr. Madhavan and many others who really initiated the movement. Unlike other movements, this movement was essentially made to link science with people so that people themselves would demand inputs of science for the betterment of their life. It is with this end in view that the KSSP endeavoured very hard to banish the erst while distance between the sophisticated urban and the rural and of course between those who had the benefits of science and many others who did not have so. In making it a people's science movement, all the sections

were encouraged to participate according to their ability and interest right from children to old people. Moreover every effort was made to spread the message to every nook and corner. Science was demonstrated as a very essential part of the process of development. Here development was not taken in a narrow sense of the term, but extended to cover all aspects of life and living including arts and entertainment. Likewise, social scientist were called upon to contribute their mite by properly understanding, appreciating, analysing and propagating the basic social foundations of science and scientific endeavour. Rather the usual gulf between natural science and even more so natural scientist and social science and social scientist was attempted to be un-done. The role of social scientist in promoting revolution was emphasised and every attempt was made to enlist the cooperation of like minded social scientists. Many a publication from Kerala, whether from the centre of development studies or the KSSP itself bear testimony to this effort. As a matter of fact, there is sufficient evidence of a new blend of natural scientist and social scientist who have got together to attack the problem of poverty, deprivation from a holistic point of view. Thus economists joined hands with experts in the field of public health and so on. Proper cognisance was taken of the works of earlier scientists like C.V. Raman, Jagdishchandra Bos, etc. and also foreign scientists so that steps were taken to convey the message of science by organising fairs and festivals to commemorate the contribution of such eminent scientists. Right from the beginning special attention was paid to the study of relationship between nature, science and society. In order to

do so, science was freed from the academic portals and brought on the streets so that everyone could take interest in science and also feel involved in science movement. As a result of introspection, decision was taken to reach the villages or rather to make the villages the mainstay of the programme. There was hardly any facat of development such as irrigation, energy, education, health pollution control, ecology, environment etc. which were not tackled. Every attempt was made to instil scientific outlook amongst the people and it was pointed out that a proper utilization of science would promote social revolution. What was implied was that by making science a part of every person's life, he or she would not only acquire but demand increasing control over his or her situation in life. In short, the existing state of affairs with all its stratification and branding people into the elite and masses, and of course, the fashioning of a system of distribution so as to favour the elite entirely, at the expense of the majority of the masses would be unacceptable to the masses and therefore they would challenge it. With this end in view, privilege of education and health facility were thrown open to every one, which resulted in the creation of social consciousness and awakening amongst the people and of course, improvement in the quality of their life by making health facility available to every one. It is certainly very well known as to how both education and health facilities have reached everyone in the remotest corners of Kerala. To mention education, the entire system of education as it prevailed came under fire and the basic purpose of education namely development of personality of the individual to the fullest extent so that he

or she would become a very effective member of society. Rather the traditional, hiatus between the educated and non-educated was not acceptable. By removing this distance everybody would feel and enjoy a sense self respect and self fulfillment. Naturally the traditional distance would no longer be accepted by any one. Not only the content of education but even the methods of teaching has to undergo a change so that the un-warranted distance between the teacher and the learner would banish, benefiting both the teacher and the learner. This also has implications for the structure of authority by making health facility available to everyone and particularly taking health care out of the hospital to the homes of the people. The problem of non-availability of health care was attempted to be solved. There was a shift in the emphasis from a doctors to paramedical staff and thus medical education has to be re-oriented to take into account the prevailing conditions. Naturally, sanitation, hygiene and environment became major issues. Likewise the importance of developing the sources of energy not in a traditional way by building big dams but by constructing small reservoirs for both drinking, irrigation as well as for generation of electricity was emphasised. All in all, every effort was made to emphasis the potentialities or rather the actualities of the abuse misuse and monopolisation of certain vital facilities by a tiny minority. it was stated and propagated rather emphatically that unless and until science, in the proper sense of the term, was brought in, the existing the state of affairs would continue, which would adversely affect the majority of the people or rather the people. Science was fused

with arts of the people. The Shastra Kala Jatha unmasked the perpetrators of evil who have enjoyed the monopoly of education, science, health and all the good things of life so far. On the other hand the Jatha pointed out the extreme anomaly of this situation and invoked people to rise against the inherent social injustice in such arrangements. With this end in view several skits were prepared and presented regarding the rotten system of education un-just system of health care, the traditional exploitation of the female by the male, the employee by the employer, borrower by the money lender etc. There was hardly any aspect of life or rather the ills of life which were not taken up for such presentation. Personally I was privileged to have seen if not participated in the preparation of various skits for the Jatha. At that time the Bhopal gas tragedy has occupied people's mind and naturally a great deal of importance was attached to educate public opinion on this evil and also to prepare people to fight against any possible recurrence of such evil. No wonder that there was a frontal attack on the archaic tradition with all its injustices. Being basically an educative and propagating movement the KSSP was able to encourage the formation of science groups for social action in various states like Andhra, Karanataka, West Bengol etc. This is borne out by the participation of various groups. Thus the role of PSM - a view from Lok Vignyan Sanghatana, Maharashtra : People Science Movement a West Bengol' perspective, Medico Friend Circle : Patriotic and people oriented science and technology groups, People's Science Movement in Andhra Pradesh, People Planning and Science in School - a report from a Vidushak Karkhana Manan Nava

Chinta Andolan and Bharatiya Samyavadi Sangh, West Bengol, Audyogic Jeevan Manch testified to the success of the KSSP in launching and spreading the People' Science Movement to various state of the country. Even here I would like to strike a personal note by mentioning that during my stay in Trivendrum in order to discuss with and learn from the KSSP group, I found that various groups from different parts of the country wanted to be associated with the People' Science Movement by evolving their own programme so as to suit their own problems and situations.

Both the association and involvement of various groups engaged in harnessing science for social action are reflected in the kinds of papers presented at the convention of the KSSP held in 1978. Practicing politics and science by Norman Diamond: Environment and Development in India by K.P. Kannan and Ashok Mody: Environment and Development KSSP's approach by M.K. Prasad: Reform of the General Education System a tentative proposal by M.P. Parameswaran: Towards a People's Health Movement by B. Ekbal (1983). Even some of the papers submitted at the convention in 1978 bring out the importance of the various issues taken up by various regional organizations and movements. Thus there is a paper called Reflection on Science for Social Revolution, Mahmed Anisur Rehman, A Bhumisena Movement in Maharashtra, Gram Vikas Mandal, Belgum, Scientific Workers Forum, West Bengol, Shramik Sanghatana, Dhulia, Maharashtra, Society of Young Scientists, New Delhi, Vignyan Shiksha Kendra, U.P. and Science Education Group, Bombay. From this listing it is clear that the KSSP was able to attract the attention of various science organizations addressed

to social action. Right from the beginning, the KSSP has been playing a motivating, stimulating and catalytic role in the furtherance of science movement for social action and yet, there is no such a thing as a blue print or a brief, which is quite in keeping with the basic philosophy of KSSP. It is true that the KSSP did not very much emphasis delivery of services. However, by conscientising people on practically all the important issues which matter to the common man, the KSSP has been able to convert, if one may use the expression to the importance of science and science movement for resolving people's basic problems. It is in this sense that the KSSP and its work has a revolutionary potential. It must be mentioned that the work of KSSP has been able to influence government policy and action programmes particularly in respect of making food available to everyone even in the worst famine years, spreading education to every corner, and providing meals in schools for poor and indigent students. There is no doubt that the general socio-cultural and political atmosphere in Kerala strengthened the hands of the KSSP. However, as already pointed out the KSSP has toed an independent line, when it came to opposing the Marxist led government about the Silent Valley Project or problem of pollution caused by certain industries. (This material is obtained from Science as Social Activism, by KSSP, 1984.)

## HOMI BHABHA EDUCATION CENTRE, BOMBAY

A group of scientists from the Tata Institute of Fundamental Research felt it important to both inquire into the factors affecting the performance of the students coming from poorer

section and even more so from socio-culturally deprived and disadvantage section but also to devise an experiment so as to remedy the problems faced by such students. In doing so they have been able to enlist the co-operation of education officer, Bombay Municipal Corporation, the Research Officer, Headmasters and teachers of the schools involved for their full and unreserved co-operation. Most of the colleagues involved in the project were motivated to put in extra hours of work on Saturday afternoons for the project. For this project investigation was confined to Dalit students who also lived in slums and whose parents did not have much of an educational background, so that the home environment was certainly not congenial for the pursuit of education by the wards of such parents and guardians. It has been pointed out time and again that the cultural aspect of education is extremely important, particularly for imbibing higher education or rather difficult disciplines like science. mathematics and in the Indian context now, not only acquaintance but a certain degree of proficiency in English language. It must be stated here that the absence of the infrastructure of facilities at home for study, analytical work not only affects scholastic performance, but also affects personality development. Such students feel different and suffer from inferiority complex, which results in alienation from society. Particularly in a city like Bombay, largely due to observing students from higher socio-economic strata and also due to the influence of media there is no doubt an ever increasing interest, inclination and even efforts (however unsuccessful they may be to imitate the so called high class students and their life style) . Therefore,

the proponents of this project - experiment felt seriously concerned about these factors and also were convinced that unless remedial measures were taken to bring about equality of educational opportunity, any talk of universalization was bound to fail. Therefore, in the very research design of the study these factors have been properly built in. This experiment is built on the assumption that talent is distributed in society in every section and that low scholastic performance of the deprived group is assumed to be due to deprivation. The project - experiment is concerned with a)to identify the hurdles b) to design specific remedial measures c)to evaluate effectiveness of the remedial measures and d) to seek meaningfull co-relations between performance and nature of deprivation and hurdles. From the point of view of methodology it was felt that such a study had to be necessarily confined to a small sample in order to carefully observe the group of students so as to devise remedial measures and also to evaluate their impact, not only in quantitative terms but also in qualitative terms. In order to conduct this study initially search was made for talent amongst students because the basic purpose was to identify the hurdles affecting the preference of even talented students in reaching higher educational standard. Of course, apart from the experimental groups of students a control group of students was also chosen. The difference in performance of a SC, ST and EBC indicates that social deprivation is an important parameter affecting motivation, cognitive development and school performance and therefore remedial measures are needed to tackle these variables. The entry characteristics of students also in

no small way affect the performance of students and this factor is generally ignored particularly in applying performance test later on. Scholastic attitude, creativity etc. are certainly impaired by the home background. Education and school performance has to be understood in the total context because attitudes, habits, leisure time activities, guidance or otherwise from the parents and siblings play a very crucial role. Of course educational opportunity is extremely significant. Even if parents are literate they do not have any reading habit which is clearly reflected in this study and naturally the environment at home is not very helpful for developing intellectual curiosity of the child. Similarly, various extra curricular inputs are equally important. Students coming from deprived section have to forfeit the benefits of a cultural and educational background. On the other hand if there is too much of a gap or gulf between what is taught and communicated in the school and the home then it would result in the development of an imperfectly integrated personality. Intellectual curiosity gets smothered. Linguistic difficulties add to the problem. Then again symbolic language presents another difficulties. In short, deprivation becomes near total and as such has to be attacked in a comprehensive manner and to do so compensatory or remedial measures need to be devised, which has been one of the important purposes of this experiment.

Content enrichment is introduced by removing the un-necessary technical jargon. The fear of abstract concepts and methods of reasoning has also to be removed. Even more important

is removing the attitude of despondency on the part of students, particularly the first generation learners about their inherent incapacity to grasp difficult knowledge like science and mathematics. Apart from removing such fears, which was also felt extremely necessary to provide a laboratory programme for science students so that they could see for themselves significance of concepts and causal link between one factor and another. Further question answer programme had to be so devised to include not only the text related questions but also experience related questions. As a matter of fact it has been found that the latter were more than 60% which certainly helped the students. Questions had to be so devised to make a student seek for additional information. In a way the thinking capacity of a student was stimulated. Similarly inquiry about gadgets as well as the incidence of environment had to be stimulated. Without underrating the importance of legends and myths appropriate intellectual framework had to be created so as to instil a questioning attitude on the part of students. Language development was equally important so that the bugbear of technical terminology could be overcome. Leisure time activities had also to be so devised that the distance between home and school work could be bridged by providing home work which would not be taxing but be related to home and environment. For this purpose utilization of ordinary day-to-day resources was inculcated among the students. One of the most heartening examples of this activity was the collection of herberiun by students who had collected various samples of plants, creepers, etc., not only from Bombay but from their native places which

they visited during vacation. It is generally observed that education often leads to alienation and therefore following assignments and activities were planned for their vacation such as :

1) Making models and decorative lanterns (which would fetch income)
2) Conducting surveys and interviews
3) Preparing harberies of plant specimens
4) Writing scrips and assays

One of the important findings of this experiment has been that as a result of conducting surveys and interviews the students did not de-generate into a mere data collector but really developed skills as to how to talk with people and how to elicit information, paying due attention to the process of inter-action and of course the qualitative aspect. It was but natural that students choose topics for their survey which bore an intimate relationship with their day-to-day life such as a study of distributors of newspapers, market prices of essential commodities, eoucational status of families residing in their chawls and even so a survey of number of persons standing in a que before a public lavator at 5 a.m. and concluded that sanitary facility in the locality was extremely poor, thus pinpointing a characteristics of extreme dis-comfort and inconvenience. I am reminded here of an interview with the now "star" - Jackie Shroff who said that he was not conscious of his wealth, popularity and status because he said "anybody who had to wait in a line for hours together to go to the bogs can not have any sense of

elation of new wealth". Thus the students have chosen topics for their studies which were of day-to-day relevance to their life. They also conducted interview with a medical practitioners, an inspector of police, a nurse, a shopkeeper, a milkman, a porter, a barber and an illicit liquor vendors etc. They have gone further and raised some socially sensitive issues like corruption, violence, underworld occupations etc. They are not content with sticking to their own environment but have also developed a curiosity about the life and life style of people belonging to middle and upper classes. Their curiosity and also their rising confidence and self assurance is reflected in their questioning guest speakers at their school about what the guest did and how he behaved in society. This clearly reflects new confidence as well as social concern and criticism. In terms of their performance in science, mathematics and English it is found that quite few of them obtained first class marks in science, mathematics and English. Of course while students from private school were 50% in this column, students from B.M.C. were five percent. On the other hand 22% from B.M.C. were placed in second class as against 41% from private school, 9% were placed in third class from private schools whereas 29% were placed in third class from B.M.C. There has been a significant difference between the performance of the experimental and control group in science and mathematics because while only one student fail from the experimental group in science, seven from the control group; seven passed from the experimental group and 12 from the control group; second class 13 each whereas first class 10 from the experimental group and only 1 from the control group. There were

students from the experimental group who got distinction marks whereas nobody from the control group got certain high marks. A similar picture has emerged in the case of mathematics - 5 fail from the experimental group whereas 10 fail from the control group, 7 passed from the experimental group whereas 15 from control group, 17 from the experimental group in second class while only 8 from control group. In First class there was one student from experimental group while none was from control group. As per distinction there were 3 from experimental group and none from control group. This really speaks the success of experiment and particularly of the remedial measures taken by this project. This success has been confirmed by the opinion of teachers who felt quite satisfied with the performance of the experimental group, likewise there has been an improvement in the development of use of English language. In addition there has been a positive change in their outlook on life, behaviour of students has become more disciplined in a village. The participation in class has grown considerably and there is a general sense of acquiring self respect and confidence. Therefore, this particular experiment proves the importance of a total approach rather than a piece meal approach to improve the scholastic performance of students particularly from the deprived and dis-advantaged classes. Unless and until the hurdles are identified and appreciated, they can not be overcome which requires not only intellectual ability but even more so empathy and concern. Therefore, such an experiment, though limited in its scope in a certain way has demonstrated the significance of

action for bringing about change in the desired direction. i.e. equity, social justice and so on.

The findings of this experiment are certainly very encouraging because of the remarkable improvement in the academic performance of students from dis-advantaged groups and not only that but even more so a considerable increase in their self esteem. Of course, what happens to them in later life both academically and occupationally would be very worthwhile watching. The level of academic achievement as well as aspirations has risen considerably, which would require appropriate opportunities for further advancement of this group of students. In any case, this study and the experiment on which it is based has given us some idea as to how knowledge and nurture can help in overcoming the traditional handicaps, which in itself is extremely significant. Intervention of this type has important social implications which can not be ignored. Thus even without branding this experiment as a science movement it contains all the required ingredients of atleast a latent movement.

This material is obtained from a technical report No. 2 entitled "Talent Search and Nurture Among The Under Privileged in 1982 to 1983 by V.G. Kulkarni and S.C. Agarkar, Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research, Homi Bhabha Marg, Kolaba, Bombay 400 005.

## MAHARASHTRA ASSOCIATION FOR THE CULTIVATION OF SCIENCE, PUNE 411 004

Earlier we have discussed intervention specifically related to educational achievements and advancements of students from dis-advantaged groups. Of course, tradition of educational advancement and other types of improvement and advancement were also included in the programme. In this particular experiment : programme carried out by MACS was designed for village improvement and it was worked out from 1982 to 1987. Eminent scientist like Dr. Sukhatme designed this programme in order to improve health of the people in various villages chosen for the project. It was felt that by improving health it would be possible to change the environment and also to save the man-days lost because of various kinds of illnesses like Diaorrhea, Common fever etc. which were largely due to unsafe water supply in-sanitary and un-hygienic conditions. Therefore, an attempt was made to impart health education with the help of school children. This could be done by not only creating health consciousness but even more so by also encouraging improvement in sanitation hygiene and environment in general. While the training and education of children in school was the entry point, adults of the villages were also involved by demonstrating to them the importance of safe water supply and also that of sanitary environment. To achieve this end, safe water supply was made available through the construction of proper storage tanks, of course, after proper chlorination. Improvement of school environment, with the help of the students and the teachers became the first step of the programme. The students carried the

message of the importance of health programmes to their parents and guardians. The health programme undertaken in this project was expected to reduce morbidity and to improve the nutritional status of the people. According to Dr. P.V. Sukhatme Mal nutrition is largely due to infection rather than inadequate supply of foodgrains and protein. As a matter of fact this experiment is based on this important assumption and therefore, steps were devised to improve sanitation and hygiene so as to correct or atleast arrest mal nutrition. That is why control of diarrhoeal diseases was given priority. As many as 25% of the children in some developing countries die before they reach the age of 5 years. The social cost of childhood mal nutrition and infection show up in morbidity. Many interventions have failed because of negligence of behavioural and social aspect of an individual and community as a whole. That is why education around appropriate social action can improve rural living conditions in terms of improving health. Naturally, the importance of socio-economic factors and its association with morbidity and nutritional status also has to be taken into account. The environmental conditions as well as the situation in the home plays a key role. Then again cultural factors also affect mal nutrition because women and children are given lesser priority than males. Therefore, the basic framework of this study is based on the premises that most of the social and economic determinants of health necessarily operate through a common set of biological mechanism which make impact on the health and growth pattern. Even then what is to be stressed is the micro approach, which takes care of the specific situation.

The intervention undertaken in this project meant that first step was to create healthy and clean environment in the school, fencing of the school compound and planting of trees had to be undertaken. Balwadi was also started so as to ensure the follow-up of health, education as well as programme. Chlorination was of course the next step. Of course, not very quantitatively meaningful co-relation have been seen to obtain partly because the period of the project was only 5 years and, as is well known, it takes a rather long period of time to change the mental state and relevant health practices. In addition, of course there is the most important factor of combining income generation with health practices so that people could immediately see results for themselves. There is no doubt that activities to generate income must also form a part and parcel of any programme of health improvement. All the same improvement in health conditions have been quite remarkable and in doing so school children, teachers and of course entire staff of the project which included medical doctors, a health workers, social workers have certainly played an important role. The changes brought about by the improvement in health conditions have been suitably acknowledged by the people. The study certainly points out a decreasing trend over the period of years in various parameters of morbidity. There has to be a proper interaction between those who through new technology offer services for improvement in health practices and those who receive it and that is why the importance of education.

In a way this experiment also emphasizes the importance of education rather than depending on offering concrete services particularly, those which could result in income yielding activities. Of course as mentioned earlier without providing or rather creating income generation mere education may not be enough.

This material is obtained from a study of Influence of The Socio-economic And Environmental Factors And Its Relations To Nutritional Status, Maharashtra Association For Cultivation Of Science, Pune 411 004, October, 1991

## PANI PANCHAYAT

In our discussion of the role played by MACS in initiating and encouraging village improvement programme, it was found that mere education and training and rendering of certain services like availability of safe water supply and medical help though very necessary is not sufficient for want of income generating activities. In order to sustain development, such income generation is a must because otherwise the problem of un-employment as well as disguised un-employment as well as poverty will remain unsolved.

The programme of Pani Panchayat is specially designed to take care of this aspect and is motivated by the lofty ideology of reducing in-equities in the Indian social system, particularly in rural society where only the "the water lords" monopolize the water and irrigation facility to such an extent that a vast majority is left high and dry. This becomes all the

more glaring when water which is very scare resource is utilized for raising commercial crops like sugarcane on an area which is lees than 3% of total land available for cultivation. In addition of course for raising such a commercial crop that is sugar 70% of water available is utilized, obviously enough starving other essential crops. This is precisely why Mr. Salunke puts the whole question in the context of in-equitable supply of water. He feel and very rightly so that unless and until water is made available to everyone for cultivation of food crops, not fancy but of the coars variety like millets and of course growing oil seeds, cotton, some wheat etc. In order to do so it is absolutely essential that every cultivator, however small his land holding may be and howsoever poor he may be should be afforded use of water for cultivation so that he can eke out subsistence. Of course there has to be a judicious admixture of food crops and cash crops which would fetch income. Never the less the poorest cultivators, for want of money as well as for want of growing adequate grain is at least semi-starved. Naturally, in order to extricate him and of course his family it is necessary to enable him to grow food which would enable him to eat sufficiently well. Of course, cash crops though on a very small scale are also needed so as to provide him with cash income so that he can buy the necessities of life like salt, pepper, clothing etc. This entails availability of water all the year round so that he can plan cultivation of food crops and cash crops meaningfully. That is why Mr. Salunke designed this experiment of Pani Panchayat which was meant to provide water to everyone so that he could feed himself and save himself from

poverty and its attendants clutches of the money lenders. In stead of promoting individualism Mr. Salunke insisted on collective approach, which meant co-operation, which also meant the poorer sections getting together so that the richer section would think twice be ---- continuing the traditional pattern and practice of exploitation. Thus the inherent central idea is not merely to feed the poorest farmers but also to make him self respecting and independent though gradually. In a sense this particular experiment has social as well as political ramification. No wonder that this particular experiment had to encounter considerable opposition in the beginning and one can not say that the end of the tunnel has been reached. This cooperative experiment further facilitates development of organizational capacity.

As we have already noted, this skill was an outcome of the severe drought of 1972. Sustained effort was made right from the beginning for delinking the ownership of land from utilization of water which is always a scare resource. Apart from making available water to every one for cultivation a certain amount of technical training is also imparted so that the members of the Pani Panchayat or at least some of them would be able to handle the problem of organization, rational and equitable distribution of water, getting the cooperation of the bureaucratic machinery of the Govt. as well as the various banks etc. In short, the idea and of course the practice has been to not only facilitate people getting fair supply of food for their consumption all the year round but also to develop capacity and

skills for organization and therefore, to meet the potential threat of vested interests. Mr. Salunke has calculated the saving of resources if the principles of Pani Panchayat is implemented everywhere. Thus he stated that there would be a saving of 80% of expenses if the experiment of Pani Panchayat is carried out everywhere. Moreover, land under cultivation rather its percentage would significantly rise, providing people the much needed employment full cash income and self respect. If the problems of un-employment and under employment can be solved satisfactorily the process of reverse migration would start, of which there is already some evidence. This of course means sever restrictions on the cultivation of sugarcane, the only crop which requires supply of water all the year round whereas all other crops require only seasonal supply of water. For example few weeks or couple of months, at at the most 3 months. But this would mean a great amount of political will. The experiment of Pani Panchayat thus is laden with immense possibilities, which transcend the purely economic concern.

Therefore, it is not surprising that this experiment attracted the attention of social scientists, administrator, bankers, the State authorities etc. Several empirical inquiries have been made about the cost benefits analysis of this scheme and also to a certain extent attempts have been made to look for qualitative change. That is why even though in pure quantitative terms the success of the scheme may not look very spectacular, the awakening of the people is regarded as extremely significant. Moreover, the figures available about food consumption by the

members of the experiment testified to their emancipation from starvation and of course clutches of money lenders. Of course, this freedom has a multiplier effect in the sense that the traditional domination of richer section would not be put up with. While majority of the members preferred to grow other food crops even cultivation of wheat was introduced by some farmers for the first time. Wheat became a new item of consumption for some. Production of pulses provided cash income. While it is true that very few farmers earn beyond Rs.2,000/- per year even the earning of cash income when coupled with food consumption all the year around signifises a very important change. It has to be borne in mind that all these cultivators had hardly any source of income prior to this scheme and were at least semi starved for a few parts of the year. The multiplier effect of this scheme has also been education of the children and increase in literacy. It is not only the economics of an experiment which is of central significance but the attendant consequences which it give rise to are socially, culturally and politically of even greater significance. Equitable availability of water for poor farmers can well be a rallying point for such farmers. The Govt. has taken congnisance of this aspect and have therefore, issued a circular urging officials to visit Naigaon experiment "which will serve as pilot schemes on the success of which will depend further progress in integrated watershed development in the villages other than those villages where other irrigation facilities already exist or are planned. The integrated development of the water resources available in small watersheds limited to a village or a group of villages is

aimed at full utilization of the available water potential in the area through surface irrigation as well as by tapping underground sources. The pilot scheme will broadly comprise minor irrigation or percolation tanks in the bund reaches of the nalla flowing within the boundaries of the villages, nalla bunding works on the small nallas joining the main nalla, providing wells on the downstream side of the percolation tank and nalla bund and small lift irrigation schemes on these wells. Thus, in the scheme, surface irrigation as well as irrigation from underground resources will be utilized so as to bring as much area as possible under irrigation in a particular village. It has to be aimed that about 60 to 70 percent of the cultivable area of the village is brought under irrigation. The whole area is to provide protective irrigation which will ensure at least one healthy crop in the fields covered by the scheme during the period of scarcity and under normal periods, it should be possible to take two crops".

Some of the studies evaluating the work of the Pani Panchayat have pointed out certain areas of difficulty such as the recovery of bank loan from the farmers in time. However, it has to be appreciated that this experiment needs a long lease of life. Notwithstanding certain difficulties and may be even risks this programme has now resulted in the initiation of 17 new schemes. As we have seen originally 37 schemes were undertaken and now this scheme or programme has spread to Andhra Pradesh, Raichur Dist, Raichur Taluka, village Dugnoor, Karnataka, Dist. Belgum, Taluka Chikodi, village Kannagale (Jyotiba),Maharashtra,

Dist. Satara, Taluka Palatan, village Chatigemal (Babakhan), Kalaj (Jai Malhar), Kalaj (Kanifnath), Suravadi, Sangli Dist, Taluka Kavthe Mahankal, village Kuchi (Jyotirling), Pune Dist, Taluka Mulshi, village Lawale (Dnyaneshwar), Jambhe, Pune Dist, Taluka Purandhar, villages Daundaj (Govindrushi), Rajuri (Hanuman) Bhiwri (Tukai), Dhapawadi (Karhamat) Rakhi (Someshwar), Taluka Baramati, village Karanja (Sant Dnyaneshwar), Taluka Maval, village Shere (Shiv Shankar).

The theme of equity has been put into the concrete form of half of acre of share of irrigation on a per capita basis and it has been dealing from the rights in land. Of course, some times this principle had to be deviated from although the basic principle was restored as and when feasible. This experiment encouraged Govt. to absorb the Pani Panchayat experiment in its planning process and it issued a suitable Govt. resolution dated 8th Sept. 1981, which has been already introduced. Not only adequate but a forceful plan has been made for the social justification for subsidy which has been correctly pointed out. Afterall all the resources belong to the society and the State must ensure that no section should monopolize any of these resources for its own privilege, fancy, monopolization and domination over others. In this sense this experiment though, confined apparently to making water available for the poorest farmers for cultivation has significant semi-revolutionary potentialities.

Last but not the least Mr. Salunke has been very successful in not only enlisting the cooperation of his wife in their entire enheavour but has now been in a position to delegate the entire responsibility to her from A to Z. No wonder that this illustrates example as to how when has positively motivated, many women do contribute significantly to make a success of this scheme.

## BhARATIYA AGRO INDUSTRIAL FOUNDATION

An overview of BAIF activities gives us an idea about the comprehensive nature of intervention made so as to improve the standard of living of poorer sections by generating income, of course, by launching activities and programmes which would facilitate such generation of income. While the BAIF launched its activity with dairy cattle production it also launched various other programmes. Afforestation and agricultural programme, tribal reconstruction programme, health services and emphasis on indigenous medicinal plants and trees, potable water, watershed development, rural polytechnic training activities and community based research so as to use feedback from the community to improve the programme and also to make new additions to the programmes from time to time such as sericulture, biogas, new resources, non conventional energy programmes etc. Even this list speaks of the multi faceted and carefully planned programmes which have spread far and wide.

In planning this programmes while care has been taken to involve the people in the planning as well as the organization -

running and implementation of the programmes, there is no doubt that key decisions about introducing new programmes rested with Dr. Manibhai Desai and his senior colleagues who had expertise in their own field and were also fired by BAIF's ideology. As has been already observed Dr. Manibhai Desai emphasized idealism rather than ideology this means that all those particularly at the helm of affairs necessarily share the underlying philosophy as propounded and communicated by Dr. Desai. When I spoke to very senior colleague of Dr. Desai, he mentioned that all those who are occupying key positions in running the different kinds of programmes listed above certainly share idealism, though not necessarily to start with. This is reflected in working on a smaller remuneration as compared to what they would have got if they had chosen to work either in the Govt. or in the private sector. The members of the presidents council like Dr. N.G. Hegde, who has became the president after Dr. Manibhai's demise, Mr. G.G. Sohani, Dr.D.V. Ranganekar, Mr. P.N. Khaire, Mr. S.B. Karvande and of course some others belong to this category, so that in addition to the technical, professional expertee a very important component of idealism is shared by all these. On the other hand, those who were in-charge of running the programme in the field, were paid competitive remuneration. This is not to suggest that they have not come to share the idealism. But there is distinct difference between the former and the latter cadres in the sense that the first are very highly professionally and technically qualified and as such are decision makers while the latter are not that highly qualified but are paid almost according to the prevailing rates of remuneration. This

particular arrangement and device takes excellent care of combining professional, technical expertise with idealism and also ensuring efficient cooperation of those put in charge of implementing the programmes at field level. That is why to ensure innovative action and also to make sure of efficient implementation such a combination has been rather ingeneously and carefully devised. Of course, those who are sticklers for "democracy" may be prone to find fault with this and yet it can not be gainsaid that the people for whom such programmes are meant are involved in the organization and implementation of such programme, leave aside the officers who are specially posted to implement the programmes at the field level. Dr. Manibhai Desai who owed his inspiration to Mahatma Gandhi was basically a scientist by training who had also excellent training in Mathematics, which reflect his keen emphasis on precision and of course, his very deep moral and philosophical conviction, whereby he had opted for a life of social service, if not total sacrifice and rather much abused term now. He had very clearly analyzed the causes of rural poverty and therefore poverty of India in general and applied his mind to devise suitable programmes which were essentially rural based. Even more so he was convinced that unless and until villagers saw for themselves concrete benefits in the shape of income to them they would not be in interested in gratuituous advice and moralizing. Of course, paripasu with the economic content of the programme Dr. Manibhai was equally insistent about the moral dimension of the people so that they should give up drink, gambling and such wasteful habits. While some of the programmes undertaken such as dairy cattle

production, which may appear as elementary to some, right from the beginning the technical excellence and expertise was introduced and insisted upon. Dr. Desai spared no pains to acquire best expertise in this field wherever it was available, consistent with training of the local staff with such expertise so as to solve the problem of permanent dependence, particularly on foreigners. Harnessing of the best scientific and technological knowledge for achieving and ensuring the best possible results, which meant a completely rational and scientific outlook, tempered by ethical values, consisting of management techniques, expertise (without manipulating people, although using economic calculus) and of course, impelled by the philosophy of providing social services, again without in any manner introducing the donor-donee relationship. On the one hand services were not free and on the other hand services were not at all charged at the market rate and even more so the services initially provided for were transferred to the communities by providing requisite training on the spot. Thus the community needs were met more than half way through the programmes and services. The community was well equipped through training to man such jobs. That is how a relationship of mutual respect is engendered. This is, one might say, a special concoction. Moreover, there is a continuous feedback from the community which is reflected in the inquiries continuously carried on by the social science cell. Of course, the implementing staff is also sensitized to the feelings and aspiration of the community so that in addition to the technical expertise they develop sensitivity, much needed for those providing such services.

Animal (milk) production has expanded considerably from 1978 to 1982-93. Thus in between 1988-1993 the progress of cattle development programme has risen from 100 thousand to 2000 and there are 584 centres in Maharashtra alone and centres has been established in Karnataka, Gujarat, Rajasthan and Uttar Pradesh. The latter having the maximum number of cattle breeding centres. Cattle development centre has been accompanied by upgrading of Frozen Semen Technology for Development of Buffaloes. The cross breed cows have given considerably larger quantity of milk in Maharashtra and elsewhere. In addition to the cattle development programme research has been conducted on by-products, so that everything is used for the gain of the members of the programmes. Taking care of animal health naturally forms an integral part of the programme.

Agro-forestry and afforestation has also been developed at various locations in Maharashtra, Gujarat and Karnataka. Naturally considerable amount of study and experimentation has gone into this so as to plan suitable trees. Of course this is also related to Bio-fertilizer for the growth of the agricultural crops. Low cost technology for conservation of natural resources and development of waste land has also been undertaken, which if it becomes very successful can tackle the problem of waste lands on an All India plane. A nodal Agency for promoting decentralized nursery through voluntary agencies in Maharashtra, Gujarat, and Karnataka has also been set up. Efforts have been made to set up social forestry national network.

Advisory services are extended to other organizations such as Gokak Falls, Gokak Mills Division, IPCL, Nagothane, Dist. Raigad, Ashok Leyland Ltd. Gadegaon, Dist. Bhandara Nocil Factory, Thane, Kakrapar Atomic Power Plant, Kakrapar, Gujarat, Tarapur Atomic Power Plant, Tarapur, Maharashtra, Larson and Tubro Ltd. Hazira, Rehabilitation of Mined out areas through Afforestation around Chandgad village, Dist. Kolhapur, Mahratta Chamber of Commerce and Industries area at Hadapsar, Pune. Campaign is organized for creating national environmental awareness. Bio-energy is developed.

Social science cell is not only expected to initiate the research study to conduct regarding the impact of various programmes but also to sensitize those in-charge of the programmes so as to encourage the dis-advantage section to acquire confidence if not power. As a matter of fact attempt has been made to empower women through the Balwadis. Then again tribal rehabilitation programmes have been undertaken in Maharashtra, Gujarat etc. A training institution has been set up for socio-economic rehabilitation of tribals and training support is extended to tribal families. Comprehensive development programme have been undertaken while exploratory studies and operational research on post production technology has also been initiated. Community health of course, forms an important part of the programme in which social scientist and action workers are involved. In providing health services traditional health practices and cultivation of medicinal plants particularly for the women folk is encouraged. Provision of

potable drinking water for tribal families has been introduced both in Gujarat and Maharashtra. Rural polytechnics are designed so as to train the local people in Ferrocement and Masonry, Carpentry, Horticulture, Mushroom, Cattle development, sericulture etc. This will provide sustainable livelihood to provide social security on one hand and prevent migration on the other hand.

BAIF Information Resource Centre has been established in Pune which provides the requisite information to everyone desirous of getting it. Towards this end slides are prepared. There is a library and information service, data base, computer and EDP services, application system of system development, data analysis, communication and publication etc. Impact studies have been undertaken on print and audio media, controlled broadcast vs conventional broadcast, development of communication material etc.

The comprehensive nature of the various activities and programmes undertaken as well as the amount of plannd and systematic thinking which has gone into it is clearly reflected in the information listed above. It clearly reflects an integrated approach towards rural development by taking into account the special problems, features, and needs of rural society. Not only that but an appropriate methodology has been ivolved so as to bridge the traditional gulf between the rural people and the urban based, the poor and well to do, resourceless and the resourceful, the untrained and educated and educated and having technical and professional expertise etc. Thus

consistently with providing services to rural society care is taken to make the rural people self reliant and therefore, self respect. Equally well there is an in-formal training for the rural and tribal people to come face to face with the external factors and prestigious personnel in particular so that they can get their problems attended to and solved. In this sense the widening of the vista of the rural and tribal people can be properly regarded as social change.

Quite in keeping with the aim and goals of BAIF and of course, the setting up of social science cell which tried to integrate economic, scientific and technological development with social development, several investigations were undertaken to assess the impact of various measures taken by BAIF. Naturally making food supplies available on a secured basis was accorded the first priority because without assured food supply nothing could be attained like wise drinking water is also important. It is not only enough to develop agricultural production but its commercialization is extremely important, without which agriculture would not be a profitable pursuit. In any process of development cooperation of all the sections of population is of vital significance. Naturally, the role of women in development is of crucial importance since they form 50% of the population. For that matter even the role of children should not be under-rated and they can also help, perhaps paradoxically as some may think, to educate the wider community by absorbing new ideas, knowledge and moralities of relating and reacting. Children are not only innocent but have an open mind and as such can provide

models for emulation by the elders. Of course, in addition to the role played by the children special impetus has been given to the adults to form themselves into self help groups so that they need not depend on any external agency including the BAIF for that matter. Many a programme are aborted for want of energy and it is to this end that BAIF has devised non conventional sources of energy which are readily available to people at relatively smaller cost and of course with assured supply. It is not enough to provide a community with various kinds of programmes of development but it is equally important to train the people to implement them. Naturally, BAIF has introduced training programmes which are not of an adhock nature but became a part and parcel of the programme itself. Thus the staff in-charge of running the programme are trained from time to time, as well as the people so as to ensure better results. Sericulture programme is specially designed to make additional income available to the people. Its impact has naturally been a matter of study by the social science cell itself. Last but not the least information centre which has been set up and provides positive services to those engaged in conducting such activities outside the BAIF Pariwar is also important because the basic ideal underlying is to communicate the modalities of various developmental programmes. Of course the BAIF personnel always have a ready access to such information.

BAIF is a non-governmental organization which implements a number of integrated rural development project in 6 states in India covering 600 thousand families spread over 8,000 villages.

Achievement of complete food security is a priority issue in terms of dermining the orientation of rural development programme. In stead of adopting a negative approach viz. how to fight famine, the BAIF has encouraged an understanding of seasonal variation in food security status, intra-households distribution because women and girl children get a poorer diet than rest of the household which needs to be corrected, emphasis on quality instead of mere quantity. How people cope with the various pressures to make food go round the whole year as naturally been a matter of concern for BAIF. Therefore, major programmes are supplemented with small income generation activities oriented toward improving the food security situations. Special programme for education and income generation among women are introduced and go a long way to improve quality of intake. Several studies of famine have pointed out that the most important cause of famine is paucity of income. The BAIF staff monitors and evaluate the food security programme. The non availability of drinking water has been the bane of Indian rural scene, leave aside that of safe water supply. Naturally, drinking water as form an important part of the programme of BAIF's activities. Without the availability of safe water supply health would be impaired. Amenities have to provided for identifying and developing sources of water for the rural community and in order to do so bore wells have been not only dug but have been fitted with hand pumps which can be operated and repaired by the local people. In the tribal areas of Vansda, Taluka Balsad district in Gujarat 197 hand pumps have been installed in 37 villages of the Talukas. Groups of

local tribal involved have been trained in hand pump installation and platform construction. A toolkit has been provided to each group and the responsibility of installation and repairing the hand pump is handed over to these groups. The expenses incurred in repairing work are shared by the hand pump users. In addition to these borewell spring development has also been initiated and roof top water harvesting has also been introduced. Check bunds are constructed. These bunds are used immediately after monsoon and water is stored so that it can provide for protective irrigation to the fruit trees planted under BAIF programmes as well as for other domestic uses. The water bodies has been created hence to re-charge ground water in these areas. Like wise drinking water is monitored for its quality and potability. School children have been involved in chlorination work and it has been found that students are most conscientious and consistent chlorinators. The local tribal girls are also trained as village help guide. Bacteriological and chemical test are conducted to ensure safety of drinking water.

Role of BAIF programmes in agricultural commercialization are run in 8,000 villages covering 500 thousand families. Of course such families are mainly dis-advantaged and therefore effort is made to provide them with sustainable livelihood, enriched environment, improved quality of living and good human values. In order to do so the farmers production system has to be put on a sound footing, utilizing the natural de-graded resources such as land, water, livestock and vegetation with the application of appropriate science and technology. Therefore

BAIF has tried to create / strengthen the farmers production base and at the same time establish sound forward and backward linkages so as to make them relevant to each activity. Dairy cattle production programme provides the cash income which is utilize for promoting agriculture and particularly for improving the de-graded land. Forestry is also another source for cash income and so are horticulture, sericulture and mushroom cultivation. The present trust of agriculture commercialization programme include 1) establishing farm enterprises 2) taking up various backward linkage activity to ensure high productivity, which in term ensures viable commercialization and 3) initiating forward linkage activities which can develop to set up various downstream enterprises. Alongwith cattle development programme and agriculture development sericulture programme have been introduced as additional sources of cash income. It has been found that women can easily take up this activity with profit.

Energy and its availability is the crux of many agricultural and economic activity. Therefore, Biogas production technology was introduced and farmer level demonstration of research was undertaken. Demonstration of energy plantation of various fast growing tree species has been taken up in over 500 hectors and BAIF regional campuses. Kisan Nursery and small woodlots by farmers have been promoted. Bio-mass is also used as a source of energy. Castor cake has also been utilized for community bio-gas plant. It has been ensured that technology for such use is essentially farmer friendly. Cow dung and effluents are used for this purpose. It is expected that this programme will become

an important constituent of development programmes undertaken in 6 states.

Quite in consonance with the philosophy and strategy of BAIF children have also been prompted and encouraged to contribute their mite to the development programmes by carrying the message of development and its significance as well as the utility of the various techniques and mechanisms involved. As they say in English "Catch them young" has been followed by BAIF. In some other studies also we have alluded to the role played by the children in spreading the message of the importance of health, hygiene and sanitation to the community by the school children. Balwadis which have been organized by BAIF are looked upon as a focal point for entry. The potentials of the children as change agents have been well documented. The elder siblings take care of younger one, help the parents in house hold chores as well as in livelihood activities. Children being curious and creative, enthusiastically receive new ideas and knowledge and apply it in practice with equal zeal. The school represents the society at large but fortunately with social hierarchies diluted or almost forgotten. It is certainly very heartening that BAIF has experienced of such dilution if not evaporation of hierarchy in school because in many other studies school is also an agency to carry forward hierarchy as it operates in the society. Teachers are natural leaders for the students. Their sustained participation, interest and support goes a long way in ensuring the success of development activities to which students in the school are introduced, exposed and encouraged to follow. Again

the situation as, I would say, created by the BAIF is extraordinary. Of course, such a situation has been generated in the Homi Bhabha Science Education Centre, Bombay which again is a special case. Learning become fun when done through non-formal methods. Games can beautifully bring home certain important message without invoking a negative attitude. Children's festival through non-formal experience based learning methods foster creativity and participation. The following steps are taken to initiate this programme 1) trainers' training 2) Organizing Bal Mela (Children Fun-fairs) based on a specific theme 3) Meetings in the school 4) Introduction of projects activities for children. It has been found that even the teachers who were initially skeptical and passive became very active and participated in a lively fashion. The activities were essentially connected with taking care of day-to-day problems. For example scabbies control, first aid and referrals (of patients ), chlorination of open wells, kitchen gardens, tree plantation, school nursery, environment awareness programme under the National Environment Awareness Campaign, BAIF organized an assay competition for children. About 500 schools from 10 districts in Maharashtra participated in this competition and more than 100 thousands wrote assays on different topics related to environment protection. All the participating schools were awarded useful literature on afforestation and prizes were given for two best assays in every class of each school. This has created significant awareness among the students and many of the schools have initiated plantation programmes. In all the above programmes it has been experienced that because students are the

Doers and not passive recipients, there is a very enthusiastic response to all the activities. The teachers are also deeply involved in the planning of the action and follow-up. Thus the results are self-evident, leading to positive feedback and fostering of new programmes. The school based child to community programmes are of dual benefit : making the process of acquiring the knowledge, an active interesting process and at the same time, for effective implementation of development programmes.

## THE ROLE OF WOMEN IN DEVELOPMENT

It is often said that women who constitute 50% of the total population, contribute 66% of society's work while get only 10% remuneration or payment. To redress this state of affairs right from the beginning BAIF regarded it as very important to involve the women by generating income and the relevant activities which they could pursue. It is from this point of view that two major schemes of social research : women's present social status and women's economic development were undertaken. Gender bias invariably affect women all over the world, be it certain discrimination or gross violence against women. Women in rural areas in India have to bear the drudgery. Even the situation in the urban areas is not far different. There is a dual labour market in operation which means that women are paid much lower than the men for the same kind and amount of work. In addition due to illiteracy and secondary social status they are poor, powerless and find it difficult to solve their problem at an individual level. The role of women is traditionally or for that

matter even now confined to the family and she is not expected to go out of the family environment. That is why training of women and injectioning income earning capacity has been hit upon as very crucial intervention by the BAIF. Of course in doing so BAIF has taken every care to avoid conflicts. And yet, a woman should be economically as well as phycho-socially independent. This means bringing the women on par with the man to shoulder social responsibility in a more efficient and equitable manner. Certain programmes were developed to contribute to the raising of women's status such as cattle development, agro-forestry and Kisan nursery, building on tradition : Wavli - a tradition among the tribal whereby income accruing from certain activities like poultry is a special monopoly of women to which earnings man has no access. That is why in tribal areas in Gujarat this tradition has been specially harnessed to promote new income generating activities such as nursery (plants and trees), seri-culture, mushroom growing etc. Utilization of Wavli for promoting these economic activity have considerably enhanced the income of women. Moreover, education of women has also been regarded as an asset because she can manage the house and accounts in a much better fashion. Therefore, there are cases where a man (elder) marries his son to a girl who is more educated and therefore, is expected to be more efficient than the son. Rural women as Kinder Garten teachers do play an important role as change agents by spreading new ideas and even more so by providing model for innovative action and even a set of social relationship. Thus a widow or deserted women has acquired acceptability by reduction of her stigma through the operation of Balwadis and of course, the role

played by the woman. Similarly, women have been encouraged to form themselves into selfhelp groups. These selfhelp groups promote savings by the women folk and also investments, which exposes them to the working of banks. Village libraries are also set up by Kinder Garten teachers and even illiterate women from these villages are demanding information about agriculture etc.

Training - a key to empowerment technical training renders acquisition of new skills because of which exploitation and limited opportunities for women can be got over. Activities like grafting techniques, of farms activities are also promoted through training. Besides women's contribution and role in cattle management means training for women in cattle development and management. Programmes are helo for developing women's leadership. Such training also adds to the income, reduces expenditure and builds confidence to explore new avenues of self development. Health problems of women also are special because of poor nutrition and the generally lower status of women. It has been obseived time and again that women and children of the house are always discriminated against in respect of food supply. Therefore special programmes have been developed by BAIF for maternal and child health. Health services and their availability in the village itself has certainly helped the women.

## WHEN AND HOW WE CAN COME TOGETHER ?

## BAIF'S SELF HELP GROUP (SHG) EXPERIENCE

Self help groups have been formed in Haveli taluka. One of the sources of encouragement for women has been their children who change their own hygienic habits and also induced their parents to change. The parents took some time to learn from the children but after doing so they came to appreciate the role played by K.G. teachers. Because of the poverty level, women could not even satisfy the dietary needs and as such a minimal credit was required. The BAIF teachers encouraged women to save even in annas and pies. The local teachers played the role of animator. Of course organizing women into help groups was not an easy task because men tried to discrupt such development. However, the formation of such groups was persistently followed, which fetched results. One of the most important aspects of this whole process is evolving the structure and organization of such groups by the women themselves over a period of time so as to counteract various difficulties and hurdles..Such groups have been engaged in loan management so that the problem of solvency and credibility is automatically taken care of. Meetings are organized from time to time to report action taken as well as to devise new course of action which is needed. In stead of providing a solution to every problem these groups have learnt to solve the problems as and when they arise by actual doing. The groups have developed their own management system for handling their money, their own norms, procedures and accountability. Within these small groups leadership qualities are developed.

Now, they are confident to start their own income generating activities. They are collecting their own corpus funds. The formation of self help group is an extremely significant step in the direction of reducing the dependence and consequently lowly status of women.

## TRAINING PROGRAMMES IN BAIF

Training forms a core activity within BAIF's programmes : be it for the farmers, for the communities functionaries, for extension staff or for senior researchers. Human resources have to be developed from time to time since they form the critical mass. Three types of Human Resources Development activities within BAIF. This consist of 1) training to programme participant in livelihood and health activities; training to extension staff in programme activities and management training. All the participants need to be trained in order that they can have self employment. The generation of gainful self employment opportunity is possible only if the resources of land, live stock, water etc. are upgraded by injecting modern science and technology, so that they can sustain the population in the area. This means training in identification and utilization of all these resources. A skill oriented functional training to properly harness new technologies for optimal utilization of natural resources is a must. That is why BAIF has introduced grass root training programme. There is also training in non farm activities, without which additional income can not be earned. Such a man power development programme is especially crucial in a growing organization and that is why man power

development activities were conducted in BAIF over the last four years and more. It has been done by deputing BAIF staff to attend training / workshops organized by other institutes; organizing special in house workshops / training programmes for BAIF Senior staff; regular training programmes for BAIF extension staff and community functionaries. Management training has also been introduced so that on the spot solving of difficulties can be efficiently handled. Techno-managerial capacity of the agencies involved in rural development is very important and only by developing such a human resource there can be a multiplier effect in terms of a wider extension of sound rural development programmes, which harness the latest development in science, technology and management to improve standard and quality of living of the rural poor. That is why BAIF has plans to establish management training centre in Pune, which has already made a small beginning.

## INFORMATION SERVICES

It is not enough to make appropriate interventions but the various results arising out of such interventions must also be systematically made available for every one who wants to profit by it, not only those who properly belong to the BAIF in various capacities but also to any one else who are so desirous of obtaining such information in order to either emulate the BAIF experiment or even to chart a new path. It is with this end in view that BAIF information resource centre and library and information services has been set up by BAIF. In addition, of course to the BAIF collections of data leaflets, monographs etc.

material is collected from other sources which has relevance to the programmes undertaken by the BAIF. Therefore, information is collected for animal sciences, agriculture, agro-forestry, appropriate technology, energy, human health etc. The basic idea underlying this endeavour is to share information and knowledge. As mentioned earlier, as for the training programme for the staff of BAIF even at higher levels, care is taken to see that any institute other than BAIF which has something worthwhile to offer is obtained by deputing BAIF staff to such training programme. This is quite in keeping with the spirit of BAIF viz. to learn from anyone and to give to anyone who is really desirous of obtaining information, not to say technical and professional know-how.

## SOCIAL SCIENCES AND ITS ANALYSIS OF SOME OF THE KEY PROGRAMMES LIKE WADI AND WAVLI INTRODUCED AND IMPLEMENTED IN TRIBAL GUJARAT

BAIF was convinced that the various programmes initiated by the Govt. for the development of the tribal did not reach them and as such devise some programmes like Wadi. The idea underlying the Wadi programme is to provide gainful self employment by enabling tribal in Vansda to grow 1 acre orchard of forest and fruit trees on degraded land. 5,000 families are participating in this programme. The BAIF identify this asset to be a `Wadi', in Gujarati means an orchard. A decision was taken not to develop wadi on paddy land belonging to tribal - this would not have met with a positive response from tribal who would have been against any attempt to change a nature of their primary productive resources. As we have already emphasized, the

BAIF programmes is always addressed to those who would not otherwise stand to gain from the existing arrangement - economic, social, cultural, political etc. Therefore, in planning the Wadi programme also special care was taken not to disturb the traditional pattern of these tribals. On the other hand the Wadi was sought to be strengthened by providing income where none was available. As a result of the introduction of Wadi programme migration of local people to outside areas in search of gainful employment, however poor it may be, was considerably reduced. More than 70% of the families stopped migrating because of growing vegetables, nursery raising which assured them of cash income. In addition to earning cash income social change also ensued in the life of the people particularly the women. Since they earned cash income there was improvement in their status. Wadi participants worked on their own land and they could afford to have better houses as a result of cash income. Women became more confident and vocal. Newer enterprises like shops, services, dairy and animal husbandry enhanced their earnings because of scientific knowledge. There was increased mobility and contact with urban areas. There was increased participation of Wadi holders. Women's status increased even in the marriage market e.g. those who had displayed capability and efficiency were sought after by the would be in-laws because they felt that such a daughter in-law would enhance the economic prospects of the family and also teach the son a few things about efficient management of resources. The increased confidence of women meant their participation in social and political activities. Further, they also took active role in decision making at family level.

There was improved access to education and health status also increased. Due to acceptance of health care services and exposure to better child care as well as new practices of bettering nutrition there was a considerable improvement in the lives of women. Thus migration was reduced and additional source of income was made available to the participating families. Working on their own lands had a salutary effect on the people since their self respect was restored. In various ways there has been a remarkable improvement in their standard of living, such as housing, utensils, education of children, better cloths, emancipation from the clutches of money lenders, particularly because now they do not have to take "khavti" loan from money lenders as their production has increased. Enhanced health services were facilitated by co-ordinating MCH care at village level because these workers could talk a language which was easily understood by the women. Therefore, efficient communication is also extremely important for learning and adopting new practices. No wonder that many others who were not participants in the Wadi programme expressed a very keen desire to be included in Wadi programme. In purely economic terms their income has wage support, increased income from agriculture, income from sell of wood, income from mangoes and post production activities, income from new enterprises, dairy and dairy shop keeping, income from women's programme - Wavli, saving in terms of reduced water borne diseases an expenses on treatment or wastage of human life / time. In social terms there was increased participation by Wadi holders, both women and men in

socio-political activities increased status in marriage, entrepreneurship development, women's status and health status.

## THE PRACTICE OF WAVLI AMONG TRIBAL WOMEN IN VANSDA TALUKA

Practically many primitive societies follow the practice of leaving certain sources of income arising out of certain economic activities like piggery, dairy, poultry for the women themselves which is not to be touched by the men folk. BAIF hit upon this cultural practice to enhance the income of women by introducing new activities such as nursery cultivation. Care was taken to see to it that the eco-balance within agriculture and forest was not disturbed and women were both encouraged and trained to do so. The social sciences cell carried out investigation to find out the present socio-economic status of the Wavli participant's family, migration in the Wavli participant family, family income sources, type of training received under the BAIF Wavli programme and its effectiveness, Wavli income and its utilization. The traditional Wavli custom has been considerably strengthened to provide new inputs like nursery activity, education of children, health services etc. meant assured income and raise in social status. Of course Wavli income is not included in the family income since it is a preserve of women. As a result of income from Wavli activities participation in socio-economic activity by the women has also considerably undergone a change : participation in formal organization : a) cooperative societies b) village Panchayat (political) c) Caste Panchayat (Social) : Informal organization : recreational organization, other institutions : a) bank b) health centre c) educational

institutions. As a consequence of participation in such organization and institutions women in the Wavli groups have learnt how to organize themselves in a systematic manner and also to ensure democratic functioning of their groups, while developing leadership quality. BAIF provided the necessary intervention by initiating income generating activities, support activities, training inputs for Wavli groups. There has been considerable impact of training on Wavli groups in respect of nursery raising and grafting vegetable cultivation, marketing, human health, group discussion etc. Thus from a traditional Wavli which was confined to house the BAIF Wavli has expanded the frontier to community and even beyond. This experiment had meant a considerable change in the lives of women and even more importantly the practice of Wavli has generated co-operative spirit and activity, which has facilitated additional earning, social status and empowerment. Thus hitting on a significant cultural practice and to introduce modification and extensions in the same has paid rich dividends. Moreover, any break which might be shock giving to a system has been cleverly and judiciously avoided. In a way this is a classical example of intervention without disturbance caused to a traditional feature and not only that but strengthening of the original practices to meet new ends and to widen horizons and thereby facilitate social change.

The BAIF experiment provides an important and novel way of cashing on traditional strength as well as introducing innovations. As Dr. Manibhai Desai very aptly put it, he was

not interested in dividing, leave aside breaking it, but in creating many small sticks. The moral of this is obviously the creation of income for people who were totally bereft of any income and as such to enable them to acquire and enjoy a modicum of self respect. Obviously enough, if they acquired self respect the traditional opperessive and authoritarian social and political arrangements and relationship would no longer be acceptable or accepted by the people. Without crying hoarse of the ideology of revolution, changes can be effected in the lives of the people a) by generating income b) by enhancing social status as well as self confidence. Further as mentioned earlier, the entire BAIF Pariwar bespeaks of idealism which is very important for anyone who is entrusted with conceiving and implementing of such programmes.

## SOME IMPORTANT ISSUES

On purpose I have decided not to present a summary or conclusions in the usual sense of the term. However, I want to raise, bring up for discussion some important issues arising out of the foregoing i.e. the presentation on science movement for social action.

Amongst the most important issues which arises is Why Science ? Is science for satisfying intellectual curiosity ? Of course, after having whetted it, there is hardly any doubt that every person, no matter at what stage of civilization he/she is placed in - ranging from the most primitive to the most advanced wants to know things, wants to learn things, and try to make

sense out of things and events which look jumbled and incomprehensible at first sight. The Jig Saw Puzzle has to be solved and with lesser or more success. In fact the primitive man was even more urgently required to come to terms with reality by understanding and deciphering the complex reality even for his barest survival. Therefore, intellectual curiosity also has an instrumental value, which can not be denied.

It is also maintained that people want to learn science in pursuit of truth such as the nature of universe, the cosmic reality, the various forces of nature which affect not only climate, availability of food supply, means of navigation and so on but also facilitate intellectual joy by pursing "truth". No wonder that the discipline of science initially formed an integral part of social and moral philosophy. Science and philosophy of science was regarded as one dimension of philosophy. Science provided one path of reaching truth. The almost unending debate between appearance and reality further sharpened the search for truth. Here truth is to be conceived of not in philosophical terms only but also in human and social relational arrangements.

In order to pursue truth, it is important to have or cultivate at least a questioning attitude amongst people. On the other hand if existing reality - state of affairs - existing social arrangement are to be taken for granted and not amenable to questioning, then science and scientific attitude requires putting a stop to such complacency. To say the least, everyone, consciously or otherwise, wants to acquire control over

his/her situation. Thus we know that everyone wants to have a least a minimum intake of food to keep the body and soul together, a minimum clothing to cover his body, particularly for protection from the forces of nature and of course because of social conventions also, and also some shelter to protect him/her from ravages of nature, animals, other human beings etc. Even as everyone wants to or should have control over his/her situation it is equally important to mention the social relational arrangements which either facilitates acquiring such controls or prevent people from acquiring such control. Extreme forms of distribution of wealth testify to this so that some roll in luxuries and comforts where as others are deprived of bare minimum necessities of life. In stead of accepting such reality as something which is God given and therefore, can not be changed or created by some superman, if such presumption is questioned particularly with the help of scientific knowledge, it will result in an effort to set things right. Of course this raises the question of setting things right for whom ? Obviously the answer is setting things right for those who suffer from the existing social, cultural, economic and political arrangements whereby some, (if not the majority) are condemned to a life of want, misery, degradation etc. It is here that a careful understanding of the utilization of science or even its monopolization by some at the cost of many becomes important. Because knowledge of which scientific knowledge form an important part has implications for the control of situation. Science has to be understood in its total and holistic context rather than in a purely academic fashion. It is true that one of the most

important functions of science is to arrive at universal propositions but the special circumstances which operate do not allow such an exercise particularly when there are vast differences in the socio-cultural and economic and political contexts. Perhaps this must have impelled C.P. Snow to divide the world into two kind of cultures - 1) the scientific and 2) non-scientific. From the above statement it becomes very clear that science has to be thought of in its social context and not in its isolation from society.

## Science for whom ?

As observed earlier, society is divided into those who has access to knowledge and those who do not have such access. Of course it must be added that this division can never be perennial because there are several individuals, groups who enter the arena of knowledge from time to time. Moreover, knowledge or some part of knowledge becomes obsolete over a period of time. Human history is replete with such instances whereby those who pusses the required knowledge at a point of time are regarded as ignorant at a later point of time since they have not caught up with later advances in knowledge. Technology of war fare provides a classical example whereby advanced societies at a given point of time in history succumb to superior technology of other societies. Illiteracy is therefore a curse for those who can not comprehend what is going on and as such can be taken for a ride, duped, exploited etc. That is why knowledge of science has become a necessity in modern times, both for the individual and the society. We have already mentioned that access to the

knowledge of science is a matter of institutional arrangements rather than a matter of individuals in capacity or resistance etc. Science in itself has become a social institution, the possession or lack of it divides both individuals and societies. It is a patent fact that there is a dual labour market - those who are skilled and trained are not only better paid but also enjoy higher prestige and power of decision making which affects everyone who does not possess these attributes. As a logical consequence of dual labour market there is also a duel market for commodities. We know very well that even apart from the fact that many people are denied approach to such market for want of purchasing power. Even those whose purchasing power is low as compared to some others have access to markets were commodities of inferior quality only are available and yet they have to pay a heavy price. This situation is considerably worsened if even this capacity is mortgaged to a shopkeeper or a money lender or a landlord. The division of society into skilled and unskilled, educated and uneducated, the well to do and the poor has to be understood in terms of lack of access to knowledge and particularly scientific knowledge. Is this situation acceptable ? If not what steps are to be taken to rectify this situation ?

## Science for all

There is hardly any doubt that science and scientific knowledge must be made available to everyone, in order that every person can understand and appreciate the intricate relationship which bear degrees of causality. The only problem is what kind

of science is to be made available to everyone ? Does it have to conform to the rigours of academic standards ? Or does it have to be related to practical life in such a manner that even those who did not have the benefits of academic discipline and training can easily understand and internalize the basic tenets of science, since everyone wants to know relationship between man and nature or even more so man, nature and society. What is the kind of module of science which has to be prepared so as to reach everyone ? How is such a module to be delivered to the people ? Because ultimately it must reach everyone in a manner which makes it easily comprehensive so that such knowledge can be utilized in day-to-day practice for the improvement of one's condition. It is very clear that formal education would not be an adequate mechanism for reaching the people because a vast majority, more than 90% are beyond the reach of such academic formal education. Thus education (scientific) has to be situation specific e.g. what is good for the tribals may not be good for the rural people, leave side the urban based. This is not to deny the importance of formal academic science education for students, although even here there are certain cultural and socio-economic factors restraining the efficacy of such education. Science education therefore, has to be made available through media which are easily accessible to the people. It is a patent fact that many people in India can not read and therefore the use of audio visual media becomes absolutely essential. Naturally there arises problems of the content of the message to be conveyed through the media to the people which has also to take into account all the peculiarity of a given situation. Even in

metropolitan areas like Bombay there are cultural and stratum wise differences which make it difficult to even decifer the message, leave aside internalizing. Naturally conveying message of science would whet the curiosity and appetiate of those who receive such education and therefore would naturally question the very rationale of existing system of education, occupation and social status because of it many are kept out of the mainstream of education, knowledge and personal advancement. Therefore, one has to think of concrete remedial action, which is not only confined to the class room situation but applies to the society at large, including the tribals, the rural and the deprived as well as dis-advantaged sections from urban areas also. Moreover, imparting of science education and technology should not cause migration of people from their own surrounding to towns or cities in search of employment, because otherwise the very purpose would be defeated. There is no doubt that science education must have applicability and that also immediate in order to solve practical problem and to gain self confidence and control over one's situation. There has to be a combination of knowledge and the generation of capacity for earnings. In fact those who have been earning their livelihood in a niggardly fashion should be able to improve their skills and efficiency so that they could earn much more and improve their life. Who is going to undertake this task of providing science education for everyone ? While it is obvious that those trained in science at higher level should properly volunteer to undertake such a responsibility. However, what is even more important is the required degree of social

awareness, sensitivity and a sense of moral duty so that some scientist could undertake this responsibility.

## Why science movement

It has been a well known fact that science perhaps like every other kind of knowledge has to be spread to everyone and science in particular needs to be conveyed to the people which will have immediate practical applicability not only for problems solving but also for injecting intellectual curiosity and confidence to change the situation as and when needed. Obviously enough this is not the task of a single individual or even a small group of individual scientists. Special efforts have to be made to organize like-minded scientists to get together and discuss and decide the moralities of how to provide science education for everyone. Of course what is implied is not the formal type of science education but in a way more basic and practicable type of education so that people can perceive relationship between different events and even causal links. There is hardly any doubt that such an organization and particularly the decision to provide everyone with science education would require a minimum degree of socio-political support. While a given political and state support for such an activity would be an ideal solution, it would be idle to make such expectation and therefore, it would be much better to sensitize scientists themselves to perform this task, with the minimum of state support. Essentially this would be a voluntary activity. Therefore, science movement would naturally be a people's movement rather than an official (state sponsored)

movement. That is why it is essential to create a people's science movement and for scientists to participate in such a movement actively. This raises another issue whether such scientist should be remunerated for their services or should they render such services purely honorarily ? One way of tackling this problem would be to enlist scientist who have their own means of living in the sense that they are holding a full time job and are devoting their spare time for performing such task. Then again scientists would also need infrastructural support from other people e.g. maintaining accounts, records, running of the office etc. which can be secured by involving non-scientists. Inevitably there would be limits of time and energy as far as carrying out the activities of science movement. People' science movement sets the pace for this important activity and would therefore encourage scientists who are engaged on a full time basis in some non-governmental organizations or other can derive inspiration from such a movement so that they would have idealistic conviction about the kind of work they are doing and not ask for a competitive remuneration. Thus people's science movement would provide the requisite ethos and model for emulation. In practical terms every scientist can not give up his job. That is where the importance of non-governmental organizations which use scientists' expertise. Besides people's science movement can be mainly an educative programme rather than a programme which would offer concrete material gains by providing with new avenues of self employment for those who have very inadequate resources. Obviously enough the purpose of science movement is to include newer actor groups and actors so that the gulf between various strata can be bridged.

Leave aside the non-governmental organizations which are voluntary bodies actuated by ideals of social services and also the people's science movement, there are scientific organizations which may feel impelled to undertake science education in the widest sense of the term in order to improve the life and conditions of the people. To this end such organizations may depend on the special sensitivities and social concern of some scientists to evolve, organize and man programmes, experiments for the development of the people. Such experiments or programmes can become either a permanent activity or can be taken up on a limited period of time. Yet the utility of launching and conducing such programmes can not be underrated or minimized because such programmes create a new model for emulation and at least give rise to a ferment in society. Sensitivity of scientists naturally results in enlisting cooperation of social scientists so that a programme is conceived of, planned and implemented in a holistic manner. That is how a proper cognizance is taken of the relationship between Man, Nature and Society.

One can not deny the importance of quite a different set of problems which arises when scientific organizations resort to basically educational programmes. On the one hand if science education is imparted to improve the performance of the students considerably it would mean entry into the market of a new group of students who would compete with others for suitable occupational careers and this prospect can be ignored. Likewise science education particularly in the field of health, while

useful in itself, may not satisfy the recipients because they would not have the wherewithal of providing the requisite supplies for meeting the requirements. Educational and material dimensions have to go together in order that programme becomes more viable and successful.

Science education per se is not sufficient but should have an ideological conviction so as to transform such an education into a practical and social transformation experiments. Acute analysis of the stark poverty of the people in the rural areas arising out of the non-availability of water for cultivating their field, necessitates a combination of ideological conviction as well as technical expertise and of course, a tremendous capacity for organizing people. The alone a programme of intervention based on expertise in science and technology can hope to have degree of success. Of course, incorporation of new actors and even more so of empowering the actors with knowledge, skills and the ability to question the traditional structure of authority and domination is very important. In a way therefore, a concrete experiment in science education has to take care of various complex dimension of social economic and political reality. Such an intervention which is based on a very firm and highest type of ideological conviction of the promoter has to be matched by at least the required degree of ideological conviction by the users or consumers of this experiment. It would be therefore useful to raise a question about the feasibility of maintaining the requisite tempo of ideological conviction ?

If on the other hand, programme of science education and technical advice, though an important part of the programme of intervention of a non-governmental organization which emphasized material and economic betterment of the people by providing new avenues of such employment, earning income, self confidence and self respect, the ideological fervour may be underplayed and substituted by a spirit of idealism. If everyone who participate in conducting such an experiment is convinced of the idealism of providing the requisite services to the people it could fetch results, without necessarily making any demands of an ideological nature on both those who implement such programme of intervention and also those who are recipient of such a programme. Rather ideology does not occupy a centre stage. However, inclusion of new actors and new modalities for promoting development of such new actors would also provide an important modality of science and technical education. As they say in English "the proof of the pudding is in eating" and therefore if such education is harnessed for improving the material conditions of the people more or less substantially, it would result in a multiplier effect. Thus it may help stimulate and even sustain social change.

The various questions raised about the nature and the efficacy of science education leads one to raise another issue of permutations and combinations which may provide a more meaningful and concrete solutions of practical problems. Thus the various modalities far from being mutually exclusive may in reality, be complementary for the simple reason that the proponents and

promoters of such experiments may reflect differences in their aptitude, approaches not to say values and convictions. Therefore it would be useful to raise question as to the precise relationship between people's science movement, which is extremely wide and ambitious in its scope, and concrete experiments which are expected to serve a vary specific end.

## Methodological issues

If one has to think in terms of permutation and combinations of various approaches and strategies such as the mix between education and rendering services which result directly in material benefits and some kind of moral persuasion. Would it be advisable to talk of a typology of science movement or in any case a programme or experiment for the development of the poorer section ? Can one discern a linear progression from one type to another ? As we have observed there are varieties of approaches embedded in the different kinds of experiments as exemplified by the KSSP to BAIF, from the abstract and the universal to something which is very specific and concrete. Whether or not these experiments are to be considered as science movement is another issue. In pure abstract or theoretical terms one may have differing opinion about this and yet if he wants to study the impact of science on social transformation a variety of experiments which may be rather specific and limited, need to be included. Similarly to what extent can one depend on the statement of objectives and goals as prepared by various organizations in respect of science and social action ? How far is it necessary to entirely rely on empirical approach as against

utilization of secondary material ? Consistently with the formulation about the philosophy of science movement, particularly people's science movement would it not be extremely important to understand and appreciate pre-requisites for both the organization and the working of the science movement ? Briefly put the prerequisites would be a socio-cultural and political support for the working of the science movement, which has to be further buttressed by economic or material outcome and benefits to the people. Any experiment however specific and limited, it may be, has to take care of this pre-requisites and if they fail to do so what would be the consequences ? Alternately a mere emphasis on the material outcome of such intervention may not qualify such experiments to be categorized as a science movement.

Science movement has to be understood as a special approach to development. What is implied by the proponents of science movement is the discarding of top to bottom approach and substituting it by from bottoms to top approach and philosophy. This would raise another problem of efficiency vs. democracy; participation vs. technocracy; ideology vs. pragmatism. As stated by Dr. Manibhai Desai it was both pragmatically and morally useful to create many small sticks instead of breaking or dividing a big stick, which was monopolized by a few. There is of course the usual problem of Micro vs. Macro and the replicability of any existing model, however carefully it may have been devised and also implemented in a more or less successful manner. Is science movement to be looked upon as a product or a process ? This would mean taking care of the dynamic aspect of science movement.