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SCIENCE AND TECHNOLOGY FOR DEVELOPMENT - INDIGENOUS COMPETENCE BUILDING *

by

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INTRODUCTION:

That science and technology (S/T) are necessary and important components in development process; that S/T knowledge is power and that this power is held by a few developed countries of the world are well established. However this does not follow that the developing countries can import readily this accumulated knowledge or that technology import is the quickest route or for that matter, the developed countries' model is the only model for the development of S/T competence building.

Sagasti ("Knowledge is power" in Mazingira) presents lucidly the difficulties in acquiring and utilising the accumulated stock of knowledge. The technologies developed in the West are to serve superfluous consumption and as means of destruction and do not serve the basic human needs: for a large number of specific problems of developing countries, developed countries do not have technologies; even if they do develop technologies in their own image, they cause serious distortions in social economic fabric of importing countries: even if technologies were appropriate, they are given under most unfavourable conditions: having got the technologies, developing nations do not have the capacity to use them effectively.

No matter how you look at it, the imperative need for developing countries is to develop self-reliant endogenous

capacity to find alternate routes; to generate relevant technologies; to screen, select, transfer, adapt and utilize imported technology and link S/T base with education, extension and production system. But this takes time and resources.

Several excellent documents are available and more particularly now in the papers before the UNCSTD on S/T for development. Several country and regional papers; position papers of U.N.agencies like UNIDO, non-governmental and other bodies all give a good account of the problems. The position paper of the Group 77 for UNCSTD presents a comprehensive clear and critical analysis of the major elements of S/T policy; the institutional arrangements; technology transfer and assessment; S/T information; development of human resources; financial arrangements; sub regional, regional, inter-regional and international co-operation in S/T.

I can add little to this picture. My attempt here is only to raise a few issues to show the matrix of great complexity and offer few proposals for program of action for operational guidance for the developing countries.

ISSUES

1. **ABILITY TO DISCERN:**

Knowledge is power; Power can be used and abused. Wisdom is to screen, select and apply knowledge to achieve a desired goal - in this case S/T knowledge for development.

This implies — first you have an access to knowledge; second, you have choices and ability to choose the right one

and the wisdom to use it for the good of the man and the environment in which he lives.

To get access to knowledge, the basic questions are: To what extent and in what areas sharing of knowledge is a human right? Knowledge is treated as a property to sell or commodity to trade in. To generate S/T knowledge costs money and time. To be given it away free may be considered as charity. If not, how is knowledge to be shared?

A vast amount of S/T information is however available in open form. Research results in basic sciences; from public funded laboratories; patents lapsed etc. are open information. The question is how to make it readily accessible on easy basis to developing countries. This calls for setting up information systems at different levels.

Question also arises whether on simple ethical and moral grounds, for the benefit of the poor, would the world agree to keep S/T information open pertaining to the basic human needs? Could we also agree that information may be shared, where technologies are yet to be developed on global problems that affect us all, like weather? Similar is the case with studies on Technology and the Future. Developing countries should know what scientific advances can be diverted to development process.

As matters stand, S/T information; generation and transfer is controlled by a few nations and companies. Technology transfer is a big business controlled by a few. The major issue is how to reduce the exploitative character of this transfer process.

Information is one thing; intelligence is another. Trade and technology intelligence are basic ingredients for national and international policies. Ability to collect latest information, to critically assess, screen, to find alternatives; to unpackage the technology package and to choose must be cultivated. This is the essence, the ability to discern. Trained minds are needed in research, industry and in decision making. A rational decision and choice can be hopefully made only if there are several techno-economic options and alternatives open. It also gives the country a bargaining capacity with technology seller.

The ability to discern; the wisdom to choose and use technology is the most critical faculty needed and institutional mechanisms are called for, for training and research in this area.

We must also realise development is a process; a continuing process; a trans-disciplinary process. The science of development must integrate the insights of S/T with those of economics, political and social sciences; This calls for a multi-disciplinary team.

The precise means of integrating S/T and development process; and the whole question of the relationship between self-reliant endogenous S/T capability, technology, transfer and scientific information are not yet quite clear;

A proposal for action on these related issues is presented later (Proposal 1).

2. TECHNOLOGY POLICY:

Who said "Technology is the answer but what is the question?"

Technology solutions can be normally found for technology problems. What is often lacking is the political will and committment to use S/T as policy instruments. What is technologically possible, economically desirable; commercially viable may not always be socially acceptable.

S/T resources are inputs and but means to securing outputs. Decisions about inputs must be dictated by those concerned with outputs. S/T activities must relate to defined markets or effective social demands on one side, and production environment on the other. S/T grows only where there is a firm linkage between S/T supply, demand, diffusion and delivery systems.

S/T demand is created by a cluster of policy instruments, defining areas where S/T knowledge is needed and where knowledge can be imported or indigenously developed.

The cluster of policy instruments cover industrial programs, priorities, legal, administrative, institutional measures to shape the structure of the industry, incentives, controls; venture oriented development banks providing risk and seed capital; promoting S/T in State enterprises; support services such as standards, engineering consultancy, information, technology diffusion, and delivery, extension, training etc. (F.Segasti STPI Project IDRC-109 C , 1978).

S/T capacity development often clashes with other goals and anxieties such as rapid industrial growth export promotion etc. Alternative options must be examined and hard political choices are needed.

All decisions are political and social. Such decisions are made by the leaders of the day. It is to see that they make right, rational decisions, several options must be provided to them. This then is also interrelated to the first issue on ability to discern.

3. **PEOPLE'S PARTICIPATION:**

S/T is organically and intimately interlinked with development, disarmament, security, peace, harmony, justice, social change and sovereignty.

Sovereignty rests with people and people should be in control of S/T. So far, S/T has escaped social control. To control, people must be aware of S/T and its impact on Society and societal values. People's awareness, participation and Control of S/T are essential.

If S/T are for people, people must be involved. What motivates them to be involved? If only S/T can practically demonstrate how their living and working conditions could be improved; their economic returns increased; social prestige increased and the drudgery of work reduced, people will accept S/T and ask for more.

Social organisation, cultural values and behavioural patterns of people have a direct bearing on people's willingness and ability to accept, adapt and absorb technology. Attitudes

towards authority and change, achievement motivation, propensity to take risks reflect on labour productivity and managerial efficiency. In traditional societies, on the name of respect for elders or people in authority, from the childhood, the questioning attitude is curbed at home, at school and even in a research institute. Then how can science thrive without the very basic questioning, critical, analytical inquiring mind?

We have to not only cut off this strangle hold, but create an environment conducive to creative, innovative attitudes and develop a national urge for innovative, problem-solving capability.

An organised effort and institutional arrangements are needed to make people awaken and aware; to popularise science to inculcate scientific attitudes; to increase resourcefulness and problem solving capability; to improve skill and entrepreneural abilities, to make people accept, absorb S/T and to create a thirst for more.

Some of these issues are discussed in proposal Two.

Let us now turn to the S/T elite in developing countries. By training and temperament, they are more oriented to the West and get alienated from the people they belong. They undertake international fashion oriented research or research related to elitistic demands: How to motivate those scientists to go to people, know their needs, conduct research and generate technologies relevant to rural needs is a pressing problem.

Some would argue that th job of the re earcher is at the laboratory bench and not in the field. True to an extent; but how can one generate relevant technology if he does not a have a feel for the realities?

Who will then define people's needs? The rural people are not articulate enough to express their needs. It is not the hungry man that goes on hunger-strike. It is the elite again sitting in air-conditioned rooms that offer the grass - roots plan.

Further the peoples'needs have to be translated into technological tasks and tasks assigned to task forces.

Task force approach and working as a team is not a major strength with creative people who tend to be jealous husbands. But as stated earlier, development process is transdisciplinary requiring transdisciplinary tea s to generate nd utilize technologies. How to give the individual researcher freedom and flexibility and yet make scientists and technologists work in a multidisciplinary team need careful orchestration and management.

The ambivalent attitudes of the researchers in Universities and research institutes towards tackling grass roots problems have to be changed. Vocational, professional and teacher training college should become power plants to generate moral and intellectual energy among the students to prepare people for development (Gunnar Myrdal : The World Quarterly April , 1979).

To generate relevant technology package - is onething. To deliver it at the doors of the people that need it and to present it in an assimilable and understandable manner, require extension skills. It is a people to people process. To catch the fish, the bait must be attractive to the fish.

Some of these issues are covered in proposal Three.

4. SOCIAL VALUES AND TECHNOLOGY CHOICES:

Development is to make life WORTH living. Worth depends on values and values dictate life styles; life styles create demands for products, processes and services - which in turn Science and Technology.

The focal social value what the society values most today appears to be material acquisition and conspicuous consumption. This has lead to domination and disparity, depletion of resources and degradation of environment, creating pollution of prosperity and pollution of poverty.

There can be no better focal social value for a man than to live with a sense of values of human dignity. Dignity comes from gainful employment, self-competence, confidence and self-reliance.

Self-reliance thus becomes a focal social value, a basic need and human right. It is said that the next world war is on social values and life styles.

Such a change in social values would mean alternative development and alternative life styles calling for new sciences and alternative technologies.

Instead of the emphasis on science for science sake, if only partly, it could be science for the sake of societal values; instead of technology for profit or war purposes, if only it could be alternative technologies, to make the man self-reliant; more productive increasing his skills and economic returns, reducing the drudgery of heavy or dirty work improving his living and working conditions and quality of life.

Technology needs in developed countries are motivated by profit or for military purposes. The priority needs of developing are to basic human and other needs. As the needs differ, technologies should differ and hence the case for alternative technology development.

There is yet another reason. Industrialisation and urbanization are considered inevitable. The modern S/T is an instrument of such development and not born out of rural development on which developing countries lay so much emphasis.

In many developing countries people live in rural areas mainly on agriculture. Agricultural development is a pre-requisite but that is not enough. Agricultural produce should become the raw material for industries to be set up in rural areas. Such rural industrialisation would mean additional employment; bring city comforts to the villager and not taking the villager to city slums.

Here again technologies are needed to utilise and maximise the returns, resources both natural and human; to

upgrade existing skills; to weave in modern methods into traditional tapestry, to scale down processes etc. Rural industrialisation would also mean decentralisation; geographical distribution; match environmental conditions, high level technology for survey of local resources and requirements and development and dissimination of employment generating technologies.

Setting up of crop based industries for rural industrialisation is discussed in proposal Four.

PROPOSALS FOR ACTION

Four proposals are presented here each as an example for specific action on some of the issues discussed earlier. These proposals are based on some experience in India.

The first proposal relates to setting up a national Centre for Development Alternatives (CDA) to accelerate indigenous technology competence for autonomous decision making and some aspects of ISSUES on ability to discern and technology policy.

The second proposal is about CHETANA which means awareness and awakening. This is a voluntary agency to promote people's participation and act as a catalyst for action mobilising and utilising technology (This relates to ISSUE 3).

The third (KARIMNAGAR EXPERIMENT) is a proposal for technology delivery system, to bring science and technology to the doors of the people at grass roots level and change the face of underdevelopment.

The fourth is a methodology for rural industrialisation to bring about rural urbar continuum rather than rural urban dualism. Additional information inter-related to this proposal is seen in the Draft Report of the Technical/Official level meeting of the International Forum of Appropriate Industiral Technology (New Delhi , 1978) under Light Industries and Rural workshops.

PROPOSAL : 1 = Centre for Development Alternatives: Indigenous Technology Competence Building:

Introduction:

Development efforts have so far been aiming at increasing the Gross National Product but have not been successful in increasing the overall quality of life in many developing countries. Problems associated with wide spread poverty keep lingering on and the poorer people do not seem to be a part of national development. In order to analyse alternative paths to development, where man's creative ability and productivity are fully utilised, a multi-disciplinary approach is called for. A viable programme which takes into consideration the economic constraints, the social conditions, cultural traditions and yet utilises the emerging trends in scienoe and technology is called for. To evolve such carefully considered alternative technologies, and alternative development systems, a multi-disciplinary, multi-institutional organisation under the title 'Center for Development Alternatives' may be established as a National Centre.

The way science and technology have been generated, used and abused, has led to high disparties and domination by

a few, depletion of resources and degradation of environment resulting in thousand million poor of which 80% live in the villages. There is now a new and genuine concern for the liberation of all men from want, alienation and exploitation. The rural poor have a right to better life, and must be drawn into the process of development. For achieving this goal a new approach based on proper application of Science and Technology is needed.

Alternative development systems need to be man-centered, need-based, endogenous and self-reliant. They should aim at development of man as a self-competent, self-confident and self-reliant individual. He must be able to get gainful employment to live with a sense of value of human dignity and in harmony with his environment.

One approach to build such alternative models would be to treat each industry as a minimum package As contrasted to the existing models namely; the advanced countries capital, energy, machine, sophisticated technology, productivity and pollution intensive model and the village industries and labour intensive but less productive model, examine critically alternatives for each subsystem of the total production system, against set goals and criteria.

Some of the criteria for such alternatives could be:

1. to maximise the yields and returns for the resources - natural, material, monetary and human resources & skills.

2. equitable distribution of the net-gains therefrom.

3. additional gainful employment.

4. increase competence of the worker.

5. increase self-confidence, self-reliant attitude.

6. to live in harmony with environment - not to control or be controlled by nature.

We may then arrive at a series of alternative development models.

OBJECTIVES:

The objectives of the Centre are:

1. To make a detailed study of the systems, sub-systems and build alternative models covering the entire spectrum - from raw material, inputs through processes, products, quality control, marketing services, linkages, sales etc. Work will be undertaken commodity/product wise. - examine alternatives for capital, technology, energy, pollution intensive advanced countries model and the less productive labour intensive village industries model.

2. To build and work as a multidisciplinary multi-organisational team of scientists, technologists, production engineers, economists, social scientists, systems analysts, market, management and finance specialists, bankers, industrialists, farmers and administrators.

3. To build indigenous competence, to analyse, assess and select suitable development alternatives and evolve systems, policies, programmes, strategies and the ability to discern.

4. To act as a focal point for consideration of all aspects of rural development and evolve strategies for overall development.

5. To closely examine the traditional technologies and strengthen them by intermixing them with modern methods of science and technology.

6. To undertake research in order to develop effective technologies and utilisation thereof.

7. To arrange practical demonstration of efficient working of such alternative technologies and alternative models.

8. To act as a regional R & D center for rural development.

9. To promote effective interaction between R&D scientists, entrepreneurs, funding agencies and users through organisation of frequent get togethers/meetings and demonstration.

10. To create a forum for the scientists to become aware of wide spread rural problems and direct their work in the pursuit of scientific solutions of such problems.

11. To undertake any related activities.

ACTIVITIES:

The center will have three major activities.

a) Technology assessment: Collection of information, analysis, assessment and communication.

b) Research: Will undertake research on building alternative models and projects which are likely to open up new avenues for development; will also form out research projects to competent agencies and work as a multi-disciplinary, multiorganisational task force for each specific project.

c) Extension: To put on ground and practically demonstrate the alternative models; to bring together technologists, industrialists and bankers and to bridge the confidence gap between technology generator and user.

An example: Leather Industry:

The centre for Development Alternatives at Central Leather Research Institute has studied 7 alternative models for the manufacture of leather goods. It is easy to see that centralised management with a master designer and master cutter; looking after markets, finance, quality control, design and cut components and with decentralised production can compete favourably with capital intensive model and yet give gainful employment. So is the case with footwear. Work is being done now on agro-and other industries.

CDA will help in:

1. Building indigenous competence and self-reliance:

Building Alternative models will help build competence to assess, analyse and choose; the mechanism to assess indigenous and foreign technology; to unpackage a package and have a bargaining capacity in the import of a portion of technologies only where needed etc; ability to blend the sophisticated and traditional; labour and capital intensive methods and the ability to discern.

2. Improving the decision making process:

The authorities concerned are now presented with alternative techno-economic, social options to choose one amongst them. The decisions became less arbitrary and not based on consulting astrologers.

3. Public awareness:

The intelligent public, press and parliament being aware of the alternatives would force the decision maker to take a rational decision.

4. Build transdisciplinary culture:

Development is a continuing trans-disciplinary process. Therefore, even decision making is transdisciplinary. The researchers realise alternative models building require transdisciplinary team, each discipline has a role to play and build the much desired transdisciplinary culture.

5. Easy to implement:

Alternative model building team comprises of industrialists and bankers. If they are satisfied, it is easy to put the model on ground. What all the government has to do is to not come in their way.

Net work of CDAs:

The national CDA of each developing country may be fruitfully interlinked to exchange ideas and information and enriched from each other's experiences.

Regional CDA:

A regional centre for development alternatives may operate on the pattern of IDRC, making resources available to grants or contracts to national CDAs; provide facilities for distinguished scholars and experts to join the transdisciplinary inter-country teams and to practically demonstrate alternative models.

This proposal covers some aspects of ISSUES 1 and 2.

PROPOSAL : 2 = 'CHETANA' (Awareness):

S/T's concerns are with people. The need is to raise the people's capacity to accept, adapt and use technology; to improve skills, tools, techniques and entrepreneurial abilities and provide an environment for creative innovative scientific attitudes.

CHETANA is a CATALYST for such action. It is to reach out to the villages and put relevant development projects on the ground.

CHETANA is a TECHNOLOGY DELIVERY system at the grass roots level. It promotes a two way traffic for technology delivery down and identified technology needs up for researches to develop relevant technologies.

CHETANA is AUTONOMOUS. It is government and yet not government. It has the credibility and respectability backed by the Government and yet it is an autonomous registered society.

It is a voluntary agency and acts as an umbrella for other voluntary agencies within the State.

CHETANA IDENTIFIES developmental and technology needs and formulates projects with the help of the rural people. It identifies technology generators and extension agents as well as financial agencies to back the projects.

CHETANA IMPLEMENTS the projects through government or voluntary agencies, who have proven competence and more important the confidence of people in that area. It monitors and evaluates the projects.

CHETANA FUNDS: It offers Risk Capital and Seed Capital for proving plants and to practically demonstrate technologies provided there is a promise of multiplier effect.

CHETANA TRAINS: It is proposing to set up an Institute in rural areas with the assistance of others, to train village workers at two levels (a) to improve tools, the villager's skills, techn ques through inform l on the job c after the job training and (b) to improve leadership/entrepreneurial abilities.

CHETANA RECEIVES funds both from government and grants from public and private enterprises and individuals which are given tax exemptions. Several of its field projects are also directly funded by outside agencies.

While CDA provides the intellectual inputs, CHETANA reaches out to people and implements the alternative technologies and alternative development projects.

A pamphlet on CHETANA will be made available at the meeting.

This proposal covers the ISSUES No. 3 and 4.

PROPOSAL 3: = Technology Delivery System:

Karimnagar Experiment - "Adoption of an underdeveloped district":

The Council of Scientific and Industrial Research (CSIR India) ventured to experiment on changing the face of underdevelopment through application of science and technology. CSIR undertook to adopt an underdeveloped district - Karimnagar in Andhra Pradesh State.

A district is taken as a unit because it has clear boundaries, 2 million people, distinct plans, funds and authority.

CSIR is the single largest civic research organisation covering every scientific discipline and many an industrial subject and over 48 national laboratories and 20,000 people working under its umbrella.

Adoption of a District program is an unique experiment.

The expectations and some of the limitations are presented here.

1. OBJECT:

.1 to take science to the doors of the people that need it;

.2 to change the face of underdevelopment to through application of science and technology;

.3 to provide extension service from the laboratory to the rural people.

2. EXPECTATIONS:

A. To scientists:-

.1 Scientists to go to the villages to get to know the problems of the real world and the needs of the rural people;

.2 to identify technological tasks to meet the needs;

.3 to reorient and make research relevant to rural needs and generate transfer and utilize relevant technologies;

.4 to recognize social factors and boundary conditions that influence technology needs and technology transfer;

.5 to provide an effective delivery system — an extension service to rural people similar to agriculture and industry to practically demonstrate — showhow of the knowhow.

.6 to understand the transdisciplinary character of the development process; to build transdisciplinary team and bring about a culture, of working as a team;

.7 to prove to themselves that their researches bear fruit and get a sense of achievement; stay more at home and less brain drain;

.8 to realise their own social responsibility;

.9 to make it a fashion for others to copy and multiply;

.10 to create faith in science and technology amongst people.

B. To people:

.1 People know about doctors, lawyers and astrologers, how they will come to know of scientists too; and how science can solve their problems;

.2 more faith in and thirst for science and technology, instead of astrology, more rational attitudes; greater resourcefulness and problem solving capability;

.3 involvement of the people and galvanizing their efforts, experience, skills and local resources;

.4 a feeling facing of adventure and pride in achievement;

.5 more gainful employment;

.6 multiplier effect.

C. To planners and Policy makers:

.1 a different approach to gross root planning;

.2 to use science and technology as a tool for integrated/rural/regional/eco-sound/man centered development;

.3 better utilisation of resources including technical manpower;

3. **LIMITATIONS:**

.1 not all scientists are good extension workers;

.2 limited experience in working with people in rural areas;

.3 scientists are more urban/foreign oriented and alienated to the very rural areas they belong;

.4 easy to work at a laboratory bench than facing the live problems and living in rural areas;

.5 Award/Reward systems are loaded in favour of internationally fashion oriented research and not in rural problems;

.6 to some, rural problems are not intellectually exciting;

.7 administrative rules in regard to TA/DA etc. and management practices come in the way of scientists moving to the villages;

.8 No established culture for working as a multidisciplinary multiorganisational team - cooperation is not a major strength;

.9 managing a team drawn from multiorganisations tends to be diffuse; lack in unified control suffer from professional jealousies, departmental diseases, e c.

.10 lack of sufficient interaction and inputs from social scientists;

.11 lack of people's participation in planning and management;

.12 even amongst the rural poor, the intelligent exploit the ignorant;

.13 lack of a well defined plan of action; demarkation of authority, and responsibility, etc.

.14 As it is an experiment, groping in the dark as it were; feeling one's way has its own limitations;

.15 political/religious leadership of the District and the State were deliberately kept apart from this experiment. It has its mixed blessing.

.16 The village level politics do cut into the experimental conditions;

.17 Where CSIR has no competence like education, family planning, etc. [illegible] did not even take off the ground.

4. SUCCESSFUL:- WHY?

None of the original minimal goals and expectations were met by this experiment. Karimnagar experiment has catalysed a number of educational/research industry/and other organisations to adopt village/cluster of villages. It has become a fashion.

The people in the District are aware and awakened to the use of science and scientists. So is the State Government. Scientists have a feeling for the villages and realisation that public funds are to be publicly accountable and a sense of social responsibility. But when the original limited objectives are expanded to cover an integrated rural development with a specific emphasis on the rural poor, requiring inputs both social and scientific from a number of organisations outside CSIR; one observes limitations, mixed successes and failures.

Where it is successful - it is due to

.1 strong faith in and committment to the cause and use of science by the political leadership - the Minister and Prime Minister at the Centre;

.2 Unconditional support by the State Government and the District authority;

.3 The District Collector made as the leader of the project;

.4 The proximity of two major national laboratories to the District under experiment;

.5 CSIR has considerable strength and experience to generate, transfer and utilize research results in a wide variety of areas;

.6 The Director-General and the Project leaders are fully conversant with the District, its people and their attitudes, needs, etc.

.7 The success is more pronounced in areas where CSIR has strengths and unitary control.

5. REPLICATE:

This unique experiment with suitable modifications deserves to be replicated in India and other developing countries.

This proposal has a bearing on ISSUES No. 3 and 4.

PROPOSAL : 4 = Leaf to the Root - Rural Industrialisation:

Much has been said about rural poor, rural development and rural industrialisation. The latest studies on development talk about man-centered, endogenous, self-reliant, need based eco, economic and social development.

Experience has shown, setting up large industries in rural areas is not rural industrialisation. The slogans such as small is beautiful; village and intermediate technologies will do for rural development have also proved to be only slogans.

The main theme is to provide gainful employment for the rural unemployed, underemployed people. Employment gives a sense of dignity; helps greater equitable distribution of incomes and helps the man to stand on his own legs. To make the poor productive, ways must be found to increase skills, enterpreneurial attitudes, resourcefulness and problem solving capability of people, in addition to raising capital per worker and technology inputs.

Science and scientific method help increasing the creative innovative attitudes; technology is problem solving capability. Couple Science and Technology - to increase the resourcefulness and problem solving capability of the man. Man's resourcefulness is his best resource.

Rural poor live on land: One should therefore consider ways to increase the returns for the resources for a given hectre of land. This may be best done through industrialisation, utilising every crop and every part of the crop from leaf to root. Instead of the customary way of looking at agro-and agro-waste based industries, every part of the plant should be considered as a raw material for an industry.

For example:- Cotton: Cotton leaf goes in to Vitamin 'C'; cotton stock into particle board; linters for nitro cellulose; seed into oil, fatty acids, hydrogenated fats, chemicals; edible protein and finally cotton seed cake as animal fodder and fertiliser.

Take Turmeric:- may be utilized for edible dyes, oleo-resins, skin creams, insecticides and turmeric leaf into paper plates.

One could, therefore, build 5 or 6 industries centered around each crop. In some cases technologies are available, in other cases they are to be developed. Further the economics and competitiveness of such products also have to be examined.

Industries centered around each crop would mean locating industries in the villages where the bulk material is; stable prices for the produce for the farmer; additional gains and savings ploughed back by the farmer into industries as a

shareholder; additional employment; electricity, roads, transport, cinema and other urban comforts coming to rural areas.

This then would mean a Rural-Urban continum and not Rural-Urban dualism. This would mean bringing city comforts to the villager and not taking the villager to the city slums.

This is not enough.

One should examine further how to maximise the resources for a hectare of land.

On the land there are soil and water; people, animals; agricultural crops and social forestry or forest crops. Each is a resource. A cumulative exercise will then be needed to maximise the returns for each of these resources and decide the number of the people, animals and the type of the crops and the industries that could be settled on this hectre of land.

One could start with th available tec nologies and the market needs. But the total integrated picture must first be thought out clearly and the mosaic pattern competed in stages over a period depending upon resources, skills, capital, etc.

A study on social implications of such a Rural Industrialisation would be worthwhile.

Such an exercise would mean generating and utilising technologies relevant to local resources and needs.

This proposal deals with some aspects of ISSUE 4.

TO CONCLUDE:

Technological development and self-reliance in developing countries is a complex process that takes time and resources. The scope and dimensions are vast to deal here with each element in detail about the technology policies, programs, technology generation, transfer, mobilisation, utilization, assessment; institutional and financial arrangement, and supporting services like information, training, etc. The emphasis here is only to raise some specific issues and seek to resolve these issues through concrete proposals for action. The methodology and approach to deal with the overall objectives for operational guidance are indicated.

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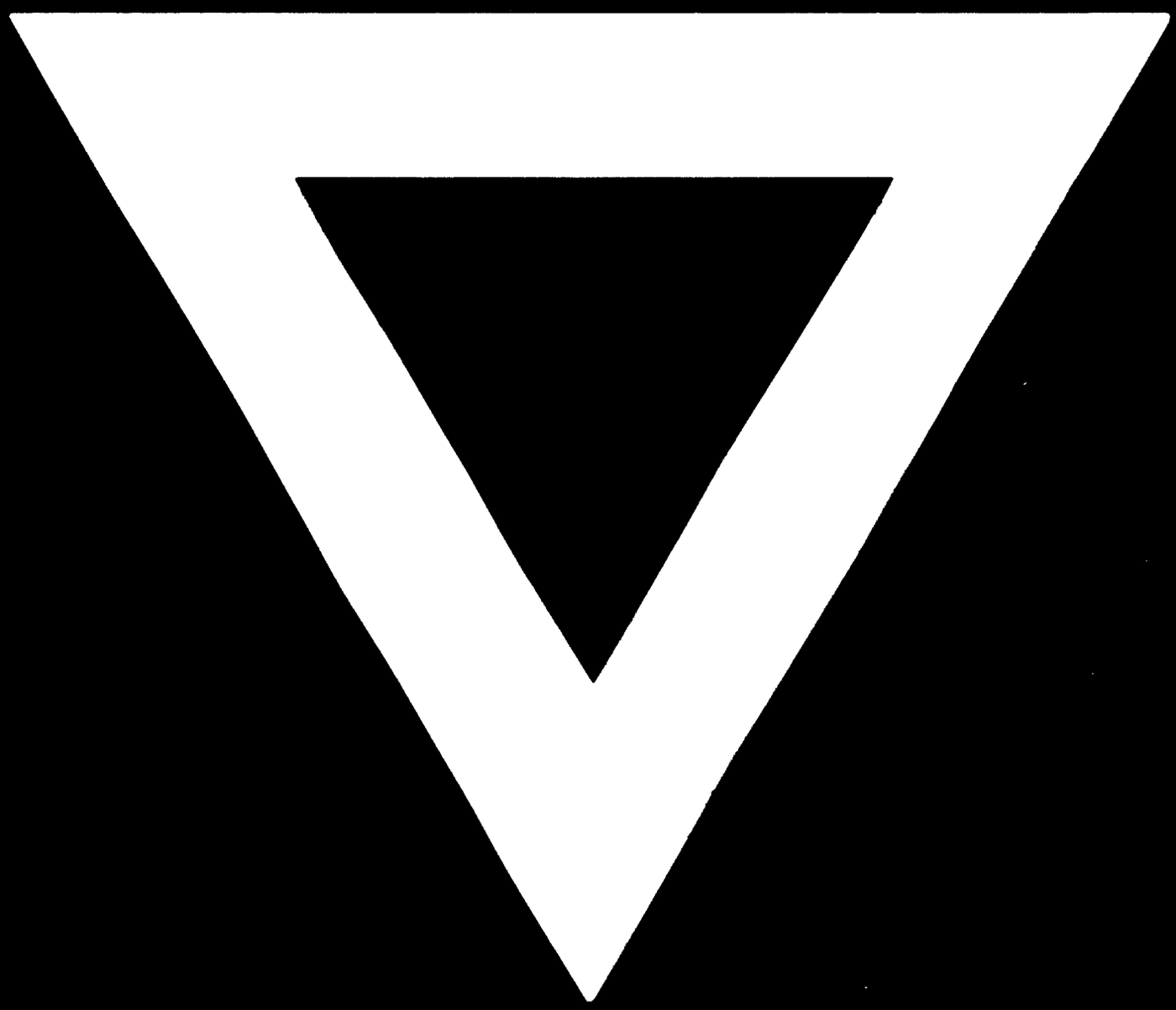

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