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SOME BASIC CONCEPTS FOR DEVELOPING APPROPRIATE TECHNOLOGY FOR RURAL AREAS

Background Paper

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SOME BASIC CONCEPTS FOR DEVELOPING APPROPRIATE TECHNOLOGY FOR RURAL AREAS

by

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Introduction

Technology involves the application of science and knowledge to practical use, enabling man to live more comfortably and securely. Fire, the wheel, the tools used in the stone, bronze and iron-ages and the industrial revolution are all links in the same chain. Man, being a rational animal, could manipulate, exploit and use various natural materials such as minerals, plants, animals and energy for this purpose. After hunting animals, man developed an agricultural society and later an industrial civilisation as he followed the path of development and progress, all the time using his knowledge, ingenuity and craftsmanship to develop all sorts of tools and contrivances. Occasionally, he suffered a setback in this process because of the long term adverse effects of a technological innovation - for example, the introduction of extensive and intensive agriculture and indiscriminate deforestation led to soil erosion and the creation of deserts and dust bowls.

The advent of the industrial revolution, which was brought about by the application of mechanised power to production, gave a qualitative jump to this process. Prior to that man's work was generally carried out using human and animal power with very little mechanical energy derived from an external source being used. Fire was the only external source to be used for cooking food, heating, softening and melting metals and minerals. As agricultural technology had brought human beings out of the forests and concentrated them in organized settlements, so mechanised power, which could be applied on a much larger scale, created a high concentration of productive activities, thus leading to the creation of large urban complexes, and the concentration of wealth, political and economic power in the hands of smaller groups.

In the western industrialised nations, the rural societies dwindled and shrank to 5% to 6% of the total population.

The main advantage of mechanised power was that it concentrated production in one area, yielding larger profits because of easy management. However, in recent times these advantages have been offset by recurrent labour disputes which can also be easily organised in concentrated areas and result in loss of production and the exertion of pressure on industries. The organisation of industry became so complex that management started depending on new techniques of management, such as remote control, computerisation etc.

LARGE VERSUS SMALL:

There are certain rules for the growth of industries and companies in the same way as there are rules for the growth of animals and plants. After some time, industry and companies like cities become unmanageable once they exceed a certain size. Efforts should therefore be made sufficiently in advance to determine the optimum size of an industrial activity. Dr. Schumacher invented the slogan "Small is Beautiful" in defiance of the modern trend of 'the Bigger the Better'.

We cannot always blame modern science and technology for the overgrowth in the size of industrial activity. Some modern developments have actually helped in decentralising industries and establishing smaller size holdings. When steampower held sway, engineering workshops used to be very large to take advantage of the large boiler and steam engine efficiencies necessary for providing motive power to the machines. However, the introduction of electric power reversed this trend and we can now see tiny cottage workshops at the side, even in rural and semi-urban areas, run by one or two people. Many of the engineering workshops are now back to the size of the ancient Smithy, although they use more up-to-date techniques.

It follows therefore that it is possible to use modern inventions to reduce the size of industrial holdings and to disperse them widely for the sake of employment generation and the balanced development of a country.

ENERGY AND POWER:

The motive power for modern industrial development is almost totally based on electricity, which can be easily transmitted by cable throughout the length and breadth of a country. The main problem is how to generate electricity itself. Thus far, fossil fuels, viz., coal and oil, have been almost exclusively used for electricity generation. But supplies of these will soon be exhausted. There is a danger of industrial civilisation collapsing completely if no alternative method of generating electricity is found soon. A great effort has been made in the last two decades to replace fossil fuels by nuclear power. However, nuclear power has not yet won the confidence of the managers of the modern world as a potential source of energy because of incalculable safety problems and indivisible radiation hazards. The main question therefore is:- Whether it is possible to generate electricity or use mechnical energy based on income energy. The most important forms of income energy available at the moment appear to be the following:-

1. Solar
2. Wind
3. Mini Hydel
4. Wood
5. Animal dung.

All these are available in abundance and will be automatically replenished as they are consumed. Wood can be replaced by human beings through afforestation and tree planting on a systematic basis.

Life Style And Suitable Products:

We have to calculate whether all the above mentioned sources of energy will be capable of providing sufficient power to sustain mankind in the extravagant manner in which he has become accustomed to live. If not, what kind of life style can they sustain? Would it necessitate a drastic reduction in the life style of all people throughout the world?

This brings us to the question of the selection of products that will find a ready market and yet will not tie the people of the world to a life of luxury and extravagance. A reappraisal has to be made of the priorities for newly-selected products, which is based more on need than on greed. During the past century we have seen an influx of new products which are killing or displacing traditional products such as man made fibres displacing cotton and wool, whiteware pottery displacing red-clay pottery, fountainpen displacing reed pens, toothbrush replacing datwan (a tree twig used for brushing teeth), tractors displacing bullock driven ploughs and implements, cement concrete displacing mud, thatch bamboo and timber, white crystal sugar displacing gur and khandsari, Dalda displacing vegetable oil or ghee, plastic replacing wood, metal, leather etc. etc.

ADVERSE EFFECTS OF TECHNOLOGY:

The development of technology is no longer a smooth and easy process. The erratic effects of modern technology are perceived in a very short time. Earlier when agricultural technology was introduced and forests were destroyed to set up a civilisation based on cultivation, the adverse effects were perceived in thousands of years. But now, after only 200 years, industrial civilisation is being threatened by a serious crisis. The principal threats to this civilisation are:-

1. Exhaustion of resources on an unprecedented scale;
2. Pollution of land, rivers, oceans and the air by effluents and wastes, fumes and radiation released by industries in huge quantities;
3. The breaking up of the social fabric due to methods of production which alienate the human being from the production process and make him into a machine tool or a cog in the wheel of production. This has resulted in a large number of dropouts in highly industrialised countries and vast income differences in the developing poor countries. Because of this and because of the very low level of production in the developing world, the thought was conceived of developing a technology more in tune with nature, more permanent and peaceful and giving a better income to the worker and artisans in the developing countries. This has been referred to by various names but the most popular usage is 'appropriate technology'.

APPROPRIATE TECHNOLOGY:

The concept of appropriate technology endeavours to eliminate the adverse effects of modern technology by devising technologies for peace and permanence, by making units as small as possible, by dispersing them over a wider area and by ensuring a living wage to the people, who work at it. It also tries to change the life-style of the world, characterized by extravagance and conspicuous consumption, by bringing mankind back to a life of simplicity which is in harmony with nature. Thus under the production programme of appropriate technology, a new list of products based on this ideology has to be prepared. One of the criteria for fixing priorities is the meeting of the essential needs of human beings.

APPROPRIATE TECHNOLOGY FOR AGRICULTURE:

Food will naturally take pride of place in this list because no one can survive without food, other essential needs such as air and water being supplied free by Nature. For producing food, an efficient and appropriate method of agriculture based on the criteria laid down above has to be developed. In developing countries this raises two basic questions. Firstly, whether sufficient return can be obtained by subsistence farmers who have to make an increased investment according to new technology of farming. Even if by so doing the productivity of the farm is increased which is obviously in the national and international interest, the interests of the individual farmer have also to be taken into account. If by investing £.2/- a farmer can get a return of £.4/- it is a 100% return on his investment. On the other hand, if by making an investment of £.6/- he gets £.9/- this is only a 50% return on his investment, although the output of his farm has increased from £.4/- to £.9/-, which will add to the total reserves of food.

INPUTS:

The second basic question whether the inputs of technology and material can be obtained from the rural area itself or will have to be brought in from cities and urban industries. In the latter case, the resources of the rural areas will be siphoned off into urban areas which the concept of appropriate technology tries to restrict. In the calculations given above, the total investment of £.6/- was for fertilizer, irrigation, high-breed seeds and mechanised equipment which are usually obtained from urban areas. This siphons off the resources from rural areas to the urban area & further impoverishes the rural population. In the earlier case, the investment of £.2/- in the form of local seed, green and organic manures, bullocks and ploughs and human labour will all be retained in the rural area itself.

It should therefore be borne in mind that unless improved agricultural implements or new techniques bring about a tremendous improvement in productivity and quality of the product they should not be recommended. If a small tractor ploughs the same area of land in a day as the bullocks there would seem to be no sense in introducing tractors which consume large quantities of oil, purchased from urban centres.

Similarly, chemical fertilizer bought fr factories in the urban centre, do not make a great deal of difference to production in the long run, while they do adversely affect the fertility of the soil. Would it not be better to use organic manures like animal dung, properly composted, instead . Animal dung is now used extensively as kitchen fuel and we will revert to this later. As far as green manures are concerned the problem for the farmer is that it keeps the field engaged without giving him any cash return from the green manure crop. If some variety of green manure such as Indigo could be introduced which would give a cash return to the farmer in some form they would be able to raise the crop of green manure for the benefit of the land. This would be much more useful than chemical fertilizer.

The main problem is that the new techniques and processes introduced in agriculture have so far been taken advantage of by large and wealthy farmers who own vast tracts of land to which the new techniques are best suited. In addition to buying their inputs from the urban areas these well off farmers become accustomed to luxuries and spend their surplus income on conspicuous consumption and exotic goods from the cities. This further siphons off the wealth of the country-side for useless goods, such as cars, refrigerators, terylene and polyester clothing, plastic goods, watches etc.

The other important areas in agricultural technology are irrigation facilities, harvest and post-harvest and processing techniques and storage. The most widely used irrigation method at present is by tubewells. This again helps mostly the wealthy farmers, lowering the water level, drying up wells and tanks and the poor farmers are further deprived of water facilities. In the areas which are irrigated by canals, the situation is a bit better. However, the poor farmer has to depend largely on rain water and thus his choice of crop is strictly limited.

For harvesting , human labour is still used on a very extensive scale, creating a shortage of lab ur at harvest ime. There is perhaps a need for an appropriate implement for harvesting which can be bullock driven or with small power. But it will have to be ensured that the traditional labour employed in these areas does not suffer as a result.

Because of the inefficient post-harvesting and Processing techniques this important income-generating activity is shifting to the urban areas. There is a need to develop efficient mechanical threshing, hulling and grinding equipment which can be operated on the farm itself to give a maximum return to the growers. The important areas in this field could be wheat grinding, which is carried out at the moment by small power (atta-chakki) wheat grinders, rice dehusking, and oil extraction from vegetable oil seeds. Factories producing semi-processed foods (canneries, bakeries, pop.t making plants etc.) are not suited to rural areas and attempts to introduce them have usually run into difficulties.

INDUSTRIAL PRODUCTIONAND PRODUCT SELECTION:

The next most important priority after food production is cloth which is used by every human being. As far as industrial production is concerned, there is a wide variety of products, ranging from supersonic, planes and locomotives to pins and needles. A judicious selection of products from the list of new and old consumer goods will have to be made which can be produced in rural areas. The main problem will be whether a large enough market can be found for these products (which are mainly intended for the 10% of the population living mostly in urban areas) if, they are produced, on a large scale, in the villages. For example, at the present time only 5%-10% of the population eats white granulated sugar, while everybody else, if at all, uses only "gur", a sweetenor. If white granulated sugar were refined on a very large scale would it be possible to sell it? This is to ignore the fact that it may not be desirable for such a large population to eat granulated sugar. Similarly, toothpaste sells well, but if produced on a large scale by the villagers could it find an easy market everywhere and if manufacture were permitted on such a large scale would it not be responsible for an increased incidence of dental caries. The rural alternative to toothpaste is a twig of neem or some other tree. but these twigs do not give a substantial return to those who sell them. Thus the other important question which the experts have to decide is what products should be selected for village industries, bearing in mind that they should produce a substantial return for the producers and should also promote healthy consuming habits based on natural needs and not on greed andartificially stimulated needs. This in fact calls for a shift in life style away from that promoted by Western industrial civilisation. There cannot be any doubt about some of the items already mentioned, notably cloth as this is the next most important priority after food. It is very difficult to fix the third priority and we have to choose from products such as house building materials (not an item of regular consumption) and footwear (not worn by the poor, although derived from an important raw material, hide and skin being available in abundance following the death or slaughter of animals). As far as the food industry is concerned, milk products based on animal husbandry, vegetable oil and cooking fats produced from oil seeds and poultry etc. and certain items which do not come strictly within the compass of industrial production can be useful products. No one can dispute that these products are vitally important and are greatly beneficial to the health of the general population. A range of other consumer products could be listed their importance varying according to local conditions and requirements, e.g. wool products, jute goods, bullock carts (based on the age-old skill of carpentry), agricultural implements (based on the blacksmith's traditional art) pottery, pens and cooking utensils (based on thepotter's ancient skill). Paper, sugar and cement are important consumer items of the present time which are manufactured only on a large scale. Fertilizers are also produced on a large scale. Power generation in the wake of the impending energy crisis.

Because no attempt has been made to improve the technology of rural industries, these industries are migrating slowly to the urban areas. This has resulted in a reduction of the percentage of rural artisans and industrialists from 13% in the year 1910 to 7% in the year 1970.

TECHNIQUE OF PRODUCTION

Once we have selected the products according to our needs, altruistic ideals and their marketability the next most important step is to determine the technique of production. It is quite obvious that the technique which is used for large-scale production in urban areas would not be appropriate or suitable for production in the rural areas. Even reducing the size of the plant, i.e. miniaturisation, does not always serve the required objective. Research and development studies must be undertaken to determine the production technology for each and every item to be manufactured on a small scale. But when fixing the optimum size, the most important criteria is that the product should be comparable as far as cost and quality are concerned with the mass-produced products of large industries. It is true that production on a smaller scale gives an advantage in that if produced for the local market it saves costs in transport and in overhead management, tax and excise duty etc. Large-scale industry has a definite advantage in its economy of scale, in research and development expertise, in more efficient management, in easy access to financial and other infrastructure etc. These respective advantages can cancel each other out if the quality of small-scale products is good and costs are kept down. The other advantages of appropriate technology, apart from helping backward rural areas are:-

(i) smaller gestation period as most of those industries can be established within six months of planning, whereas large industries take 3 years to 4 years, and the capital remains tied up;

(ii) Equipment does not have to be imported and most of it can be fabricated in small workshops and machinery can be bought within the country.

After the research and development work has been completed for each technology, it is necessary to set up pilot projects in actual field conditions to test the economic viability and technical feasibility of the project under operational conditions.

The next important criteria for promoting small-scale production in rural areas is to have an efficient organisational pattern, the main hallmark of major industries. To simplify matters, it is better to have one institution which can serve many industrial production units in one field. The function of this institution would be to arrange suitable materials for the industry at the cheapest rate and of the best quality, buying at a time when costs are low and storing the materials for the rest of the year. In addition, the institution could arrange bank finance and credit, store product stocks and set up an efficient sales and marketing organisation. The research and development department could keep on working on new techniques, processes and products so that as soon as the product stops selling the industry can switch or to diversify the product.

ORGANISATIONAL PATTERN:

There can be many approaches for evolving a technique in its entire package for small-scale production. Firstly it would be developed in its entirety with the organisational pattern built-in, which can be sold to prospective entrepreneurs who could then set up these industries on their own. By their very nature and built-in constraints they would have to be situated in the rural areas to be near to the raw materials. They would also have to be near to consumer centres to save expenditure on transport. The most obvious products are sugar, cement and paper. The second approach could be to set up a service centre, either controlled by the government, a cooperative society or any other institution, which is prepared to provide an organisational pattern to feed and serve a number of small producing units situated round the service centre. The producing units would be too small to be able to arrange for their own raw materials and their own market or to obtain finance and credit from banks. The products best suited to this approach are whiteware pottery, cotton spinning, rural oil etc. The second pattern would place much of the productive activity in the rural areas and would be more close to the ideology of production by the masses. The earlier model would be owned by rich rural entrepreneurs who would employ workers on wages. Obviously, the workers would not consider themselves to be partners in production and would be open to exploitation. However, the location of these industries in rural areas will open up vast possibilities of activity in other fields. It has been a matter of experience that these rural areas where small-scale sugar and cement factories have been set up have grown in comparatively prosperous areas. Thus, both models have got something to offer to rural development.

LIST OF PRODUCTS:

Regarding the list of products for starting new industrial activities in the rural areas, there could be common agreement on the following minimum categorywise distribution.

1. By scaling down large scale manufacture -

(i) Sugar
(ii) Cement
(iii) Paper
(iv) Cotton Spinning
(v) Jute Spinning & Weaving
(vi) Wool Spinning
(vii) Chemical Fertiliser Manufacture
(viii) Soap making
(ix) Matches

2. By upgrading traditional village technologies -

(i) Handloom Weaving
(ii) Black Smithy & Carpentry
(iii) Extraction of vegetable oil edible and non-edible.
(iv) Red Clay and White Ware Pottery
(v) Tanning & Shoe Making
(vi) Cereal Processing like dehusking, grinding of wheat, paddy, spices, pulses etc.
(vii) Gur and Jaggery manufacture.

3. Miscellaneous - Power Generation, Domestics & Household, Education & Services.

(i) Village Power Pool including solar appliances, Windmills, Mini Hydel & Bio-gas.
(ii) Environmental Sanitation and Drainage.
(iii) Village Transport including Bullock Carts.
(iv) Animal Husbandry & Milk Products.
(v) Poultry & Egg Products.
(vi) Social Forestry & Forest Based Industries.
(vii) Land Reclamation
(viii) Educational materials such as exercise-books, Fountain pens, Chalk crayons, Blackboards etc.
(ix) Plastic goods such as toys, combs, cases and other practical items.

A number of other items could be added to these lists depending on local conditions. It is estimated that if suitable technologies were to be developed for manufacturing the above-mentioned items, direct employment would be created for at least 15 million people in the villages. Once that much employment were generated the economy would be greatly stimulated and indirect employment would be provided for at least 50 million people.

POWER & ENERGY:

The next most important priority for the rural areas of India, in some respects connected with industrial production, is the provision of power and energy for irrigation, household and domestic purposes as well as for industrial production. It is a matter of common knowledge that the plan for electrical generation and distribution has covered almost all the urban areas of the country in the last 30 years. Before independence, there were many district towns which had no electricity. Now there is hardly a block headquarter which is not served by electricity. However, in most of the rural areas with an electricity supply, the percentage is probably between 30% to 40% of the entire villages of India. The electricity available is used generally for energising tube wells only and is rarely used for any other purpose, perhaps due to lack of demand or supply. It is quite obvious that if there is an increase in demand from all the villages which have been reached by electricity for domestic connections and for industrial production there will be an acute shortage of electricity which the present generation capacity will be unable to meet.

Coal and oil have been used to generate electricity. India is acutely short of oil, which has to be used for more important needs such as the production of naphtha for fertilisers, transport etc. Good quality coal is also becoming decreasingly scarce. Therefore it may not be possible to provide electricity to all the villages by the conventional method of thermal power stations. Moreover, the installation of transmission lines, transformers and sub-stations presents such a huge management problem that it will be very difficult to manage the distribution of electricity. Already theft of transmission wires and power is rampant in the rural areas and it is very difficult to control. Moreover, electricity supply to the villages will always be controlled from a central point miles away from the villages and they will have to depend on one human agency for water, food and all essentials if they have to depend on the Electricity Boards. Gandhi Ji thought that it would be terrible to lose the independence of the villagers in this way. It would be preferable for each village or group of villages to have its own power house which it would be able to manage, operate, repair and maintain and thereby exercise complete control. For this purpose, an appropriate technology based on income energy, and using locally available, replaceable materials will have to be devised and developed. It has already been mentioned that a developing country such as India cannot afford to generate sufficient power for the rural areas, which are dependent on rapidly depleting resources of fossil fuel. The sources of income energy* freely endowed by nature and available locally in the villages of India are as follows:-

1. Solar - About 300 days in a year is available in most parts.

2. Wind - Available at low velocity everywhere in India but in about 30% of the area it is available at a high velocity.

3. Mini Hydel - Available in abundance in hilly areas and in low head available throughout in India in rivers, streams, rivulets etc.

4. Bio Gas- Based on animal dung available in abundance in every village, but at present 60% is used as fuel for cooking.

5. Wood - Available in every village. Trees can also be planted in large numbers and used in a rational manner in such a way that they can be used as fuel either directly or by low temperature carbonisation.

6. Others - Like geo-thermal, tidal, sea etc., which could be exploited by sophisticated and modern technology but not so relevant to the villages.

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* F.N. = The same may apply with a little variation to other developing countries.

There is a need to carry out a detailed survey of the strength of all these income energy sources to find out how much energy in terms of K.W.H. they are capable of providing for the villages. Next a suitable technology for each of these resources has to be developed so that the maximum utilisation may be achieved.

SOLAR:

We have to find out whether it is possible to use solar energy for cooking in every household taking into account the technical and social constraints. Otherwise, is it possible to design solar power generators which can generate electricity that can in turn be used for cooking, refrigeration, running of engines etc.

A great international effort is needed in the area of solar energy alone to increase the efficiencies of the absorbing and collecting surfaces already in operation in many places. Similarly, work on utilising the solar energy so collected has also to be done.

WIND:

As regards windmills, there is hardly any design of windmills which can operate at low velocity. There is an established need for such windmills as nearly 70% of Indian villages fall in the low wind velocity region. However in the five months from February to June there is intermittently high velocity wind which can be used for pumping water, grinding grain and other low energy uses. However one of the greatest drawbacks of both solar and wind power is that they are intermittent and require a high capital expenditure per K.W.H. for any attempt to harness them although there are no operating expenses once they have been set up. All these points have to be considered when designing equipment and contrivances for harnessing solar and wind energy.

BIO-GAS:

The next most important resource available which can be profitably used for power generation is animal dung, which is readily available in every village where the animal population is usually nearly half the human population. Standard designs of bio-gas plants for the generation of methane gas from animal dung are already available. However, the low generation efficiency, the large volume of the plant, the high cost of installation have restricted their wide adoption in Indian villages especially by the poor farmers who do not have sufficient capital.

MINI-HYDEL:

Mini-hydel plants will be useful especially in hilly areas where the people are already using the water energy provided by the poorly designed water wheels used for grinding wheat and other cereals. If a little attention were paid by technologists and designers to this problem it would be possible both to increase the efficiency of the water wheels and to use them for electricity generation and taking electricity on wires to remote villages which are not served by streams or waterfalls.

WOOD.

Wood is the primary kitchen fuel in village households. The villagers pick up the supply of their fuel wood either every day or periodically and store it for use in their kitchens. However, no planned effort has been made to plant trees on a large scale to replenish the supply of wood burned every day in millions of households. The fuel like the fossil fuel crisis has now assumed serious proportions. This is due to lack of foresight after all trees take only a few years to grow, not millions of years like fossil fuels. Even now if a certain percentage of the land area in each village were reserved for tree plantation, this crisis could be averted and a regular supply of fuel wood could be assured. The most efficient method of burning wood has also to be determined by the technologist and scientist. At present, the burning of fuel and cooking is carried out in a most inefficient manner resulting in loss of valuable calories at the time of the transfer of heat from the burning fuel to the cooking utensil and again from the cooking utensil in the shape of steam and vapour. Better designed ovens and cooking utensils can solve this problem and reduce the loss of heat to a considerable extent.

Wood can also be used in a more efficient way by the process of low temperature carbonisation. This would provide a supply of cooking gas and charcoal for fuel.

All these methods have to be investigated to ascertain how much contribution each, namely solar, wind, hydel where available, bio-gas and wood can make to a village power pool.

PHYSICAL AMENITIES IN THE RURAL HOME:

The most important activities for the rural areas have been covered in the earlier paragraphs which dealt with the production of food and the setting up of industrial production activities for income generation for the rural areas and also for surplus formation for other investment and the supply of energy for these purposes. Now we have to consider other areas for improving the quality of life in the rural areas and providing physical amenities and services which are lamentably lacking in most of the villages. These can be enumerated as follows:-

1. Rural Water Supply - Most essential for healthy living, elimination of worms, germs causing dysentery and other diseases.

2. Sanitation - This would involve setting up of sanitary latrines in the household and drainage of water etc.

3. House Building - To improve the quality of shelters in the rural areas and to develop suitable materials for this purpose which are more durable, water proof and fire resistant.

4. Construction of roads

5. Health Care

6. Household and Domestic - For cooking, washing of clothes and utensils, supply of hot water etc. This has been covered to some extent in the earlier chapters.

7. Education and Culture - Education is one of the most important requirements to change the attitude of the people and to give them knowledge about the best methods for improving their environment and to make best use of the material available around them. The pattern of education developed by the industrialised countries was such that it has given false hopes and expectations to people of the affluent and extravagant life being generally led in the Western countries. This has alienated the educated rural folk from their roots and they are not able to put in their best for the development of the local environment. A proper system of education has to be developed by the rural people themselves which can help them to carry out the activities as mentioned in the earlier chapter to the best of their capabilities and thereby to earn sufficient income for themselves and also to improve the quality of their life and environment.

These are the only methods through which the 66% of the people of the world living in the rural areas mostly of the developing countries in 2 million villages can be salvaged, otherwise there is no hope.

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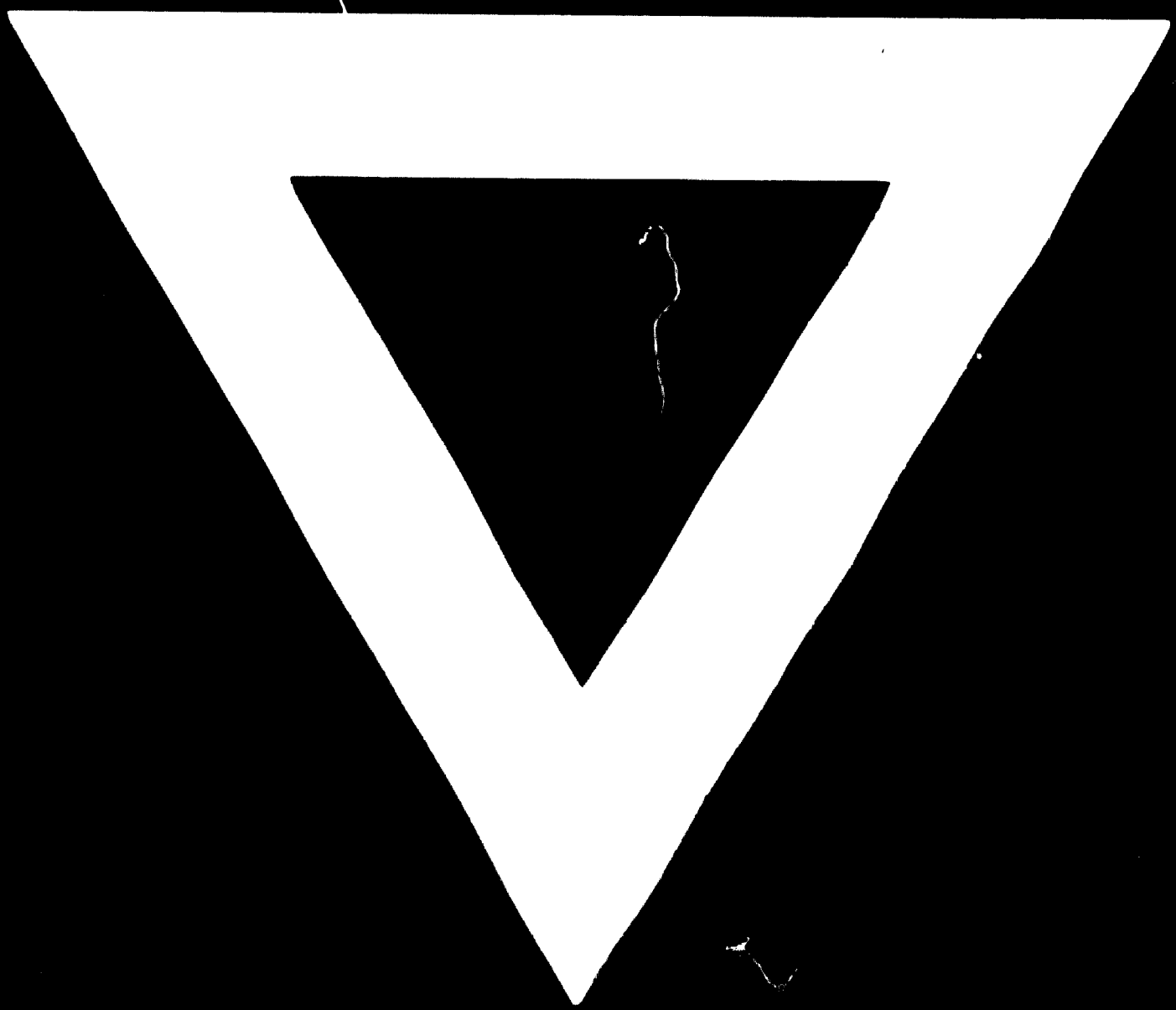

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