

SUSTAINABLE AGRICULTURE AS A MEANS TO POVERTY ALLEVIATION

-by Dr.Y.P. Anand, J.C.Pant**
Laxmi Narain Modi, Nikhil Pant

1. INTRODUCTION

Poverty alleviation in the country has so far been attempted primarily through various subsidy programmes, quite divorced from agriculture, in order to trigger off economic regeneration mostly as a non-farm activity, with or without the help of institutional finance channelised through the cooperatives or the banks. This approach succeeded wherever the beneficiary groups were properly organized and supported by the local agricultural production system, and the delivery system had imaginative managers at different levels. Even though a few of such success stories can be replicated through proper implementation, it has been observed that such measures for poverty alleviation have not necessarily resulted in raising the quality of life of the people concerned. In other words, the future strategy for poverty alleviation should be well supported by the local agricultural production system not merely for the purpose of economic development but also for improving access to nutritious food and other attributes of a good life, and to improve the quality of life of the beneficiaries. Therefore, there is need to redefine the approach to poverty alleviation and its eradication.

Food security has been an outstanding achievement of Indian agriculture so far but increasing population pressure is raising doubts about the sustainability of agriculture as it is practiced in India today. In order to make Indian agriculture sustainable, not only regional imbalances in agricultural growth have to be rectified, even the type of agriculture that is

being promoted in different parts of the country has to be examined with a "microscope" to evaluate its sustainability from the standpoint of equity, productivity, quality, eco-friendliness, energy intensity and viability.

2. ESSENTIALS FOR A GOOD LIFE

A strategy of development which can provide the following to all its people alone can be considered a sound approach to economic development:

- (i) clean air to breathe;
- (ii) clean water to drink;
- (iii) water for irrigation;
- (iv) nutritious food;
- (v) sufficient clothing;
- (vi) shelter;
- (vii) productive employment; &
- (viii) health care

It is worth quoting Gandhiji here who once said "there is enough to meet everyone's needs but not enough to meet everyone's greed". Curbing the greed of the high and mighty, bent upon appropriating what is available, to launch on a fast track growth at the expense of the less fortunate members of society, must become an essential task of good governance, if essentials for a good life are to be provided to everyone. It is in this context, that sustainable agriculture as a strategy for promoting sustainable development becomes relevant to a strategy for poverty alleviation in order to make it possible to meet the essential needs of all.

3. SUSTAINABLE AGRICULTURE

Inadequate availability of drinking water in a large number of villages of the country is a recent phenomena consequent to over drawl of ground

water by some people for taking recourse to high cost, high yielding agriculture. The village well and the village tank have existed in India for centuries and were always a steady source of supply of drinking water to humans, their cattle as well as for irrigating their lands throughout the year. Today, the village tanks have silted up and the village wells have dried up on account of the lifestyle changes that have taken place in our rural areas. De-silting of the village tank was done as a ritual by the village potters who provided pots of various shapes and sizes to store grains, milk, water as well as for making utensils for domestic use like "Kullhar" or drinking water. Both the village well and the village pond have dried up primarily because of the high-cost agriculture which necessitated over drawl of ground water. It needs to be appreciated that promoting practice of sustainable agriculture is essential if we have to make availability of drinking water possible throughout the country in the foreseeable future, at a reasonable cost.

Sustainable agriculture is, therefore, not a matter of choice but a necessity. India's drive to maintain self-sufficiency in foodgrains' production, and thereby retaining her independent stance in the comity of nations in her foreign policy, is very much dependant upon her success in promoting sustainable agriculture, to maintain high productivity levels in irrigated arable areas and to increase the same in rainfed areas. Sustainable agriculture, thus, provides a solution that is far-reaching and appropriate. It is an approach to land and water management that is ecological, economical, equitable and efficient (popularly known as 4 E's) in such a way that whatever we take from nature is suitably returned back so that nature retains its re-generative capacity. It ensures that future generations inherit from us the same or added environmental capital than what we inherited from our fore-fathers. Sustainable

agriculture is based on the principle of Low External Input and Sustainable Agriculture or LEISA as against the high yielding fast growth approach of High External Input Agriculture, or HEIA. The former may be referred to as "tikau Kheti" as against the latter which is 'bikau kheti'. LEISA emphasizes on utilization of locally available resources- soil and water, and human intellect which is of prime importance in sustaining agriculture. It also emphasizes on the development and implementation of methodologies that ensure a process of growth that conforms to the 4 E's. On the other hand HEIA represents the fast-track growth to agriculture which is practiced in canal irrigation dominated regions of India and countries like USA and Canada etc, that relies heavily on intensive doses of finances, fertilizers, farm mechanization, pesticides and other high-cost elements. This approach, in the long run, does more harm than good by negating all norms of the 4 E's and perpetuating all-round disequilibrium and degeneration of the ecosystem.

4. ANIMAL POWER AND CATTLE CARE

According to an estimate, an equivalent of about 40,000 mega watts of power in the rural areas is provided by bullocks in India. In fact, the main logic of prohibition of cow-slaughter was to propagate bullock power and to utilize the dung for rural fuel and manure. Cow milk was primarily a bye-product only for domestic use which provided a guarantee for proper nutrition to women and children of the house and the old who took care of the cows. With the arrival of diesel driven tractors the bullock power was looked down upon, though it is still the mainstay of rural energy in large parts of the country, and with the buffaloe becoming the main supplier of commercial milk, the cow and its progeny, the bull got short shrift in the eyes of the development planners. In rural households also the buffaloe displaced the cow and

all the milk was sold leaving nothing for the women and the children. A sharp decline in the nutritional status of women and children in the rural areas can be clearly attributed to the eclipse of the cow which was revered since the ancient times. Male offsprings of cows and buffaloes both are now feeding the meat trade through the slaughter houses, and export market of meat is getting all kinds of incentives from the Government. Cattle population in India was never a burden on the land as they grazed green or dry grass and ate agricultural waste, and provided valuable dung for fuel and manure, apart from being used for draught power. A strategy to promote decline in the cattle population in order to reduce the biotic pressure on land will ultimately prove counter productive, as there is no cheap substitute available for fuel and manure in place of dung in our rural areas. The existing tractors are not able to put in their full capacity utilization due to shortage of diesel which itself has to be imported and is likely to face further shortages in future.

In the long run bullock power must be regarded as the mainstay of rural energy. The breed improvement programmes of govt. today are primarily tailored to increasing milk production and not to improvement of draught power of cattle. This, therefore, needs immediate correction. In the interest of sustainable agriculture too, cattle rearing would contribute valuable organic manure to our agricultural lands already hooked to high and still higher doses of chemical fertilizer and pesticides. Cow urine is regarded as a very effective pesticide while cow dung can be used to putrefy large quantities of waste biomass to convert it into rich manure. Panchagavya, which means a combination of five products procured from the cow i.e, ghee, curd, milk, urine, dung in appropriate proportions has been found to be the most effective and economical pesticide as a concoction when allowed to ferment for 10 days, in

suppressing the pathogen and in increasing the vigour and resistance of the plants, by scientists at the University of Agricultural Sciences, Bangalore (High -five; Sept'30, 1996 Down to Earth). The water bearing capacity of our soil has been jeopardized by continuous use of chemical fertilizers and the same can now be restored only by application of bio-fertilizer and dung based natural manures. Relevant statistics relating to cattle and animal power are given in the annexure.

There is, therefore, a clear case for bringing back the cow as an essential member of the rural household. Gosewa based lifestyle is a part of our cultural tradition which could also restore the nutritional status of our women and children in the rural areas. In other words, not only has gosewa a potential for improving the nutritional status of women and children, it would also give rural women employment as well as social status, apart from, of course reviving the sagging fortunes of the bull, the prime mover of rural energy. There is now an urgent need to evolve appropriate bullock-driven rural technology to reduce the drudgery of rural life specially for women and the old persons.

5. IRRIGATED VS RAINFED AGRICULTURE

Of the approximately 140 million hectares of land under agriculture in India about 30% area is served by assured means of irrigation which produce about 60% of the total food grains in the country. The rest 70% of area produce only 40% of the food grains. Any strategy for increasing agricultural production must address the irrigation needs of this 70% of rainfed arable area. About half of this rainfed arable area is paddy area where there is excess of water crying for proper management, while the remaining half is entirely depending on the rains and only appropriate rainwater conservation

measures can provide water for drinking and irrigation purposes.

It has been established that rainwater conservation through vegetative conservation measures on the principle of watershed management is the most appropriate and sustainable means to maximize the productivity of land which would enable provision of the eight basic necessities outlined in para 2 above, to the vast majority of the farming population of the country residing in rainfed areas. One such project is the National Watershed Development Project for Rainfed Areas (NWDPA) being implemented by the Agriculture Ministry since the Eighth Five Year Plan through over 2500 watershed projects covering over 10000 villages in about 2500 development blocks where assured means of irrigation were the least in the country. These 2500 watershed projects are developing as models of sustainable agriculture to enable the farmers in these development blocks to draw appropriate lessons in the matter of methodologies for rainwater conservation, water management wherever it is in excess, appropriate vegetation to provide food grains, vegetables, fruits, fodder for their cattle, trees to provide fuel and timber as well as house building material for shelter, fibre for clothing, productive employment all-round the year, and consequently a healthy life through natural means at a low cost. This needs to be pursued on the same but expanded lines in the Ninth Five Year Plan in order to get the full benefits out of this project, as also to enable watershed development methodology to become a peoples' programme as recommended by the Standing Committee of Parliament for Agriculture in their report on Watershed Development.

The 30% arable area under assured means of irrigation in the country is also crying for attention. Over 20 million hectares of prime cultivable land has been rendered uncultivable

because of water logging, salinity etc., due to faulty water management and excess irrigation. Sustainable agricultural practices here also are necessary in order to maintain the high levels of productivity attained so far by proper crop rotation and land management. The lands which have degenerated also need to be revived by means of developing models of regeneration of adequate size i.e., about 10,000 hectares, one per district of affected areas under NWDPRRA, to become examples for progressive farmers to follow.

6. LAND MANAGEMENT

When we talk of sustainable agriculture as a means to ecological conservation we would have to pay special attention to the management of land which is our main natural resource. The history of land management in India in recent times can be traced back to the Mughal Emperor Akbar whose Minister Raja Todarmal initiated the concept of land records and land revenue. 10% of the marketable surplus alone was recovered as land revenue, all personal consumption of the farmers being exempted from this tax. The land record and land revenue system of Todarmal was perfected by the British rulers through periodic settlement operations carried out at an interval of 40 years to record the changes in the soil texture to enable enhancement in land revenue which was linked to the quality of soil depending on its productivity. This process of maintaining land records and levying land revenue emerged as a powerful tool for land management over the centuries. Unfortunately, the Britishers delegated the responsibility of collection of land revenue to Zamindars and Jagirdars as sinecure for their loyalty to the British crown. This resulted in recovery of land revenue becoming anti-peasant giving rise to peasantry movements during the freedom struggle which called for abolition of land revenue. After independence abolition of land revenue became a

socialistic goal and in most states also, after independence abolition of land revenue became a socialistic goal and land revenue today stands abolished. This has resulted in neglect of the maintenance of land records. The neglect of the land records has in turn blunted a very powerful instrument of land management which India had inherited from the erstwhile rulers, the Mughals as well as the Britishers. With land management in disarray, measures to restore agriculture in India to a sustainable status would be that much more difficult to implement, and therefore, re-imposition of land revenue should begin to figure in the agenda of the development planners.

7. LAND LEGISLATION

In nearly all the land laws that were passed after independence by the states to promote land reforms, there was a salutary provision of at least 10% of the village lands to be left for common purposes such as grazing, village wood-lots etc. which were known as the Gauchars. Since sociologists were of the view that possession of land gives status to a person, these common lands were gradually parceled out to the landless agricultural labourers all over the country thereby leading to a situation which is now being described as the "vanishing commons". This phenomenon has hurt the rural poor in two ways. The rural poor were heavily dependent on the village common lands for drinking water, collection of fuel, grazing of their cattle and for various easement rights as well as community matters. Due to the phenomenon of 'vanishing commons' the rural poor had no where to go but to migrate to the metropolises of the country, thus leading to the swelling of urban slums which are living hells on earth. The second way in which the 'vanishing commons' affected the rural poor was that lands that were allotted were so small in size that they gave no economic returns to the allottees, who either left them unutilized

or sold them off to the nearest cultivator. Today, there are large tracts of land in the rural areas which are lying un-cultivated because of out-migration of the rural poor. Immediate attention, therefore, needs to be given to this problem of the "vanishing commons" and their intimate relation to the state of the rural poor.

Gauchar was the traditional grazing ground in each village and was treated as a sacred institution. If Gosewa is encouraged and Goshalas take on all the cattle i.e. cows and buffaloes being reared by individual families, which have stopped giving milk, these Goshalas can become the hub of village industries. The hide and the bones of cattle dying naturally would provide valuable raw material for village industries. The rich natural manure produced by the goshalas would then provide a steady supply of the same to local farmers on a sustained basis to make sustainable agriculture possible. The Goshalas and the Gauchars would be able to also provide for the return migration of erstwhile landless agricultural labour who had been earlier forced to leave for the towns and cities to make a living. There have been instances of reverse migrations from urban to rural areas such as the one that took place in Maharashtra following the implementation of the employment guarantee scheme in the early eighties. It would be worthwhile to explore such possibilities further and encourage adoption of similar and appropriate schemes by other states as well. One very salutary feature of the rural poor residing in the urban slums is that, by sheer dint of daily experience of urban life they have been shorn of their caste prejudices, unlike their kith and kin back in the villages who are still steeped in these prejudices. This reverse migration apart from decongesting the urban slums would have a beneficial effect, in the long run of divesting the rural poor and the other village folk of their

caste prejudices and superstitions to help reduce social tensions in the faction-ridden villages.

8. CROP INSURANCE

The crop insurance scheme which was in operation up till the 8th five-year plan was implemented only in the disaster prone states of Andhra Pradesh and Gujarat while the agriculturally advanced states like Punjab and Haryana did not subscribe to it. The existing crop insurance scheme seems to entail heavy subsidy from Government of India and attempts are being made to evolve a crop insurance scheme which would be fully viable on the basis of premium to be paid by the farmers. No insurance scheme can succeed if only those who suffer are beneficiaries and make contributions as members. Crop insurance in order to be viable should involve all the farmers in the country. That would be possible only if the land revenue proposed to be recovered from the farmers is treated as premium for crop insurance. This would immediately give rise to a corpus of upto over Rs. 500 crores which would be enough to implement a crop insurance scheme to benefit all the farmers in the country for all types of natural calamities as well as those like fire etc. There is, therefore, a strong case for re-instituting the concept of land revenue that was valued by the farmer as a proof of possession of land and which was by no means a hardship to him. This land revenue was in accordance to the soil type and, therefore, had a close relationship to the productivity of the soil also. This would in turn lead to improvements in the maintenance of land records which are in any case very important for the farmer for various purposes such as taking loans from cooperative societies or the banks, and would thus be a powerful tool to promote sustainable agriculture.

9. OWNERSHIP RIGHTS

The increasing population in the country has resulted in fragmentation of the landed properties owned by people. This may not have dire consequences for properties situated in the urban areas, but for agricultural lands it has grave implications. If agricultural productivity is to be maintained fragmentation of agricultural lands has to stop at a certain stage. This is not possible with the concept of individual ownership, that has now come in vogue considering that the growth of population cannot be controlled overnight. Ideal arrangement for ownership of property, would, of course, be community ownership, the models of which are emerging in the cooperative housing societies where each member is a lessee. As a long term objective this may be discussed and even legislated upon but it would not be an easy measure to translate into practice. The next best option could be family ownership that would have the desired effect of preventing fragmentation of agricultural lands. If the two-child small-family norm gets accepted throughout the country, as a measure of population stabilization, one child can cultivate the land while the other can move on to take up non-agricultural activities. This would promote the joint family as a federation of nuclear families. This would be in contrast to the nuclear family which has become the fashion of the day because of the small family norm. The joint family would prevent the lonely child from becoming a tyrant and the whole joint family would take care of all their children. This has been a traditional practice in India through the ages providing security to the young and the old alike. With longevity going up the neglect of the older generation is also emerging as a major social problem in the country and this manner of family ownership of property would go a long way in providing social insurance to the old and the disabled.

10. CONCEPT OF COMMUNITY

Very often when reference is made to Panchayati Raj institutions it is presumed that they are representing the community with all its implications. It must be understood that more than one revenue village add up to a Panchayat. In the past, the village factions have resulted in the Pradhan belonging to one revenue village alienating common lands of the other revenue villages in the Panchayat. The revenue village itself is a product of the land record system of the country, and tracing back the history of the revenue village one can visualize that a group of hamlets which settled in a given area to cultivate the lands evolved as a revenue village. It is the hamlet which is the real community, and this community still exists. Unfortunately the demarcation of Panchayats in the country has been done on population criteria without any consideration of the hamlets which constitute the revenue villages. We cannot reach out to every family in the country but we must reach out to every hamlet and if we do that, we would have succeeded in reaching out to every family through the community in that hamlet. It is this hamlet which should be the unit of our outreach for economic and social development. A hamlet based development strategy along with sustainable agricultural practices getting promoted, would inevitably lead to sustainable development for poverty alleviation.

11. SUSTAINABLE DEVELOPMENT

It was made out at the very beginning that "It is possible to meet everyone's needs but not everyone's greed". A development strategy which would be aimed at meeting every one's needs alone can be described as a strategy for sustainable development. For a country like India whose economy and manpower are predominantly agricultural it is sustainable agriculture which has to be the

backbone of the strategy for sustainable development. The importance of animal power and cattle-care as a source of rural energy and essential nutrition for women and children in our rural areas has already been mentioned, and the special relevance of the tradition of Gosewa in this regard has been highlighted. Sustainable agriculture thus becomes a strategy for land management to promote rainwater conservation, soil conservation as well as for the conservation of other natural resources. Sustained practice on these lines inturn would alone lead to conservation of the whole environment as well as to the eco-restoration of the degraded lands of the country. We may as well define sustainable rural development to be the accumulated result of

- a Gosewa based life style,
- a Goshala based rural industrial system, and
- a Gauchar based sustainable agriculture system, which would have a definite impact on the overall developed scenario in the country.

12. PROTECTION OF ENVIRONMENT AND ECO-RESTORATION

A study* conducted by the Geological Survey of India (GSI) on the presence of high concentrations of arsenic in the ground water in six districts of West Bengal has suggested that the heavy use of Phosphatic fertilizers may have caused local leaching of arsenate compounds from the soil and aquifers into the ground water. The study also holds over-extraction of ground water and the resulting oxidation of the source due to increased ingress of atmospheric oxygen, responsible for the crisis. The areas subjected to intensive irrigation through tube wells have been affected by arsenic. The affected districts are Malda, Murshidabad, Nadia, Bardhman, and 24 Paraganas North and South.

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The depth of the water table of the six districts varies from 2.44 m to 8.15 m below ground level.

Aquifers appear at different stratigraphic levels and are classified as shallow (below 50 m), intermediate (50 - 150 m) and deep (more than 150 m). While water from shallow aquifers showed higher concentration of arsenic, water from intermediate and deep aquifers have been found to be free of arsenic (although water from a borewell as deep as 240 m in the 24 paraganas (North) yielded high levels of arsenic).

While the study rules out industrial pollution as a source of the arsenic, it has focused on the geomorphological characteristics, taken on an inventory of wells to study the ground water, studied near surface sections and bore-hole logs and analyzed samples of ground water and aquifers sediments for identification of arsenic bearing mineral phases.

"The arsenic affected areas were found to lie along a north south linear belt starting from Kaliachak in Malda district to Barnipur in 24 Paraganas (south) district, a distance of about 400 Km", states Shri S.N. Mitra of the GSI. "Except for Purbasthali in Bardhaman district - which is situated on the western side of the Hugli - most of this belt lies on the eastern side of the Bhaghirathi river". According to Shri Mitra, these districts lie within the quaternary sediments of deltaic plains of the Bengal basin (where the sub-surface comprises of only loose soil and not hard rocks). The region comprises of coalescing and superposed meander zones of palaeo-channels. In other words, this low-lying area is one where several rivers originating from different sources meet, making the chemical composition of the sub-soil water highly complex. Such a geological phenomenon results in the ground water displaying even those chemicals that are not necessarily

present in the same area in large quantities. While these geological factors have been provisionally identified as the source of the arsenic, the precise mechanism by which arsenic is mobilized into the water is yet to be understood clearly.

Long-term measures such as a detailed inventory of ground and surface water resources that would ensure a planned and regulated use of water, have been recommended by the GSI. The study points out that the dimensions and disposition of aquifers need to be determined. In addition, a detailed petro-mineralogical and geochemical analysis of aquifer sediments and a chemical analysis of bore-space water also needs to be done. Such an examination would help quantify the existing arsenic content.

Rainwater is the most important source of pure water on earth - both for irrigation as well as drinking purpose. Sadly, in India, we are presently not utilizing more than 45% of this water that falls on mother earth. As a result, most of the rainwater that falls on the earth is simply washed away and not conserved. Thus, the hydrological cycle, constituted by the perennial evapo-transpiration, condensation and precipitation of water in its various forms - solid, liquid and gaseous, which recycles the atmospheres' water resources under the overall power of the Sun's solar energy, remains untapped by us. During the course of each new cycle this water strikes the earth with renewed vigour and vengeance bringing greater destruction on the top-soil by eroding it ever so violently since there is very little vegetation covering this soil. As a result, land is not only adversely affected by loss of fertile top-soil accumulated through centuries and the consequent decline in agricultural productivity, the lower reaches also suffer from repeated spells of floods and loss of life and property. Protection of environment thus becomes a very essential part

of our strategy of sustainable agriculture. In fact, the very process of development should be such that whatever disturbance that takes place during the process is set right through the development process itself. Application of science to the development process has to be, therefore, primarily for the purpose of bringing about eco-restoration through the process of development, as well as to modify the ill effects of pollution to make the resulting effluents not only harmless but useful also.

13. REVIEW OF EXISTING LAWS RELATING TO LAND, PANCHAYATS AND FORESTS

The existing laws were framed with a certain mind set in the past which may have now become outdated in view of the rising population and the need for conservation of the scarce natural and other resources. For instance, under the land laws any one in possession of a piece of land for a period of over 12 years was legally entitled to be called the owner of that land. This was a salutary provision when more and more lands in the country had to be brought under agriculture, but now that horizontal expansion of agriculture is ruled out, this provision of law is leading to occupation of the lands of the poor by the rich and the strong in the rural areas. Similarly, in the matter of extraction of minor forest produce in the forest areas, the tribal people had certain traditional rights that also led to the protection of the forest areas by the tribals themselves. Now, under the Wild Life Act, the tribal population have to be moved out of the forests, thereby taking away their traditional rights for extraction of minor forest produce. Subsequently, they are labeled as thieves if they go back to the forests in accordance with their tribal customs. There is, therefore, an urgent need to review all these laws to examine them from the viewpoint as to whether they are friendly to local communities, whether they promote

community action or prohibit the same. Similarly the legal powers conferred on the sarpanches of the Nyay Panchayats have never been used because they are not usable according to the manner of the existing legislation.

14. STATUS OF WOMEN

Many of the social ills that the country is facing today in the matter of economic and social development are due to the unequal status of women. It is now well understood that the population explosion itself is a consequence of the neglect of women and children by our society. In order to have less children, the infants born should survive, which is only possible if they are healthy at birth. This in turn is possible only if the mother giving birth to a child is healthy and of proper age. This calls for late marriages, delayed first child, spacing of at least 5 years between two children, giving up of male preference for a baby, and adequate nutrition for women and children in the family. Male domination fuelled by greed for more and more has further worsened the status of women in our society. Sustainable development which is expected to provide a minimum of requirements to all for a good life would be impossible unless the greed of the high and mighty is curbed, and for this the men in the male dominated society have to renounce their greed for more and more. It is now well established that difficulties in making available clean drinking water for the family, and fuel for the hearth, have made the lives of our women folk miserable on account of the extra miles they have to trudge for these, and the extra time they have to spend in drudgery to take care of the family. In other words sustainable development would call for **emancipation** of men from their lust to have more and more anyhow in the shortest possible time. It will also require awakening women to encourage them to rise to their full potential and share the responsibility of social development

with their male counterparts. A Panchsheel for Gender Relations as a programme for moral reawakening must, therefore, be evolved and the same is being suggested here:

PANCHSHEEL FOR GENDER RELATIONS

1. Equality of status.
2. Respect for the views and independence of the other even in situations of interdependence.
3. Gentle courtesy in personal and social relations.
4. Extending maximum assistance to the other to achieve full potential.
5. Abjuring possessiveness.

WOMEN'S AWAKENING - MEN'S EMANCIPATION

15. ENERGY ISSUES IN THE CONTEXT OF SUSTAINABLE AGRICULTURE

Population growth and economic development demand increasing productivity per unit area of cultivated land. Considering the inelasticity of arable land area in India, this is being achieved primarily by adopting energy (commercial) intensive methods, namely, use of hybrid seeds, irrigation, chemical fertilizers and pesticides and mechanization of agricultural operations. But, considering India's meagre fossil fuel resources and large human/animal power base, risks of over dependence on oil imports and ecological imperatives, this strategy is unsustainable.

In 1960, only 1.6% of India's final energy consumption was used directly in agricultural sector; in 1990, it had risen to 9.2%, 58% of it being petroleum based. According to the 8th Plan document, in 1996-97, 20% of the total HSD and 23% of the total electrical energy consumption would be used directly in agricultural sector (mainly

tractors and pumpsets). Indirect energy is consumed in this sector for production of fertilizers and pesticides and agricultural machinery. Fertilizer use in India has grown from 65,600 m.t. in 1950-51 to 13.87 million m.t. in 1995-96 (about 80 kg/ha net sown area). Gross energy requirements for production of nitrogen, phosphatic and potassic nutrients is about 80, 12 and 8 MJ/kg respectively and for pesticides 100 MJ/kg. It means over 2 kg coal or 1.33 kg oil per kg N-fertilizer!

India has only 5.7% of proven coal reserves and 0.4% of proven hydrocarbon reserves of the world while it has 1/6th of its population. But compared with other major agriculture producing countries, India has an abundant resources base of renewable energy; human, animal and plant. However, India's dependence on commercial energy has been growing from 19.8 m.t.o.e in 1953-54 to 101.5 m.t.o.e in 1990-91, @ 4.52% per year.

The situation of petroleum products is even more critical. Use of oil and gas grew @ 5.4% during 6th Plan but @ 6.9% during 7th Plan. Consumption of petroleum products has risen from 17.9 million m.t. in 1970-71 to 75 million m.t. in 1995-96 and is likely to reach 164 (150 as per another estimate) million m.t. in 2010-11. India's self-reliance index of oil has dropped from 70% in 1984-85, to 48% in 1992-93, and is likely to drop to 27% in 2010-11. Import bill of petroleum crude and products has risen from Rs. 7000 crores in 1960-61 to Rs. 10870.0 cr. in 1990-91, to Rs. 24095.0 cr. in 1995-96, to the likely Rs. 33420.0 cr. (\$ 9.3 billion) in 1996-97. This despite a long spell of low international prices of crude oil, which have just started to rise. Crude prices are highly sensitive to political situation in the Middle East which has about 64% of world's oil reserves and is militarily controlled by USA. Allowing India's oil sufficiency ratio to drop

below 50% is a security risk and would impose an intolerable cost of imports.

India's petroleum dependence problem is compounded by its relatively excessive use of 'middle distillates' (HSD and K.oil. So India must import not only crude but also HSD. This is a result of keeping HSD price presently only at 38% of that of petrol while their production cost is about the same. Similarly the use of scarce electrical energy in agricultural sector is charged at mere **Re. 0.33/kwh** while its supply cost is about 10 times. The result is wasteful and avoidable use of HSD and electricity in agricultural sector.

Conversely, the situation for the traditional indigenous animate energy sources is one of neglect and underutilization. India has 272.5 million cattle and buffaloe population, 85 million draught animals and 15 million animal carts. These animals are well integrated into the Indian agriculture, economy and ecology and provide not only draught power but also milk, dung and urine as manure, and a host of valuable products on death. The draught animals constitute together 40 million HP mechanical power. About 60% of the sown area covered by smaller holdings still depends on draught animals.

Similarly, the use of 'biofertilizers', namely, animal wastes, crop residues, human and municipal wastes, aquatic plants and wastes, green manuring and leguminous crops and trees, and biological N-fixation, optimally integrated into the nutrient supplies, could considerably reduce the demand for energy intensive fertilizers. Biofertilizers have the additional benefit of preventing soil degradation caused by heavy use of fertilizers and also preventing the widespread pollution caused by the leaching of fertilizers and pesticides (presently 60-70% of fertilizer is washed away and

in some cases less than 1% of pesticide may be actually used up).

But for the enormous subsidies given to energy-intensive fertilizers and pesticides, HSD and electricity, Indian agriculture would be far more sustainable, self-reliant and environment-friendly. We also need to direct R&D inputs into developing the efficiency of traditional resources, e.g. a draught animal is now used only for, say, 300 hours a year on average as against easily possible 1000 hours, and an animal cart could carry 2 to 3 times the load with improvements in its design and manufacture. Simultaneously, much energy could be saved with better upkeep of pumpsets and other machinery and judicious use of fertilizers, pesticides and irrigation (such as drip and sprinkler irrigation).

But all this is possible only if the inherent limitations to the availability and increasing use of fossil fuel energy in agriculture sector are recognized and alternative strategies based on our resource base and opportunities are adopted.

16. SUMMING UP:

Promotion of sustainable agriculture through maximization of rain-water conservation and cattle care, as a strategy for prompting sustainable rural development, leading to poverty alleviation has now to be taken up in all seriousness. These measures to ensure a good life for all are not picking up in spite of policy pronouncements to this effect from time to time. The reason for this is clear to see, that we as a people do not seem to be involved in the entire development process initiated by governmental planning, in spite of the fact that parliamentary democracy is supposed to be functioning satisfactorily in the country for the last fifty years. What exactly is missing in the whole development process? Have the planners been

able to find out what the people need or are they busy making plans according to their own wisdom and assessment of what the people need? Keeping the energy scenario in India and the whole world in view, how long can the fast track high yielding agriculture, hooked to higher and still higher doses of imported chemical fertilizers and pesticides, be sustained? Has the so called decentralization process been able to involve the rural poor and the urban poor in preparing plans for their own development? The rural landless migrating to urban slums today number about 10 crore and lead the most miserable existence possible, next to the vulgar display of urban wealth. While the census figures mention that 27 to 30% of urban population resides in these urban slums, this figure for Mumbai is 50% and for Delhi it is 40% and is likely to increase rapidly. How long will this inequality co-existing cheek by jowl for such a long time not flare up into uncontrollable violence? Such a process may well start from Mumbai and then Delhi is not far away. Is it known that there is no primary health care system to serve the urban poor living in the slums? The only way to improve the quality of life in the urban slums is to decongest them to say, half their existing population. How can reverse migration from urban slums to the rural areas be triggered off? The only way this seems possible is to generate employment in the rural areas through village industries based on agricultural produce which in turn can be sustained only if there is an assured market for products of village industries. In other words, the only way our towns and cities can be saved from certain disaster is to create assured markets for the products of village industries. Can the capitalist entrepreneurs of our country be convinced of this logic of creating assured markets for village industries as the only way to save the cities? Why has the nutritional status of women and children in rural areas and urban slums declined so precipitously during the last 50 years? It is now

realized that the population explosion, in large measure is a consequence of poor health and nutritional status of women and children in the country.

These are uncomfortable questions, but if an attempt is made to answer them it may throw up an alternative development strategy more in tune with the traditions and culture of this country known as India, that is Bharat. This paper developed by a few concerned individuals could provide an inkling to what an alternative development strategy might look like. India is a vast country with immense diversity and different development models for different regions could emerge through this alternative development strategy. What should be the mechanism to evolve such different development models to suit the requirements of different regions of the country in a manner which will enable the involvement of the local people in planning and implementing them? This is a question we would like to leave to the top planners and experts of our country to answer.

**Particulars about the authors.

P.T.O

- ** Dr. Y.P. Anand -Former Chairman Railway Board and presently, Director, National Gandhi Museum, Rajghat, New Delhi.
- Laxmi Narain Modi -Managing Trustee, Bharatiya Cattle Resources Development Foundation, Ahimsa Sthal, Mehrauli, New Delhi.
- J.C.Pant, IAS (Retd.)-Former Secretary to Govt. of India in the Ministries of Of Agriculture, Health and Family Welfare, New Delhi.
- Nikhil Pant -Civil Engineer and Member National Governing Board of REACHA, (Research and Extension Association for Conservation, Horticulture and Agro-Forestry), New Delhi.

NOTE: This paper was prepared in May-June, 1997 and was sent to the then Prime Minister Shri Deve Goda, as well as Deputy Chairman, Planning Commission Shri Madhu Dandavate. Shri Madhu Dandavate was kind enough to acknowledge receipt of this paper.

ANNEXURE

	ECONOMIC IMPORTANCE OF DRAUGHT ANIMALS IN INDIA	
Present Population	APPROX 73 million equivalent to 27 million MW of power	
Area cultivated 60.65%	Approx 85.93 million ha	
Replacement rate	10 bullocks\tractor	
Present population equivalent to	7.3 million tractors	
Annual saving of diesel due to use of draught Animals	Approx.23.75 million tones worth Rs.21,500 crores at the prevailing subsidized rate	
Present market value Of draught animals @ Rs. 8000/pair	Rs. 28,200 crores	
Present value of investment on animal drawn equipment @ Rs. 3000/pair	Rs. 10,950 crores	
Present value of animal carts 14.3 million @ Rs. 7000/cart		
Replacement value of existing draught animals implements and carts	Rs. 182,500 crores	
by 7.3 million tractors and equipment @Rs.2.5lakhs/tractor		

	and set of equipment		
	Draught animals	Approx. Rs. 5000	
	provide approx. 100	Crores/year	
	millions tonnes of dry		
	dung/year 5 million		
	tonnes of fire wood/year		
	Provide by-products	Approx Rs. 100	
	hides, skin, bone, horn	crores/year	
	etc.		

AVAILABILITY OF TRACTORS, DRAUGHT ANIMALS, AGRICULTURAL WORKERS IN INDIA						
For doing proper tillage operation in time, ideally the farm power availability should be as under:						
Tractors		66/1000ha		@15 ha/tractor		
Draught Animals		1000/1000 ha		@ 2 ha/pair		
Agriculture Worker		Cultivator + Agricultural Labourers				
Number per 1000 ha						
Sl.No.	State	Tractors 1994	Power tillers 1994	DAP198	Agricultural Workers 1991	
1	All India	10.56	0.669	467	1312	
2	Andhra Pradesh	4.26	0.219	583	1766	
3	Assam	1.43	1.46	962	1675	
4	Bihar	5.25	0.138	N.A.	2718	
5	Gujrat	7.57	0.142	303	846	
6	Haryana	42.98	0.002	233	758	
7	Himachal Pradesh	2.11	0.003	1609	2032	
8	Jammu & Kashmir	2.7	0.149	1028	N.A.	
9	Karnataka	2.79	0.947	359	1036	
10	Kerala	2.39	1.92	105	1408	
11	Madhya Pradesh	4.95	0.086	548	974	
12	Maharashtra	3.02	0.131	380	1023	
13	Orissa	0.82	0.19	830	1170	
14	Punjab	57.29	-	7	803	
15	Rajasthan	6.48	0.002	192	595	
16	Tamilnadu	6.3	1.45	567	2247	
17	Uttar Pradesh	16.32	0.009	729	1731	
18	West Bengal	0.66	2.56	498	2038	
19	Meghalay	0.03	1.46	775	2545	
20	Manipur	0.87	6.84	2628	3228	
Source: Srivastava, N.S.L, (1996), CIAE Bhopal						
Based on Livestock Census Report 1987, Census of India 1991, and Machinery Division DOAC GOI						