

DIMENSIONS OF TECHNOLOGICAL TRANSFORMATION

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It has been realized that a farmer plays the role of a multi-purpose entrepreneur. A farmer produces varieties of seasonal crops with a limited availability of land and sells the produce in the market to fulfill his own demand. From the limited acres of land, only 25-40 percent of the products fetch him money whereas major portion, 60 to 70% of the product is totally wasted. Sometimes, he has to burn such waste products in his fields. If the waste is taken into consideration one can find that the productivity of agriculture remained abnormally low as compared to the productivity of industry where we find a minimum wastage between 5 to 10%. It is the wastage that has made farming non-remunerative. No doubt to help the farmers government provides agricultural subsidies to farmers in the form of minimum support price (MSP) but the subsidies provided by the government are not enough to counter balance the loss of the wastage. If no subsidy will be given by the government the farmer still can get a profitable price if he can well manage the wastage for agricultural residues. This can be possible only when the residues can be used to produce energy for powering India. In another situation, if there will be a crop failure

due to some natural calamity no doubt the waste produce if, sold in the market a farmer can get an extra income of Rs. 3,000 to Rs. 5,000 per acre. This price will be of great help at the time of distress sale of crop by a farmer. Government is making a slogan for green revolution and bio-tech revolution for increasing the agricultural productivity but not taking any steps to reduce the crop wastage and to recycle the waste products which can be used for many productive purposes. A farmer can get a handsome of income if the wastages can be used for any alternative uses such as producing energy with the help of technology. Three types of energies can be produced from these residues: (i) Liquid fuel such as Ethanol (ii) Gaseous fuels like bio-gas (methane) and (iii) Electricity.

Ethanol, which is used as transport fuel can be produced from the residues of sugar cane. Extensive R&D is being done to optimize this technology. A few large plants in Canada, Japan and US have already been set up with this technology. Theoretically, residues in India can produce 156 billion liters of ethanol which can take care of 42% of India's oil demand for the year 2012.



Energy crops like sugarcane for ethanol production or *Jatropha* for producing bio diesel may affect food production. These effects are being felt in U where huge acreage under corn has been diverted for ethanol production. Similarly, a large track of land in Brazil is being diverted from food production to growing sugar cane for ethanol production. When farms produce both food and fuel, their utility becomes manifold. 65% of India's population depends on farming for its livelihood. If, energy from agriculture emerges as an area of interest India can emerge as a high Tech farming community.

Organic farming:

The advantage of adopting organic farming is two fold as it reduces cost and raises production. The experts said the Indian apple must be produced organically instead of chemically on a large scale to compete in the International market. This would not only fetch higher returns but help greatly in restoring the ecological damage done due to the use of harmful chemical fertilizers and pesticides. China the World's largest producer of apples has already started producing the fruit with the help of organic farming in a big way. During the first three years yield will remain low compared to inorganic farming. However, it will help enrich the soil. Pricing of organic products will be 10-20% higher than inorganic products.

Contract Farming:

Contract farming allows corporate, retailers and food processing companies to enter into an agreement directly with the farmers to procure their produce. This ensures a steady supply of commodities. The system will boost the food industry and retail chain industry. No title or rights

in or ownership or possession of agriculture land of the contract farming producer shall be vested in the name of the contract buyers' companies. The companies can only buy the agricultural produce but at no cost will they be allowed to buy land. Contract farming provides good frame work for the flow of credit to marginal and small farmers at a reduced transaction cost. Now a days contract farming is widely been accepted and to spread it widely it is better that Self-Help Groups (SHGs) should be involved.

The share of India in World agriculture, which is measured in terms of value of net agricultural production, has remained nearly stagnant between 9-11% for the period 1991-2010. While India has the largest area of arable land next to only US in the world, it has not been able to show its big strength to increase its agricultural productivity to the level of other economies. India is the second largest producer of wheat and paddy in the world, but the yield of wheat in China and France are around 1.7 and 2.4 times that of India, respectively. Similarly, India's paddy yield is less than half of China and the US. Availability of food grains in India has increased by just 11% in the past 60 years; the population has more than tripled in the same period. This has serious implications on the per capita consumption of food by people in India, which is estimated to be five times lower than that of advanced countries like US. There is an urgent need to stream line the whole agriculture value chain and liberalise the price policy and exports of agriculture products. Agriculture should be made more profitable and be seen as a business rather than as a source of livelihood. India needs to boost both public and private investments to improve the conditions of the supporting infrastructure for the agriculture sector, like irrigation facilities,

Total and Indebted Farm Households and their source of Debt by Landholding size, 2003

Size class of land possessed (Hectares)	Total Households in (%)	Total Indebted Households in (%)	Loans from Institutional Agencies (%)	Loans from Non-Institutional Agencies (%)
<0.01	1.4	1.3	22.6	77.4
0.01-0.40	32.8	30.0	43.3	56.7
0.41-1.00	31.7	29.8	52.8	47.2
1.01-2.00	18.0	18.9	57.6	42.3
Up to 2.00	83.9	79.9	51.3	49.7
2.01-4.00	10.5	12.5	65.1	35.0
4.01-10.00	4.8	6.4	68.8	31.3
10.00+	0.9	1.2	67.6	32.4
All Sizes	100.0	100.0	57.7	42.4

Source- Economic and political weekly (March, 2008)

reliable power supply and construction of roads in villages to revive the agriculture sector.

From the table it has been revealed that scheduled commercial (SCBs) and other formal lending institution severely curtailed credit flow to the farm sector and thus push farmers into the clutches of money lenders. Households holding, 0.01 hectares have received only 22.6% of agricultural loan from institutional source where as major portion 77.4% of credit has been received by them from the non-institutional source. Similarly, it has been seen that when the land holding is increasing institutional source of financing is also increasing which clearly says that financial institutions remained very conservative in sanctioning loans towards the farmers having lesser hectares of land holding. It is due to this reason the poor farmers have been trapped by the money lenders to borrow the loan from them at an exorbitant high interest.

Recommendations And Policy Suggestions

Farm Mechanization

Indian food consumption is rising and farmers are under pressure to produce more, faster and cheaper. Yet, Indian farmers traditionally use fewer farm machines than their peer nations, partly because their acreage is so small. For example, India is one of the largest markets for tractors but their use is limited. Mostly tractors are used at construction sites or for ferrying people and things. That is due to the fact that farm sizes remain very small to utilize the service of a tractor with the full capacity. The farms are less than 2 hectare per capita which is far below the global average of 3.7 hectare. Therefore, it is better that the small sized tractors can be used in place of big ones. Another advantage of using the small tractors is that they are more cost-efficient than the traditional bullocks. A pair of bullocks costs Rs. 100,000 and can be used only during the agricultural season. But one has to take care of the bullocks for the entire year as a result the cost of agricultural production increases. On the other hand if one will have a tractor and if there is no work it can be used for some other non- agricultural activities or if at all if there is no other alternative and if a tractor remains idle the farmer will not have to bear a large amount of maintenance cost as required for maintaining the bullocks for the whole year.

Water Shed Management

60% of our net sown area still remains at the mercy of the rain. While large tracks of the irrigation canals may exit only on paper most of the canals are

running dry with silt, garbage and sewage choking them. More than 58% of irrigation is now taking place with the help of ground water drawn from wells and tube wells hiring an estimated 6.5 million diesel pumps and 11 million electric pumps. This results into making farming very costly and unviable for small farmers. Scientific watershed management programme, consisting of a number of measures like diversion drains, graded bunds and check dams can be utilized to use canal water with minimum loss to irrigate agricultural land. The concept of watershed management is a single window approach to harmonise the use of natural resources of land, water, vegetation, livestock, fisheries and human resources.

Dematerialization of land Records

We have significantly strong IT and financial sectors, the benefit of which has not really reached the farmers. The initiative rests upon the idea of dematerializing landholding for the farmer with a satellite imagery of the farmers land imprinted against his ownership. In the dematerialized form the ownership of land always remains with the farmer and no exploiter can take his land away in hurry. However, he may leave his land through the demat form to corporate for a specific period. In return the corporate may – (a) pay the farmer a fixed quarterly lease rental per acre (b) take him as a shareholder with a certain number of shares allotted against each acre of land and (c) provide employment to one member of the family per acre to discourage urban migration on labour. The suggested measure has a potential to increase the earnings to 2.5 to 3 times.

Adoption of Genetically Modified (GM) Crops

To increase the agricultural productivity, we must also be more open and receptive to the idea of experimenting with genetically modified crops like Bt cotton and Bt Brinjal. Many countries have tackled food security in the past with the introduction of conventionally bred, although gene altered high yielding crops.

Balanced Application of several Nutrients

The enrichment of soil and the enhancement of agricultural productivity require the balanced infusion of several nutrients. Excessive and exclusive dependence on nitrogenous and phosphatic fertilizers is very harmful to the soil. As a result, overall agricultural productivity is bound to decline. A national agricultural sustainability mission must be established to devise best practices, restore critical nutrients and manage water usage.

Encourage private investment

An intelligent subsidy and tax structure can encourage private investments, resulting in more efficient deployment of inputs and greater technology use.

Develop Food Processing Industries

Food processing and exports are the natural route for farm produce, raising incomes and creating jobs along with supply chain. Despite incentives for supply chain infrastructure, investment in cold storages, warehousing and refrigerated transport etc. have not been forthcoming because of market fragmentation and lack of assured supplies. To address these challenges, initiatives such as food parks, training and standard certification institutions and relevant transport connectivity would need to be accelerated so that private sector role can be enlarged.

Promote Eco-Technologies for sustainability

Eco technology is based on 3Es- Economics, Ecology, and Equity. This is to be achieved by adopting integrated crop management (ICM) Integrated Nutrient Management (INM), Integrated Water Management (IWM) and Integrated Pest Management (IPM). These are the different areas which are coming under "Green Agriculture"

Provide adequate institutional support to the needy borrowers

The flow of credit particularly to the small and marginal farmers should be made speedier and hassle free. The weather based insurance for agricultural risk should be promoted to increase the coverage which is very low. Effectiveness of the various food supply should be given prime importance and the present PDS (PDS) should be modified and same may be handed over to the village panchayat levels or if possible to SHGs working in the remote rural areas.

Post harvest Management

There is a need to develop cold chains and establishment of large cold storages in strategic locations for long storage of fruits and vegetables. There is also the need for a large number of refrigerated vehicles and containers to carry the perishable produce. Particularly, to carry high quality dairy products milk value chain is extremely helpful.

Develop Agro Based Industries

World wide, agro processing industry has been recognized as a strong economic activity in view of

development of new technological capabilities in processing, storage etc. There is a need to extend term loan facilities to the existing units to upgrade themselves for conforming to the international standards.

Price Risk Mitigation Products

Commodity exchange of India is now spreading far and wide covering a large number of commodities. It is a time to make available the benefits of commodity markets available to farmers. Banks in India with a wide network of branches in rural areas can act as an intermediary between the exchanges and farmers and thus make available the benefits of price risk insurance to large sections of farmers through put option contract.

Adoption of Bio-technology in agriculture

Improvements in agricultural technology are a critical component of meeting the challenges of a sustainable agriculture. Bio-technology crops are already making a contribution. Insect protected crops and herbicide tolerant crops allow farmers to achieve high yields even while using fewer pesticides. Now drought tolerant crops which will grow and survive even when the rainfall is not optimal are being developed through bio-technology. The development of crops that can be used as bio-fuels is another development.

Conclusion:

India needs a big revolution driven by market demand and market needs. Every demand needs investment and without investment improvement can not take place. The investment can be properly utilized through a good forward thinking, good policies and investment in modern technology. If we want inclusive growth both central and state governments have to focus more on the agriculture sector. Government should also have the political will to implement policies effectively and help the farmers to increase the productivity of the farm land through innovative approaches. The government really needs to do is to set up some mechanism to assure the farmer that even when his crop fail, he should not lose his assets. We need a new growth model to improve the agricultural production we must launch technology mission to deal with all these challenges. The model should be from urban migration to rural migration.

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