CHAPTER-2
SALIENT FEATURES OF INDIAN AGRICULTURE

Agriculture in India is characterised by a deep sense of philosophical undertones. It is eulogised thus: "... agriculture is not merely a profession or a business. It is synonymous with way of our living, it is the spinal chord of our rural living. It determines and shapes our traditions and deeply influences progress of our civilisation."\(^1\) Hence, Mahatma Gandhi had extolled the farmer as 'the father of the world'.\(^2\) It is indeed hard to miss the relevance of agriculture to our country. It is asserted, "the importance of agriculture in the economic life of India can hardly be exaggerated. It is the very backbone of her economic system. In fact, the prosperity of agriculture is synonymous with the prosperity of India".\(^3\) The relationship between agriculture and economic stability is a very close-knit one. Its contribution to food security is immense. Hence it is claimed, "since food occupies the first place on the hierarchical needs of man, we can neglect agriculture only at the risk of economic instability".\(^4\)

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1. Bhairon Singh Shekhawat, "Agriculture: The Spinal Chord of Our Rural Living", University News, 45 (01), January 01-07-2007, p.16 (Convocation Address by the then Vice-President of India, Shri Bhairon Singh Shekhawat at Maharana Pratap University of Agriculture and Technology, Udaipur on 16-10-2006).
It is thus evident that agriculture has permeated through the body and soul of everything that is Indian. However, the position of agriculture and farmers appears to be not as cosy as it should have been. Being 'life-givers' and life-sustainers', they should have been placed at the highest pedestal and worshipped. But, they are going through a very lean patch and reeling under pathetic plight. That is why it is lamented, “the situation, however, is not so rosy today. This reflects the extreme hardships being faced particularly by small and marginal farmers….perhaps we forgot that agricultural growth is not just about increasing yields and incomes. The key issue of ensuring over-all welfare of the farmer is of prime importance…”.\(^5\)

Perhaps the need of the hour is a holistic approach towards the agricultural sector; a farmer-centric plan is what is required to be vigorously pursued. Hence, it is asserted, “our farmer has to be at the centre of focus in any strategy for agricultural development. We cannot have sustainable agricultural growth unless our farmers are comprehensively empowered to lead a life without deprivation…. Such empowerment is of critical importance….; otherwise the deteriorating situation would cause big social unrest and even threaten our food security”.\(^6\)

Unfortunately, the efforts made since independence to boost the agricultural sector have boomranged. Though partial gains were witnessed, the overall analysis has revealed a dismal picture. The so-called Green

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\(^5\) *Supra* n.1, pp. 16-17.

\(^6\) *Id.*
Revolution has left deep scars. The present attempt to rejuvenate the agriculture via the Gene Revolution is also alleged to be heading towards the same fate.

2.1 The Significance of Agriculture vis-à-vis Indian Economy

There is a wealth of literature that supports the mutually complementary nature of agriculture and economy. *Prima facie*, the two appear to be contradictory terms; but deep inside, they are mutually inclusive and complementary to each other. It is claimed, "agriculture promotes economic development of the country. The economic history of many developed countries of the world like U.K., U.S.A., Russia, Germany, Japan, etc., demonstrates that agricultural development helped and smoothened the process of industrial development.... agriculture is the fountain-head... to help industrial development. Industrial development in a country hinges on the prosperity and development of agriculture. The first and foremost role of agriculture is its promotion of economic progress in the country... the economic development in general and industrial development in particular depend on agricultural development".  

This general view, it is argued, applies perfectly to the Indian scenario. Agricultural economists have hailed the role of Indian agriculture in the development of her economy. It is always emphasised, "agriculture forms the backbone of the Indian economy and despite concerted industrialisation in the

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last four decades, agriculture occupies a place of pride. Being the largest industry in the country, agriculture provides employment to around 65 per cent of the total workforce in the country".  

There can hardly be two opinions about the paramountcy of agriculture so far as India is concerned. As such, its role in Indian economy can be analysed from following angles.

2.1.1 A Source of Livelihood

Agriculture is a source of livelihood for teeming millions in this country. It has generated employment opportunities on an unprecedented scale. It is claimed, "More than two-thirds (70 per cent) of our working population are engaged directly in the cultivation of land and, when we take into account the people who are indirectly dependent upon agriculture, the ratio rises to more than even three-fourths".  

2.1.2 Contribution to National Income

The contribution of agriculture to national income is invaluable. It is shown that nearly one-half of our total annual national income comes from agriculture. It is often claimed, "when taken independently no other sector contributes so much to the national income of our country". Though its

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8 Supra n.4, p.460.
9 Supra n.3.
10 Id.
share is decreasing continuously since independence, its influence cannot be ruled out. Hence, it is claimed, "... yet, even at present, the share of agriculture in the country's national income is very much higher than in developed countries".

2.1.3 Provider of Food

As a source of food, agriculture is unrivalled. Of course, it was not able to satisfy the food requirements at all times, but quantum of food produced alone was not to blame. It is claimed, "there is no doubt that during the last three decades, it failed to meet our food requirements fully and we have had to rely on heavy annual food imports.... All the same, the total value of food grains produced in the country would come to a very large figure...". Statistics indicate a steady production of food grains. In fact, production of food grains is on the rise. In 2000-01, it was 196.8 million tonnes; in 2001-02, 211.9 million tonnes; in 2002-03, 174.2 million tonnes (provisional); in 2003-

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12 "The share of agriculture in national income has been decreasing steadily. For instance, the share of agriculture in national output was 59 per cent in 1950-51, 54 per cent in 1960-61, 48 per cent in 1970-71 and 40 per cent in 1980-81". Quoted in Ruddar Datt and K.P.M. Sundharam, Indian Economy, (New Delhi: S.Chand & Company Ltd., 1984), p.392.
13 Supra n.3.
14 Id.
15 Supra n.4, p.553.

Production of food grains during various Five years Plans

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04, 212.1 million tonnes\textsuperscript{16}. As such, the second advance estimates for 2006-07 have put the production at 209.2 million tonnes.\textsuperscript{17} We are, of course, self-sufficient now.\textsuperscript{18}

2.1.4 Supporter of Industrial Sector

Agriculture supports industrial sector in a big way. It is observed, “the agricultural sector is the backbone of our economy which provides the basic ingredients to mankind and now raw material for industrialisation”.\textsuperscript{19} Further, it is said, “It feeds not only the population but her manufacturing industries too….”\textsuperscript{20} It is estimated that agriculture is responsible, roughly, for one half of the income of the manufacturing sector.\textsuperscript{21} In fact, it is asserted, “agriculture in India is considered to be the mother of all industries.”\textsuperscript{22}

2.1.5 Phillip to Trade

Agriculture has played a vital role to boost the trade prospects of India. As observed, agriculture’s share in this area is phenomenal. “Broadly speaking”, it is said, “the proportion of agricultural goods which are exported may amount to 50 per cent of our exports, and manufactures with agricultural content… contribute another 20 per cent or so; and the total comes to 70 per cent of India’s exports. This has great significance for economic


\textsuperscript{17} Deccan Herald, Wednesday, August 15, 2007, p.9.

\textsuperscript{18} Supra n.11.


\textsuperscript{20} Supra n.3.

\textsuperscript{21} Id.

\textsuperscript{22} Supra n.11.
development. For, increased exports help the country to pay for the increased imports of machinery and raw materials".  

2.1.6 Source of Governmental Revenue

Agriculture is widely hailed as an important source of governmental revenue. It is claimed, “agriculture is one of the main sources of revenue ... especially for the State Government... Indeed, a bad agricultural year is a bad year all round both for the Government and for the people”.

2.1.7 Instrumental in Economic Planning

Agriculture certainly determines the course economic planning should navigate. It is said, “a good crop always provides impetus towards planned economic development of the country by creating a better business climate for other sectors of the economy. A good crop also brings a good amount of finance to the Government for meeting its planned expenditure”.

2.1.8 Social and Political Relevance

Agriculture is second to none in terms of its social and political relevance. Its relevance is described thus: “...agriculture has in India considerable social and political importance. Agriculturists are.... the backbone of the Indian society and make for social and political stability”.

It is, thus, crystal clear from these points, which are by the way illustrative and not exhaustive, that agriculture has had, is having and shall

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23 Supra n.4, p.461.
24 Supra n.3
25 Supra n.19, p.III /5.
26 Supra n.3, pp.56-57.
have, profound influence on Indians. It is, in fact, *omni potent, omni present* and *omni scient*. Its relevance can be summed up thus: "Generally, it is the failure in the agricultural front that has led to failure of economic planning in particular periods. Agricultural growth has direct impact on poverty eradication. Agricultural growth is also an important factor in containing inflation, raising agricultural wages and for employment generation".\textsuperscript{27}

Hence, it is claimed, "... agriculture is the premier, national key industry of India and it is idle to expect any economic improvement in India without carefully attending to it".\textsuperscript{28}

\textbf{2.2 Different Systems of Farming}

Agriculture is too massive an exercise to be confined to strait-jacket formulae. For most part, agricultural operations are regulated by nature. Obviously, it goes without saying that agriculture is practised under different conditions. Hence, it is quite true that there are different ways of farming. Soil, rainfall, climatic conditions are, \textit{inter alia}, the most important determinants of agriculture. Accordingly, one can expect different types of farming.

It is said, "Broadly, the term 'system of farm organisation' denotes a particular method of agriculture and the specific type of ownership of land".\textsuperscript{29}

It is asserted that any system of farming is bound to influence the social,

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\textsuperscript{27} Supra n.4, p.461.
\textsuperscript{28} Id., p.57.
\textsuperscript{29} Supra n.19, p.1/145.
religious and economic framework of agricultural sector.\textsuperscript{30} Peasant Farming or Family Farming, Corporate Farming, State Farming, Collective Farming and Co-operative Farming are the different categories of farming.

2.2.1 Peasant Farming

Peasant Farming stands for private enterprise on a small scale. It is marked by individual proprietorship and permanent, inheritable and transferable rights on land. The farmer is assisted by members of his family in his endeavour. Managing the farm in his own way, the farmer plans and produces the crop and sells or retains a part of it at his discretion. Since the land holdings are small, mechanisation is hardly possible.\textsuperscript{31}

This is the most prevalent type in India. It is also called as 'subsistence farming' since farmers generally grow the crops for consumption by themselves. The residue remaining, if any, may be sold. Because of small land holdings and abject poverty, farmers find it difficult to switch over to mechanisation.

2.2.2 Corporate Farming

Corporate Farming is also known as capitalist or estate farming. Here a corporate or a syndicate is formed for the purpose of cultivation. The farm is managed in a modern way with a limited liability. This farming is characterised by large land holdings, modern methods of agriculture and hired labour. It is suitable for efficient and large-scale production.

\textsuperscript{30} \textit{id.} \\
\textsuperscript{31} \textit{id.}
Such type of farming was found in the States of Bombay, Madras and Mysore specifically for the plantation of Coffee, Tea, Rubber and Sugarcane.\textsuperscript{32}

2.2.3 State Farming

State Farming refers to the application of state enterprise to agriculture. In this system, land is owned and managed by the State itself. In fact, the State plans the whole thing. Obviously, State bears the risk. Cultivation is done by engaging labourers on hire basis.

State Farming was a typical feature of the erstwhile U.S.S.R. In India some State-managed farms exist in U.P. and other States where mechanised farming has been adopted.\textsuperscript{33}

2.2.4 Collective Farming

In Collective Farming, farms are owned and managed jointly by a group of individuals forming a society. There are three main types of Collective Farming the features of which, respectively, are; where there is collective ownership of land but cultivation is done individually; where there is common housing and messing besides Collective Farming; and where there is an irrevocable transfer of land to the society and cultivation is carried on by joint management.\textsuperscript{34}

\textsuperscript{32} Id.
\textsuperscript{33} Supra n.29.
\textsuperscript{34} Ibid., p.I/146.
2.2.5 Co-operative Farming

Co-operative Farming denotes a system of farming in which all agricultural operations are carried on jointly by farmers on voluntary basis. Here, every farmer retains one's right over the land. The land is pooled and treated as one unit, cultivation takes place under the direction of an elected society. After making the necessary deductions, a part of the profit will be distributed among the members according to one's share. The rest of the profit is distributed in proportion to the wages earned by them.

The societies can be classified into four parts; co-operative joint farming; co-operative collective farming; co-operative better farming; and co-operative tenant farming.\(^35\)

Since time immemorial, Indian farmers have been following the peasant or subsistence farming. The traditional outlook of the farming community and several problems plaguing our agricultural sector are the reasons for prevalence of this system. Agriculture is viewed as a 'way of life, a cherished part of yesterday's, today's and tomorrow's culture and an avowed mission'. Coupled with this emotional attitude, there are host of problems over which no average Indian farmer had / has any control. Hence, he is content with Peasant Farming only.

2.3 Problems of Indian Agriculture

Indian agriculture is, to say the least, caught in a whirlpool of problems. But, the worse aspect is that no exit, to escape from this maze of problems, is

\(^{35}\) Ibid.
in sight. That, of course, does not mean that it has hit the nadir now. On the eve of independence, it had plumbed unfathomable depths; gradually, however, it scaled newer heights. But, it is also true that agriculture has not reached the zenith. Attempts made to reach the peak did not yield cent per cent results.

Agriculture in India is certainly at cross-roads. It has, over the years, no doubt made some greater strides; but the achievements are obscured and eclipsed by certain chronic problems so much so that these problems appear to be an integral part, a quintessence of our agriculture. No doubt, Indian agriculture has been transformed from being a begging bowl into a bread basket.36 But, it is asserted, "agricultural economy of India presents a dual picture of prosperity and plenty on one side; and poverty and misery on the other".37 Hence, an analysis of the problems facing agriculture assumes great significance in the light of all this background.

These problems indeed are the root cause of low productivity in India; some of course are directly responsible and some, indirectly. It is explained, "The term 'agricultural productivity' can be variously defined. Productivity expresses the varying relationship between agricultural output and one of the major inputs like land.... other complementary factors remaining the same. Thus, we may talk of land productivity, i.e, yield per acre or per hectare... It is common, however, to talk of land productivity as yield per acre. It may be

36 Supra n.7, p.260.
37 Ibid.
borne in mind that productivity is a physical rather than a value concept. In other words, we take into account the quantity of the produce and not its value.\footnote{38} It is asserted in this context, "...agricultural productivity in India ...is among the lowest in the world."\footnote{39} Hence, it is pertinent to analyse the factors responsible for the same which factors are nothing but problems facing Indian agriculture. These problems are various, varied and varying.

2.3.1 Diverse Factors

India is too vast a country to be homogeneous. The sheer expanse is the reason behind diverse factors. Hence, it is claimed, "no two regions will be similar in all respects."\footnote{40} This has led to the assertion that such diversities make generalisation very difficult in Indian agriculture.\footnote{41} Thus, it appears that these diverse factors are responsible for the present woes of agriculture.

2.3.2 Unpredictable Monsoons

It is claimed, "Agriculture in India is dominated by nature, specially rainfall."\footnote{42} But the rainfall does not seem to be kind to Indian agriculture. In fact, it is asserted, "...agriculture in India has continued to be a gamble in the monsoons."\footnote{43} It is observed, "The rains may be insufficient or unevenly distributed."\footnote{44} In fact, there seems to be a great unpredictability about the

\footnote{38} Supra n.3, p.63.\footnote{39} Supra n.4, p.465.\footnote{40} Supra n.7,261.\footnote{41} Ibid.\footnote{42} Supra n.3, p.64.\footnote{43} Supra n.4, p.558.\footnote{44} Supra n.42.
unpredictability of monsoons as there is “failure of rainfall in some parts of the country and excessive rains and consequent floods in certain other areas of the country”. As most of the farmers have to rely on these uncertain monsoons, their present is tense and future, uncertain.

2.3.3 Unfair Distribution of Land

Distribution of agricultural land in India is unjust and unfair. Hence, it is asserted that there is a considerable degree of concentration of land holdings among the rich landlords, farmers and money-lenders throughout the country. It is further claimed that the vast majority of farmers own very small and uneconomic size of holdings leading to higher cost per unit.  

2.3.4 Untenable Size of Land Holdings

It is claimed, “The average size of holdings in India is very low, less than 2 hectares or 5 acres. Not only agricultural holdings are small but they are fragmented too”. In fact, it is claimed, “in certain parts of the country plots of land have become so small that it is impossible to move even an ordinary plough”. All this has rendered mechanisation impossible. Small land holdings have led to other problems as well.

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45 Supra n.43.
46 Supra n.19, p.III/7.
47 Supra n.4, p.466.
48 Id.
49 See Id.: “Problems such as waste of time, labour and cattle power; difficulty in proper utilization of irrigation facilities, quarrels and consequent litigation among farmers, etc”.
2.3.5 Overcrowding

It is said, "the real problem of Indian agriculture is that there are too many people who depend on agriculture." So, it is asserted, "Too many cooks spoil the broth is a proverb which applies to Indian agriculture." It is asserted that agricultural productivity is in inverse proportion to the number of people engaged in it, there is excessive pressure of population on land resulting in small, uneconomic and fragmented holdings.

It is estimated that about 40 per cent of the working force in Indian agriculture is surplus. This constitutes unproductive dependents who reduce agricultural incomes that could have been saved and invested. This, it is asserted, lack of investment is responsible for the continuance of primitive techniques etc., and causes low agricultural productivity.

2.3.6 Alarming Rural Indebtedness

It is generally observed that the Indian farmer is born in debt, lives in debt and dies in debt. He is caught in the tentacles of poverty and debt. It is asserted, "Poverty leads to indebtedness and indebtedness in turn leads to poverty among the farmers." Farmers borrow heavily and regularly and so, the debt passes from generation to generation. As a result, they fall into the debt trap. This impacts the overall performance in agriculture adversely.

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50 Supra n.47.
51 Supra n.42.
52 Ibid.
53 Ibid.
54 Supra n.7, p.262.
55 Supra n.19, p.III/8
2.3.7 Inadequate Finance

Closely related to the foregoing problem is the woeful lack of adequate finance. This has made the farmer rely on village money-lenders charging exorbitant rate of interest. Even today, farmers rely on private financers for ½ of their credit requirements. Hence, it is asserted, "This vicious circle resulting in poverty, debt and high interest rates holds the small cultivator in a tight grip".56

2.3.8 Obsolete Farming Techniques

The farming techniques used by Indian farmers are old, obsolete, moth-eaten and archaic. Poverty and traditions have dissuaded them from adopting new and modern techniques. It is said, "primitive and poor techniques of production, inadequate and obsolete nature of implements and failure to apply modern science and technology to our agriculture have been the contributory factors for the low productivity....".57

2.3.9 Disheartening Rural Atmosphere

By and large, Indian farmers are poor, illiterate, ignorant, superstitious and conservative. This state of affairs is responsible for the lack of scientific temper among them. Consequently, they resign themselves to the 'fate factor'. This had made any meaningful advancement in agriculture extremely difficult, if not impossible.

56 Supra n.3, p65.
57 Supra n.11, p.181.
These, then, are some of the major problems staring Indian agriculture in its face. The farmers' cup of woes is already overflowing. However, as if all this is not enough, it is contended, Indian farmers are being compelled to adopt another problem in the form of the monstrous biotechnology.

2.4 Green Revolution and its Impact

Agricultural sector has always been unfortunately, a thorn in the side for our policy-makers. It has not been given its due. Admittedly, it suffers from several chronic problems. However, no sincere and fool-proof efforts seem to have been undertaken to rid agriculture of its curse. The 'mother earth' and farmers have been treated like a milch cow-only to be milched fully, leaving nothing to the calf. That, perhaps, is the crux of the problem. Agricultural sector is exploited to the fullest extent possible without any quid pro quo. That is why the Mahatma had lamented thus; "such is our benighted state. We only talk of agriculture. It has got stuck in our throats and does not go further than that".\(^58\)

As the focus of the present study is on the impact of agricultural biotechnology, it covers attempts, made and being made, to augment the food production and their consequences.

One of the important reasons for the emphasis on agricultural growth, as part of developmental strategy, is concern for food security.\(^59\) Of course, it

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provides food. However, on the eve of the First Five Year Plan, our country was not self-sufficient in food grains and had to depend upon imports. This prompted the Government to emphasise on the production of food grains.

The position was quite comfortable in the first couple of plans. However, the Third plan was a washout as far as agriculture was concerned.

The fiasco of the Third plan forced the Government to look for alternatives. It rolled out red carpet for what later came to be popularly identified as ‘Green Revolution’.

2.4.1 Technology Ingrained in Green Revolution

In the beginning of the Sixties, a new strategy was taken up on an experimental basis. It is said, “Initially, the new technology was tried in 1960-61 as a pilot-project in seven districts and was called Intensive Agricultural District Programme (IADP). Later, the High Yielding Varieties Programme (HYVP) was also added and the strategy was extended to cover the entire country. This strategy has been called by various names: modern agricultural technology, seed -fertiliser- water technology or simply Green Revolution”.

The technology is described thus: “In popular parlance, the phenomenon of the Green Revolution is identified with India’s being catapulted from a chronically food short country, with a begging-bowl image,

60 Supra n.4
61 Supra n.4, p.554.
62 Ibid., p.559.
to one which was self-sufficient and which became over time even surplus in food".  

Green Revolution is the result of application of modern agricultural technology. It is explained, "Green Revolution refers to the quantum jump in food grain production following the use of high-yielding varieties, fertilisers, pesticides, improved irrigation facility and the multiple cropping".  

Of course, like any new development, innovation, research or technology, Green Revolution also has supporters and opponents. There are people who have eulogised it; while there are others who have condemned it. It certainly has positive as well as negative side.

It is explained, "The term 'Green Revolution' was coined in 1968, by Dr. William S.Gand, Director of the US Agency for International Development (USAID) to describe the breakthrough in food grain production and rapid diffusion of the semi-dwarf wheat and rice varieties in India, Pakistan and other parts of the developing world. The dwarf varieties of wheat were produced by American born Mexican Scientist Dr.Norman F. Borlaug at CIMMYT (Centro International de Mejoramiento de Maizy Trigo) known as International Centre for Wheat and Maize Improvement, Mexico". These varieties brought Nobel Prize for Peace to Borlaug in 1970. It is commented, "According to the Nobel Prize Committee, 'the kinds of grain which are the

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64 Dr.Arvind Singh, "Green Revolution: Other Side of the Coin", *Chanakya Civil Services Today*, February 2007, p.60.
65 Ibid.
result of Dr. Borlaug's work speed economic growth in general in the developing countries'. The miracle seeds that Borlaug had created were seen as a source of new abundance and peace". However, it is strongly asserted that instead of being a harbinger of peace, Green Revolution turned out to be a Satan of death and violence.

It is further pointed out, "In 1963, Dr. M.S. Swaminathan, one of Borlaug's wheat apostles, arranged for the high priest to visit India and spread his gospel of the 'miracle' seeds". It is argued strongly that Green Revolution was a reluctant entrant into India. Not every one supported it. Agricultural scientists, leading economists, the Planning Commission, many State Governments, among others, were not willing to adopt this strategy. It is criticised, "within India, the main supporter of the Green Revolution strategy was C. Subramanian, who became Agriculture Minister in 1964, and M.S. Swaminathan... and had been trained by Norman Borlaug...".

It was in fact certain developments that took place in the mid Sixties that paved the way for the entry of Green Revolution in India. The events leading up to this entry are captured thus: "The occurrence of drought in 1966 caused a severe drop in food production in India, and an unprecedented increase in food grain supply from the US. Food dependency was used to set new policy conditions on India. The US President, Lyndon Johnson, put

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67 Ibid., pp 61-62.
68 Ibid., p.31.
69 Ibid., p.30.
wheat supplies on a short tether. He refused to commit food aid beyond one month in advance until an agreement to adopt the Green Revolution package was signed between the Indian Agriculture Minister... and the US ... Lal Bahadur Shastri, the Indian Prime Minister, in 1965 had raised caution against the rushing into a new agriculture based on new varieties. With his sudden death in 1966 the new strategy was easier to introduce. The Planning Commission, which approves all large investment into India, was also bypassed since it was viewed as a bottleneck."70

Thus, it can be seen that Green Revolution entered India as a political- and not as an agricultural-policy. Hence, the impact has spawned over several frontiers – social, economic, political, environmental, etc.

2.4.2 Ingredients of Green Revolution

It is observed, “The package of Green Revolution introduced by the Government of India involved: The use of high-yielding varieties; extensive application of chemical fertilisers; extensive use of chemical pesticides to control pest; arrangement of adequate irrigation facilities; multiple cropping and use of modern mechanical implements like tractors, threshers, harvesters, tube well, etc. to accomplish the agricultural practices”.71

Green Revolution, thus, involved a different approach; an approach which was not thought of or contemplated by the traditional farmers, earlier in India. The problems associated with it, inter alia, are or can be attributed to

70 Ibid., pp 31-32.
71 Supra n.64.
the technology itself. It is asserted, "it involved a package of new high-yield seeds developed after years of genetic research and use of chemical fertiliser and plant protection measures scarcely known hitherto in the region. It also required more dependable water supply and eventually a greater use of machines". 72

Apart from these factors, several others were also part of this overall broad strategy. Factors such as consolidation of land holdings, greater intensity of cropping, role of public institutions like National Seeds Corporation etc., guaranteed minimum prices, agricultural research and education,73 among others, were equally instrumental in this partial success of Green Revolution.

Thus, in the ultimate analysis, Green Revolution was a technology-oriented and technology-driven strategy.

2.4.3 Green Revolution: An Evaluation

No doubt, Green Revolution had its share of ups and downs. Not that every thing about it was good or bad. It was a mixed bag of pleasures and pains. However, it is asserted that the negative impact of Green Revolution has outweighed its sunny side. Hence, it is said, "the new agricultural technology has both been praised and condemned. A study, the Person Report, describes it as one of the authentic marvels of our time. There are, however, critics who do concede that the country has benefited from it. But

72 T.C.Sharma, Technological Change in Indian Agriculture, (Jaipur; Rawat Publications, 1999), p.12.
73 Supra n.19, pp.III/183-184.
they point out some highly unsatisfactory features which have seriously marred its performance".\footnote{A.N.Agarwal and Kundan Lal, \textit{Agricultural Problems of India}, (New Delhi: Vikas Publishing House Pvt.Ltd., 1996), p.136.} In fact, people have mounted scathing attack on it as, "Green Revolution is like watermelon: green only from outside but red within".\footnote{Supra n.64, p.61.}

In fact, the rationale behind the introduction of Green Revolution itself is questioned. Considering the peculiar features of Indian agriculture, the compatibility of Green Revolution with our agriculture was doubted. As such, it was regarded as an exercise in futility. The best of the western scientists found it useless.

As such, it is described, "in the agriculture of Asia we find ourselves confronted with a system of peasant farming which, in essentials, soon became stabilised... The agricultural practice of the orient have passed the supreme test, they are almost as permanent as those of the primeval forest, of the prairie, or of the ocean".\footnote{Supra n.66, p.25.}

When, in 1889, the British Government deputed Dr.J.A.Voelcker to advise it on the application of agricultural chemistry to Indian agriculture, he stated: "I explain that I do not share the opinions which have been expressed as to Indian Agriculture being, as a whole, primitive and backward, but I believe that in many parts there is little or nothing that can be improved... certain it is that I, at least, have never seen a more perfect picture of careful
cultivation combined with hard labour, perseverance and fertility of resources".77

Opinions such as these, certainly, strengthened the arguments against Green Revolution and justified the criticisms.

2.4.4 The Positive Effects of Green Revolution

Even if Green Revolution could not match the tall claims made by its proponents, it certainly had its share of success.

(i) Large-scale Production

It is asserted, “The new technology enabled the country to secure large increases in output of food grains, particularly in wheat, and to an extent in rice. In a short period, it became possible to overcome the shortages.... The country became almost self-sufficient in respect of the basic items of consumption of the masses".78 This impact can be evidenced by the index of agricultural production. “The index of agricultural production increased from 68.8 in 1960-61 to 85.9 in 1970-71.... The index of agricultural production stood at 163.9 in 2000-01”79. The rise in production of food grains, of course, has been quite steady.80

(ii) Employment Generation

To a certain extent, Green Revolution has been able to generate employment opportunities. It is noted, “another important benefit arising out

78 Supra n.74, p.136.
79 Supra n.19, p.111/187.
80 Supra nn.15,16, &17.
of this new technology is the creation of employment potential and absorption of excess labour force in the rural areas and also effective use of labour...
The wage rates also increased considerably.\textsuperscript{81}

(iii) Increase in Farm Income

It is observed that, “the conditions of farmers who were having low income prior to Green Revolution due to poor per hectare yield improved a lot.... The increase in farm incomes had a multiplier effect. It gave a boost to investment and a phillip to non-farm sectors as well”.\textsuperscript{82}

(iv) Change in Crop Pattern

It is claimed, “As a result of the Green Revolution, the crop pattern in India has undergone two significant changes. Firstly, the output of cereals has risen at the rate of 3 to 4 per cent per annum.... cereals have risen in importance from 84 per cent to 92 per cent...”.\textsuperscript{83} Further, “... among cereals, the proportion of rice in total cereals output has come down marginally from 50 per cent to 46 per cent between 1950-51 and 1996-97. During the same period, however, the importance of wheat has more than doubled....”\textsuperscript{84} It is, thus, observed that, “in the pre-Green Revolution period, we have hardly two main crops (wheat and maize) and cereals remained stagnant. But new strategy has ushered the new trend and new cropping pattern emerged in the

\textsuperscript{81} Supra n.7, p.359.  
\textsuperscript{82} Supra n.19, p.III/187.  
\textsuperscript{83} Supra n.4, p.561.  
\textsuperscript{84} Ibid.
This change encouraged the farmers to grow other crops such as oilseeds, pulses, cereals and other commercial crops.

(v) Improvement in Foreign Exchange

A significant effect on the position of foreign exchange was also noticed. Earlier, 'the country had to import large quantities of food to feed the ever increasing population. Thus, a heavy bill of imported food had to be paid year after year. Now, instead, the nation has started generating surplus in export'.

(vi) Introduction of Modern Technology

It is claimed, "A revolutionary impact of Green Revolution... is that it has broken away from the old and outdated traditional practices and paved way to latest and modern technology to raise the productivity per unit of land, per unit of man." Evidently, a shift from traditional agriculture to modern one was an important achievement of this technology which brought the average Indian farmer outside from his cocoon.

These then, are, some of the benefits, achievements, merits or positive aspects of Green Revolution. However, the adverse impact of Green Revolution swept all these achievements under the carpet. It, indeed, has left behind generations who are licking their wounds.

85 Supra n.19, p.III/188.
86 Ibid.
87 Ibid.
2.4.5 The Negative Story of Green Revolution

It is widely asserted, “The Green Revolution... has also an ugly and unfavourable impact on rural sector”. As the initial enthusiasm and anxiety died down, people started questioning the credibility of the story. It is claimed, “more recently... few would subscribe to the tall claims made during its early stages. The euphoria of the late Sixties has yielded place to pragmatic sense of realism and the emphasis has shifted from the achievements of the new technology to an analysis of the problems in and due to it...”.

Ever since the advent of Green Revolution, the debate was on “as to whether Green Revolution has proved to be a cornucopia or Pandora’s box”. Consequently, it was asserted, “that the Green Revolution, once a harbinger of prosperity is withering, is a bitter truth...”. It was vehemently argued, “it has now become increasingly clear that the new technology is not a runaway success (as it is often made out) due to deficiencies in itself, constraints peculiar to the Indian farms, and several ecological problems. Besides, it has thrown up problems, which will pose a serious challenge... in the coming years”. Hence, it is observed that, “others who are frankly sceptical,
proclaim that Green Revolution is neither Green nor Revolution, but it is a myth".93

Green Revolution, thus, has been a great disaster. Its consequences are presented thus: "Green Revolution is the name given to science based transformation of Third World agriculture, and the Indian Punjab was its most celebrated success. Paradoxically, after two decades of the Green Revolution, Punjab is neither a land of prosperity, nor peace. It is a region riddled with discontent and violence. Instead of abundance, Punjab has been left with diseased soils, pest-infected crops, waterlogged deserts and indebted and discontented farmers".94

Perhaps, it would be in the fitness of things to analyse the impact of Green Revolution from two angles broadly – one from the ecological angle and the other, from the socio-economic angle.

2.4.6 The Impact on Ecology

Green Revolution has, reportedly, left a catastrophic impact on the environment. This effect can be measured in terms of various criteria.

(i) Deforestation

It is claimed that, advent of Green Revolution has caused a marked decline in the forest cover of India. Use of modern mechanical instruments led to large-scale deforestation. The per capita forest land in India is 0.1 hectare compared to the world average of 1.0 hectare. Deforestation causes

93 Supra n.7, p.350.
94 Supra n.66.
drought, siltation of rivers and dams, flood, loss of biodiversity, global warming, etc. 95

(ii) Loss of Biological Diversity

It is noted that, the use of high yielding variety crops only has led to the loss of biodiversity. The local indigenous varieties lost their importance due to persistent use of high yielding varieties. This is a matter of great concern. 96

(iii) Environmental Degradation

The worst effect of Green Revolution has been on the environment – leading to the problem of environmental pollution. Increased use of fertilisers and pesticides has caused the problems of air, water and soil pollution. Nitrous oxide produced by microbial action on inorganic fertilisers in soil causes depletion of ozone layer; methane produced by methanogenic bacteria in water logged paddy fields is a potent green house gas responsible for global warming. The drinking of nitrate and nitrate contaminated water causes the disease methaemoglobinaemia in human beings leading to many diseases.

The indiscriminate use of pesticides kills the useful microbial flora and fauna resulting into the loss of soil fertility. Endosulphan is a commonly used pesticide for the control of pests in rice crop which is highly hazardous as it causes serous eye, kidney and liver disorders. Pesticides like D.D.T. are non-biodegradable and are fat-soluble which enter the food chain and reach

95 Supra n.64, p.61.
96 Ibid.
the human body. An average Indian’s daily diet is reported to contain 270 mg of D.D.T.

(iv) Soil Erosion

It is noted that the process of the removal of the topsoil cover is known as soil erosion. The nutrient, organic matter and microbial population is mostly concentrated in the top layer of the soil. Thus, the top soil is at the core of soil fertility. The extensive cultivation practice under Green Revolution without fallowing has put severe pressure on land resources leading to the problem of soil erosion. It has been found that each inch of topsoil lost due to erosion reduces yield of wheat by roughly six per cent. 97

(v) Reduction in Nutritive Value

It is also claimed that, excessive use of nitrogenous fertilisers decreases the potassium content of the food grains. Potassium is an important element that checks the rise of blood pressure and also averts the chances of heart attack. Since most of the Indians are vegetarian, consumption of low quality protein leads to malnutrition. 98

(vi) Mosquito- borne Diseases

Further, construction of canals to boost the agricultural production under Green Revolution has led to spread and outbreak of diseases like malaria, filaria, etc. The improved irrigation facilities have increased the scourge of malaria. 99

97 Ibid.
98 Supra n.64, p.61.
99 Supra n.64, p.62.
(vii) Pest Resurgence

Moreover, the continuous use of pesticides has enabled the pest to develop resistance against the pesticides. This has led to the problem of pest resurgence and multiplication. This makes farmers use higher doses of expensive and toxic chemicals. This effect is called as *pesticide treadmill* where farmers use larger proportions of their income in pesticides without increasing their yield. Crop failure follows and large-scale suicides by farmers are reported.\(^{100}\)

Apart from these, there are also problems like lowering of ground-water table, soil salinity, alkalinity and water logging, loss to production of pulses, etc.

2.4.7 The Impact on Socio- Economic Front

Green Revolution has an equally deleterious effect on the socio-economic sector as well.

(i) Regional Imbalances

It is asserted, “the new technology has proved successful only in certain regions. Haryana, Punjab, Gujarat and Tamil Nadu have adopted this scheme with considerable success, whereas in other States this has still to make a mark. Thus, it has created regional imbalance to aggravate still further the existing regional disparities”.\(^ {101}\)

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\(^{100}\) ibid.

\(^{101}\) Supra n.7, p.352.
It is also asserted, “Dr. M. L. Dantwala has rightly pointed out that the technology evolved during mid-Sixties was suited only to some specific regions but not to other regions”\(^\text{102}\). “This strategy is intended”, it is criticised, “only to regions of assured irrigational facilities and India has irrigational facilities only for about 20 per cent of cultivable land. Moreover, the technology has not developed anything for ‘dry farming’. Hence, the disparities will be very significant”.\(^\text{103}\)

(ii) Imbalance of Food Production

Green Revolution is criticised for having benefited wheat a lot. So, it is said, “…in its coverage over crops, the Green Revolution has been partial and lopsided”.\(^\text{104}\) This was bound to create an imbalance in food production. That is why it is said, “there are no two opinions that Green Revolutions has primarily been a wheat revolution and other crops have not shown encouraging results”.\(^\text{105}\)

However, this had its own adverse effect as noted thus: “wheat accounts for about one-eighth of the total acreage under food grains. Rice on the other hand accounts for nearly one third and the gains in output in respect of that premier crop have not been that impressive. This greatly detracts from the success of the new strategy”.\(^\text{106}\)
(iii) Social Imbalance

Perhaps, one of the baneful effects of Green Revolution has been the social imbalance created by it. It is asserted, “the principal beneficiaries have by and large been the large landowners who have secured handsome dividends from farm inputs, bumper crops and attractive prices.... The majority of the peasants and farm labourers have remained outside the orbit of the new technology”. 107 It was criticised that the heavy dose of input in Green Revolution was beyond the capacity of small farmers and they could not afford such a huge investment even though they might have been assured of good returns. 108 That is why it was asserted, “the Green Revolution is said to be capitalist revolution in socialist India ... and a serious social imbalance or social polarisation is developing ..... 109

(iv) Labour Problems

It is also emphasised that through Green Revolution has had a positive effect on employment opportunities, “at the same time, there has been displacement of agricultural labour by the extensive use of agricultural machinery”. 110 It was observed, “introduction of HYV programme has dual affect on labour. In one sense, it is labour absorbing on the biological side, while it is labour saving on the mechanical side.... The latter will result in

107 Supra n.3, p.72.
108 Supra n.7, p.352.
109 Supra n.107.
110 Supra n.4, p.561.
displacement of labour”. 111 Thus, it can be seen that though there were peripheral benefits, they were overshadowed by real losses.

These are, thus, some of the disastrous effects of Green Revolution. As such, the impact on environment and health is nothing less than that of ‘Bhoposhima’.112 It is asserted, “The Green Revolution did ... contribute to increase in inequality in the countryside.... pursuing a strategy which was more ‘equitable’, and ‘politically correct’ but left the rural poor, already living at the edges of survival, worse off would be cruel”.

Perhaps fears generated by Green Revolution over environmental issues, it seems, can never be allayed. It is said in this connection: “A major and pressing issue that has surfaced in recent years relates to the question of environmental degradation and the long-term sustainability of agricultural growth. The negative environmental impact of excessive use of chemical fertilisers and pesticides, as well as the plateauing off of the growth rates in areas using such technology over a long period, such as Punjab, has been well- documented. The excessive withdrawal of groundwater for irrigation, which is taking place in many Green Revolution areas without adequate recharging of the sub-soil aquifers, is also environmentally unsustainable”.114

Nothing, it appears, sums up better the impact of Green Revolution than the views of Dr.V.K.R.V.Rao who said; “It is now well known that the so-

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111 Supra n.7, p.353.
113 Supra n.63, p.419.
114 Ibid., p.420.
called Green Revolution which helped the country to raise its output of food grains has also been accompanied by a widening of the range of inequality in rural incomes, the loss of their status as tenants by a number of small farmers and the emergence of social and economic tensions in the countryside.... The challenge which Indian agriculture faces is not only of production but also that of distribution, and in our anxiety to concentrate on production problems, we should not forget the human and social implications of agricultural development".115

2.5 From Green Revolution to Gene Revolution

The disastrous end to Green Revolution left the Government and farmers in a lurch. Of course, with the curtains coming down over the Green Revolution, environmentalists, organic farmers and other like-minded people heaved a very big sigh of relief. It was speculated that it would take years before the wounds caused by Green Revolution would heal, let alone the scars. However, their relief proved to be short-lived as around the same time when Green Revolution exited, i.e., '80s, another technology was making headway on the global scene, which more or less every country, including India, embraced with open arms. It was called ‘biotechnology’. It made people anxious as the technology was perceived to be nothing more than a Frankenstein’s monster- a reincarnation of the dreaded Green Revolution. Since its main plank is ‘alteration of genes’, it is referred to as ‘Gene Revolution”. India is on the threshold of Gene Revolution today, attracted by

115 Supra n.4, p.563.
its alleged benefits. However, the sceptics strongly assert that Gene Revolution is more diabolical than Green Revolution.

2.5.1 The Genesis of Biotechnology

It is explained, “The term Biotechnology was coined by Karl Ereky, a Hungarian Engineer, in 1919. The origin of biotechnology can be traced back to pre-historic times when micro organisms were already used for processes like fermentation, formation of yoghurt and cheese from milk, vinegar form molasses....”

However, the technology did not develop overtime. It is said, “biotechnology got a boost in the 1970s with the discovery of restriction enzymes which led to the development of a variety of gene technologies and is thus considered to be the greatest scientific revolution of this century.”

The evolution of biotechnology as an important breakthrough was indeed gradual. For instance, the restriction endonuclease was discovered for the first time in 1970; plants were regenerated from protoplasts in 1971; then DNA molecule, by using restriction enzymes, was produced in 1972; most importantly, the Bt gene was isolated, from the bacterium Bacillus thuringiensis in 1987, which is behind the current controversy of, inter alia, whether to continue with Bt Cotton or not in India. Hence, it is said, “biotechnology thus consists of a variety of techniques, designed to

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117 Ibid.
118 Ibid., at 7 and 8.
genetically improve and / or exploit living systems or their components for the benefits of man. In fact, biotechnology is the product interaction between sciences of biology and technology. It is the technological exploitation and control of biological systems".\textsuperscript{119}

2.5.2 The Concept of Biotechnology

Since biotechnology is a product of many techniques, it is natural to expect as many definitions. Concepts such as these defy any single definition for the various components involved in it.

Hence, it is said, "Biotechnology concerns techniques for using the properties of living things to make products or services. These techniques include selecting natural strains or organisms that carry desirable traits; making hybrids by fusing cells from different parental sources; using chemicals and radiation to create mutant strains; or genetically engineering plants, animals, and micro-organisms to produce specific phenotypic characteristics".\textsuperscript{120}

At the global level, an important attempt to define biotechnology can be seen in \textit{Convention on Biological Diversity, 1992}. According to it, "Biotechnology" means any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.\textsuperscript{121}

\textsuperscript{119} \textit{Supra} n.116.
\textsuperscript{120} Sean D. Murphy, "Biotechnology and International Law", \textit{Harvard International Law Journal}, vol.42 (1) 2001, p.47.
\textsuperscript{121} See Article 2 of the Convention on Biological Diversity, 1992.
The Organisation for Economic Cooperation and Development defines it as, “the application of scientific and engineering principles to processing of materials by biological agents to produce food and services”.122

In India, biotechnology is defined in various legal instruments. Accordingly, the Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro Organisms/ Genetically Engineered Organisms or Cells, 1989 define Biotechnology as the application of scientific and engineering principles to the processing of materials by biological agents to produce goods and services.123

The same Rules also define Genetic Engineering. This term assumes significance since agricultural biotechnology largely employs, today, this technique. Accordingly, “Genetic Engineering” means the technique by which heritable material which does not usually occur or will not occur naturally in the organism of cell concerned, generated outside the organism or the cell is “inserted” into said cell or organism. It shall also mean the formation of new combinations of genetic material by incorporation of a cell into a host cell, where they occur naturally (self-cloning) as well as modification of an organism or in a cell by deletion and removal of parts of the heritable material.124

123 See Rule 3 (i).
124 See Rule 3 (iv).
The US National Science Foundation defines biotechnology as, “the controlled use of biological agents such as micro-organisms or cellular components for beneficial use”. 125

Thus, attempts are made to define biotechnology, but it appears that there is no unanimity among the various people and groups who have given these definitions.

Be that as it may, the concept of biotechnology seems to have gone through different phases. It is said, “At present, we are in the third generation of biotechnology. By first generation biotechnology what is meant to describe is the older and more common techniques like making cheese, the fermentation of wine, the breeding of plants and animals. The first generation biotechnology was a result of natural process discovered by observation rather than systematic application of scientific analysis. The second-generation biotechnology concerned more with techniques involving scientific analysis. Application of microbiology resulted in the discovery of role played by micro-organisms in the fermentation process and the discovery of vaccines. Thus the systematic application of fermentation techniques was developed and used to produce penicillin and other antibiotics during this period. The third generation modern day biotechnology signifies the shifting of focus from microbiology to molecular biology specifically to genetic engineering that began in 1970s”. 126

125 Supra n.116.
126 Supra n.122.
Biotechnology thus defined is capable of several applications—pharmaceuticals, agriculture, environment, etc. Supporters of biotechnology assert that its applications to agriculture are extremely useful; its detractors, however, argue that its side effects could be too devastating.

The application of biotechnology to agriculture is instrumental in creating genetically modified organisms. It is said, "Genetically modified organisms can be defined as organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally. The technology is often called "modern biotechnology" or "gene technology", sometimes also "recombinant DNA technology" or "genetic engineering". It allows selected individual genes to be transferred from one organism into another, also between non-related species. Such methods are used to create GM plants—which are then used to grow GM food crops". 127

Thus, "genetic engineering denotes more than just modification as the organism can be radically transformed, using genes alien to the organism. Genetic engineering is a revolutionary new technology that allows scientists to change the characteristics of living organisms by transferring genes from one organism across species barriers to another. The technology can transfer genes between organisms that cannot inter-breed in nature. Thus genes from humans have been put into mice, from fish into tomatoes and from bacteria

into plants producing what are referred to as transgenic organisms, or in popular parlance as genetically modified organisms (GMOs)". 128

Biotechnology and its applications have generated heated debates across the globe. It would only be apt to say that the whole world is divided into two blocs- the pro-and anti-biotechnology. While some perceive great benefits in it, others discern equally deleterious effects. A brief idea of both, at this juncture, would not seem to be out of place.

2.5.3 Potential Benefits

It is claimed, “Supporters of genetic engineering promise remarkable advance in medicine, agriculture, and other fields. These may include new medical treatments and vaccines, new industrial products, and improved fibres and fuels. Proponents of the technology argue that biotechnology has the potential to increase food security, decrease pressure on land use, sustainable yield increase in marginal lands or inhospitable environments and reduce the use of water and agro- chemicals in agriculture” 129

Hence, it is asserted, “GM foods are developed and marketed because there is some perceived advantage either to the producer or consumer of these foods. This is meant to translate into a product with a lower price, greater benefit (in terms of durability or nutritional value) or both ....The GM crops currently on the market are mainly aimed at an increased level of crop protection through the introduction of resistance against plant diseases

caused by insects or viruses or through increased tolerance towards herbicides.\textsuperscript{130}

2.5.4 The Perceived Risks and Threats

Obviously, every one does not agree with the proponents of biotechnology. Critics have fiercely attacked the concept and its fallout. In fact, protests against the introduction of biotechnology, especially the agricultural biotechnology, have turned violent everywhere. The anti-biotechnology lobby contends that it is (biotechnology) unacceptable and not infallible – ethically, environmentally, socially, economically and above all, in terms of human health and human rights.

It is asserted, in this context, that, "biotechnology is a very new field, and not much is known about the interaction of GMOs with various ecosystems. Some of the concerns about this new technology include its potential adverse effects on biological diversity, and potential risks to human health. Other likely areas of concern are unintended changes in the survival ability, virulence, or other characteristics of the target species; the possibility of adverse impacts on non-target species (such as beneficial insects) and ecosystem; the potential for weediness in genetically modified crops (where a plant becomes more weedy than the original, perhaps by transferring its genes to wild relatives); and the stability of inserted genes (the possibilities that a gene will lose its effectiveness or will be re-transferred to another host)

\textsuperscript{130} Supra n.127.
or that the gene will produce unintended toxins and allergens".\textsuperscript{131} Hence, it is said, "... the three main issues debated are tendencies to provoke allergic reaction (allergenicity), gene transfer and out crossing".\textsuperscript{132}

It is noted in this connexion: "Whereas the application of GM technology to the field of medicines has gained public acceptance, its application to agriculture and food production has raised several controversies. Resistance to GM foods is based on many factors. One is the science itself, primarily its safety for the environment, human and animal health and the other is the regulatory policy governing the use of GM technology and its products. There are serious misgivings about the Intellectual Property Rights (IPR) regime associated with it and the dominance of the technology by the multinational corporations..."\textsuperscript{133}

Perceptive critics fear that Green Revolution pales into insignificance compared to the adverse impact of Gene Revolution or biotechnology. They feel that though Green Revolution left in its trail disastrous effects, it nevertheless had a ‘human face’ to it. Only a comparative analysis made of the two illumines this darker area.

Conclusion

Agriculture in India has undergone variegated changes in too quick successions – especially after independence – to be able to come to terms with. Its journey from being the traditional subsistence type through Green

\textsuperscript{131} Supra n.129.
\textsuperscript{132} Supra n.127.
\textsuperscript{133} Supra n.128, p.2.
Revolution to the threshold of Gene Revolution is full of fluctuating fortunes. Nevertheless, it has weathered the storm. Critics of biotechnology have foreseen clear forebodings should it go in for agbiotechnology, and are vehemently demanding the government not to allow it. Considering the past experience, and the present ominous trends regarding technologies, they are resolutely seeking a ban on agbiotechnology.