Saving Seeds, Protecting Rights.

Beej Swaraj, Beej Bachao.

Bharat Dogra

I would like to record my thanks for the help and support of Sh. Jayesh Joshi and the VAAGDHARA team

—Bharat Dogra

1: Humanity's Precious Heritage of Seeds

1.1: Increasing Importance of *Beej Swaraj*

There are several reasons why in the present context more and more farmers and concerned citizens are voicing the need for protecting self-reliance of farming communities and seeds sovereignty, with this being voiced in India more in terms of *Beej Swaraj.* To understand this, we need to review the dramatic changes that have been taking place in the seeds sector and more generally in biodiversity in recent decades. One of the biggest worries relating to the food and farming system at world level has been that in recent decades the diversity of crops being grown on the fields of farmers has declined to an alarming extent. The diversity of crops has decreased and in addition the diversity of varieties of crops has decreased even more and their genetic base has become narrower.

Earlier the crop diversity had evolved over a period of over ten thousand years on farms and for much longer in nature. Apart from nature's bounty or gift, efforts and experience and wisdom of hundreds of generations of farmers had contributed to this diversity in the form of thousands of varieties and cultivars of many crops. What had evolved or had been created over thousands of years has been lost on a massive scale on the farms of farmers over a period of just a few decades.

This trend is deeply worrying due to a number of reasons. The varieties which have been lost rapidly had existed precisely because these were useful in providing particular types of foods and other useful materials, or were suitable for growing in some special environmental conditions, or were resistant to some troublesome pests and diseases, or were of use in other ways. Their loss is not just an immediate loss or a one-time loss, but would adversely affect the ability of future generations to grow several useful and cherished kinds of food and what is more, protect their crops from adverse weather or from disease and pests. In times of climate change greater diversity of crops was needed to cope with new challenges, but the disturbing trends have moved in the opposite direction.

The official response nationally and internationally to this crisis situation has been to create gene banks or similar establishments in which germplasm can be kept in protected lab conditions under the care of various government and international institutions but also increasingly under the control of several big corporate interests and powerful multinational companies who are more likely to use these collections for increasing their profits and power.

In this way what was once the heritage of farmers and indeed of all humanity in free conditions, available on the fields of tens of millions of farmers all over the world, has increasingly become concentrated in conditions in which there are increasing chances of this being used more for increasing profits and power of a few.

In addition, it has been increasingly realized that farm biodiversity cannot really be protected just in lab conditions as this is a very fragile and uncertain protection which can be endangered by several mistakes, flaws and accidental factors. The best way to ensure the protection of farm biodiversity is to save it on the fields of farmers.

Hence it has been increasingly emphasized by several experts as well as by social and farmers' movements that the focus should shift to creating enabling and encouraging conditions in which farm biodiversity can be saved on the fields of farmers in ways that are highly creative and involving for farming communities, just as these had always been for thousands of years before the disruptions of recent decades arrived.

If farm biodiversity is saved on the farms of ordinary farmers, then this means that this becomes accessible to all farmers and people just as it should be and just as it was in times of our ancestors who had contributed so much to this farm biodiversity (as against the experience

of fast decline of farm biodiversity in recent times). However, to ensure the realization of farm biodiversity being a common heritage, it is important also to ensure that laws and plant patents do not become a barrier to this.

This becomes a more complex issue as in recent decades powerful forces have been working to spread narrow laws and patents, or systems similar to this. This is a very important aspect of the adverse changes in recent times which have threatened the entire concept of free growth of farm biodiversity as a common heritage of humankind without any disruption from narrow interests guided by profit and control.

While abundant genetic diversity on farms had earlier always been seen as a sign of wellness, what happened in the course of the so-called 'green revolution' was that exotic varieties with a narrow genetic base were promoted by powerful forces with the aim of increasing at a very fast pace the use of chemical fertilizers and pesticides, while at the same time a very false message was spread that the traditional diversity of crops and their many, many varieties was a sign of backwardness. Although this was done in the name of increasing yields, the traditional varieties that were already giving high yields even without high doses of chemical fertilizers were ignored and phased out. As has subsequently become very clear, the yield increases promised by the green revolution proved to be an illusion or a big exaggeration, or came with so many other adverse factors (harm caused to soil, water, environment being only some of these) as to deny any overall beneficial impact. Thus, we had an utterly absurd and tragic situation of the heritage of a vast diversity of crop varieties suited to local conditions and evolved by hundreds of generations of farmers being rudely displaced by exotic varieties heralding expensive farming promoted by agribusiness interests, and all this being applauded as a big development achievement.

The matter did no end here. This was followed by the promotion of plant patents and intellectual property rights. While the concept of patents being applied to plants had initially appeared absurd to people more used to thinking of plant diversity as a common heritage, with immense resources being poured in by powerful forces to take forward patent-based thinking this soon began dominating the discourse in the seeds sector. As a result, the task of saving farm biodiversity on the farms of ordinary farmers with a perspective that they and all people are involved in both protecting and sharing a common heritage of humanity has become more and more difficult. Instead, the forces of profits and control are increasing their grip on the seeds sector.

It is in these difficult conditions that we must proclaim the commitment to two most important objectives. Firstly, farm biodiversity must definitely be saved as a big priority and it must be saved on the fields of farmers (while publicly owned gene banks can play a supportive role). Secondly, all farm biodiversity must be seen as a common heritage of humankind, of all farmers and of all people, to be freely shared, exchanged, grown, saved, conserved, celebrated.

All those who are working in this direction and to take forward this objective are doing a great service to humanity and to farming and farm biodiversity. However, some of them are able to come only half-way as they feel the need to make some compromises. They should also come forward in a more public-spirited way to take up what is most needed in the present difficult conditions.

1.2: Increasing Importance of Seed Conservation by Farmers and Rural Communities

In traditional farming one of the most important tasks and responsibilities was that of selecting, saving and conserving seeds. In several rural communities' women farmers had an important role in this as well as special skills and understanding related to this. Several tribal communities were particularly known for their seed conservation efforts.

While this has been well recognized for a long time, what is often not appreciated adequately is the extent to which the skills and wisdom of several traditional communities was advanced in matters relating to seeds conservation.

Dr. R.H.Richharia, former Director of the Central Rice Research Institute of India, was among those few senior scientists who mingled up very well with communities of very remote villages and with tribal communities and this enabled him to have an understanding of seed conservation strengths of rural and tribal communities. It was this people-based and community-based work of this senior scientist and his colleagues which led him to prepare a great compilation of over 17,000 cultivars of rice grown in India. As he told me, he was particularly impressed by the ability of tribal communities to remember and pass from generation-to-generation knowledge concerning the characteristics of hundreds of rice varieties and cultivars, the suitability of different varieties for various kinds of land, their water requirements or drought resistance, their different cooking qualities, their different aromas and even medicinal properties etc. Most of this realization was in the context of farmers of Chhattisgarh region including Bastar where the tendency of most other experts has been to dismiss tribal communities as being very backward. However, Dr. Richharia on the basis of his own deeper understanding was able to better appreciate the richness of the knowledge of tribal communities and he also encouraged his co-workers to do so, as I could also understand when I met some m embers of his team later. Dr. Richharia, who was one of the earliest and youngest scientists from India to get a doctorate in Botany from Cambridge while studying in the middle of great resource constraints in Britain, told me that some farmers including women farmers were particularly well-skilled in this and took a very keen interest too. However, as not all farmers could be expected to have equal skills and ability regarding this, some of the learnings were sought to be captured in the form of some rituals which could be more easily observed as a part of daily life by most community members and farmers.

While traditional skills of farming communities for seed conservation needed to be valued greatly and constantly strengthened and encouraged, unfortunately exactly the reverse has happened due to a number of adverse factors.

From mid-1960s onwards the strategy of farm development based on new exotic green revolution varieties and seeds was based largely on uprooting the greater diversity of existing crop-varieties grown in time honoured systems of mixed farming and rotations on the basis of the accumulated wisdom and experience of many generations of farmers relating to local agro-ecological conditions.

While this sudden change was inherently wrong and harmful, the situation worsened further as powerful corporate interests, including multinational companies and the research institutes allied to them, made seeds the main source of trying to forever increase their profits as well as their control over farming and food. Towards this end they exerted huge pressure to realize the monster objective of patents and IPRs over life forms and plant varieties, as well as to promote highly harmful technologies that could facilitate this. Hence what started happening was that as crop and seed diversity was vanishing from the fields of farmers, it was being concentrated in the labs and gene banks controlled or accessed more readily by the big corporates who then used and stole the accumulated work of generations of farmers to release 'their' patented varieties, sometimes after manipulating them genetically to increase their control and monopoly over them. All this was sought to be promoted under the name of 'science' and 'development', with awards being given for this.

It took some time for communities to recover from this horrible deception and shock. Once more of them started realizing the extent of the harm being caused, they started assuming the responsibility of again strengthening their seed conservation efforts.

As the displacement of farm and seed diversity was far from complete particularly in the more remote villages, several communities could still take up the task of conserving seeds. These communities noted that some disruption and harm had been caused, and legal changes had also created problems, but if the farmers and their communities acted with increasing unity and wisdom to protect their seeds diversity and sovereignty, still the diversity of seeds could be saved and protected on the fields of farmers.

Hence in recent years we have seen several communities taking up the task of protecting seeds diversity and sovereignty with a renewed and increasing sense of urgency, in India and in many other countries. I was present at a recent such effort in the form of a seed festival organized by a voluntary organization VAAGDHARA in parts of three states in Central India. The mostly young men and women members of this organization mobilized themselves very enthusiastically to organize nearly 90 gatherings of tribal communities, in turn reaching out to people of about a thousand villages and hamlets. At these gatherings people of various villages assembled with their collections of various seeds which have become more difficult to find in recent times, so that these and/or the knowledge relating to this could be shared with farmers of other villages. Visiting such gatherings, I could see that the villagers assembled here were so happy and enthused by this entire effort that they wanted such seed festivals to be organized very regularly. Women in particular were very enthusiastic participants.

This could not have been such a big success if earlier efforts had not been made to prepare a strong base for seed conservation as an integral and important part of the many-sided development efforts initiated in this region by VAAGDHARA in recent years. This has helped to strengthen the earlier inclinations of these tribal communities for seed conservation, although some disruption had appeared earlier to disturb the continuity of this effort.

Earlier in the course of my work in the Himalayan region, particularly in villages of Garhwal, I could learn much from the efforts of *Beej Bachao Andolan* (Save the Seeds Movement). The efforts of this movement led to much better appreciation of seed diversity saved on the farms on the basis of traditional mixed farming systems like *'barahanaja'* (growing 12 or more crops together on a small plot of land to ensure balanced nutrition and self-reliance in food).

> *The Save the Seeds Movement organized several foot marches in which marchers went from one village to another, carrying with them those seeds which had been getting rare to find.*

Before this effort, some locally posted officials and even 'scientists' were speaking in terms of uprooting such excellent traditional systems declared to be backward by them, much in tune with the terrible trends of the 'green revolution'. The Save the Seeds Movement helped to confront and change this highly distorted thinking. The movement organized several foot marches in which marchers went from one village to another, carrying with them those seeds which had been getting rare to find. They provided some of these seeds to those farmers in the visited villages who wanted them. At the same time, they collected information on the seeds which had been preserved and saved in this village. In very joyful ways a lot of information on diversity of traditional seeds was collected and in addition farmers could also exchange seeds. The valuable contributions made by women farmers were also highlighted in the course of these important initiatives.

Clearly there is need for many more such efforts as well as for protecting the seeds sovereignty of farmers, their rights to conserve, protect, grow and exchange their seeds without any obstructions being placed in this.

1.3: Saving Indigenous Seeds is A Duty to Protect a Right!

It is being increasingly stated that farmers' seed rights need to be protected. However, this can be linked to the progress of farming and farmers only when there is adequate on-farm protection of seeds. Hence the seed rights of farmers are linked to their duty to protect indigenous seeds. When green revolution seeds with a narrow genetic base were spread rapidly over a vast part of the agricultural land of India and several other developing countries, these displaced a vast diversity of local crops and crop-varieties. The reason why farmers over several generations had developed and preserved a vast and increasing diversity of crop-species was that these were needed for different kinds of land, situations and needs.

There could be different varieties suitable for lower land and upper land, for flood-prone land and well-protected land. Seeds selected could differ depending on whether rains were normal, deficient or excess. Different varieties could be selected for preparing normal rice or scented rice, for rice known to be best for preparing *khichdi* or *kheer,* or for processing into *poha* or *murmura*, or for meeting some special health or medicinal need.

Farmers recognized and understood their local, highly diverse seeds and their special characteristics. As long as they had these seeds with them in their stock, or could obtain from sharing with neighbours, they could adapt themselves to various changing situations at the local level without waiting for any instructions from above or from outside.

Once these seeds were lost and displaced, farmers became very helpless and they then understood their great loss. However, by then often it was too late and a lot of the precious heritage of seeds had been lost. However, gradually several community efforts started being made to find and save whatever traditional seeds could be found. Of course, government and corporate efforts too had started to save endangered seed varieties in gene banks, but from the point of view of farmers what was really important was to save the traditional seeds by growing them on their farms. These would then be shared with others and so the process of revival of the diversity of traditional indigenous seeds would spread.

The Himalayan region with different seeds found suitable for different elevations and with

farmers traditionally growing many fascinating mixed farming systems, including millet crops much rarer in the plains, have been particularly known for the genetic diversity of crops. When some *Chipko Movement* activists of Hemvalghti region in Garhwal (Uttarakhand) realized that this diversity including an invaluable system of growing together about 12 nutritious crops, called *'Barahanaja'*, was being threatened in various ways, they launched a pioneering movement called *'Beej Bachao Aandolan'* or save the seeds movement to protect the heritage of traditional indigenous seeds. They took out *Padayatras* or foot marches to remote villages to spread the message of protecting indigenous seeds and mixed farming systems like *Barahanaja*. Several endangered seeds were collected from remote villages and shared with various farmers so that these could be saved in field and farm conditions. Characteristics of many diverse varieties of rice and other crops were carefully documented.

Subsequently several efforts which were trying to spread natural farming practices realized that it is very important for the success of these efforts to create a strong based of diverse traditionally grown indigenous seeds. SRIJAN, a voluntary organization which has been promoting natural farming in several states has set up natural farming centres which also include efforts to collect and share several diverse varieties of traditional indigenous seeds.

Several such efforts have found that tribal communities in particular have a rich heritage of great diversity of traditionally grown indigenous seeds and they have been quick to realize the importance of saving this heritage. In the tri-junction tribal belt of Rajasthan, Madhya Pradesh and Gujarat, efforts of a voluntary organization VAAGDHARA to protect this heritage of tribal communities, particularly the *Bhil* tribal community, have won widespread appreciation.

These efforts have continued for over 15 years. Several *Padayatras* were taken out to spread this message. While individual farmers were also encouraged in indigenous seed protection efforts, at the same time some community seed banks were also established.

> *"The response of farmers particularly women farmers from tribal communities have been so encouraging that our theoretical understanding of the concept of Beej Swaraj has been clearly confirmed by the field level realities and experiences.*

These efforts led to the emergence of several women farmers in particular as very capable and successful conservers of indigenous seeds. They were honoured at gatherings of villagers as *Beej Mitra* and *Beej Mata.*

Thanks to the sharing of these seeds by farmers at several levels, these seeds which were once getting severely endangered are now being grown in several villages by an increasing number of farmers. A recently organized seeds festival, which involved the holding of nearly 90 seeds assemblies in as many villages, has given a big boost to this saving and sharing of indigenous seeds by tribal farmers, particularly women farmers.

For the activists of VAAGDHARA this is part of a wider vision of Gram Swaraj or village self-reliance which draws its inspiration from Mahatma Gandhi and has proven of great value in improving the livelihood base of tribal communities and reducing their dependence on highly exploitative migrant labour. As the Coordinator of VAAGDHARA Jayesh Joshi says, "Practical application of Gandhiji's concept of Swaraj in terms of contemporary issues and needs is very important and in the context of the farmers their most important need perhaps is to be self-reliant in terms of seeds. Seed is after all the basis of all farming. Hence *Beej Swaraj* or seed self-reliance of farmers has been for us a very important part of the overall concept of swaraj."

"What is more", he continues, "the response of farmers particularly women farmers from tribal communities have been so encouraging that clearly our theoretical understanding of the concept of Beej Swaraj has been clearly confirmed by the field level realities and experiences."

The other aspects of promotion of self-reliance in this context have been in terms of promotion of natural farming and preparation of field level natural fertilizers and pest repellents based on locally available resources. All these components are mutually supportive and can be well-integrated with each other.

Hence the way forward increasingly is not to look at the saving of indigenous seeds as an isolated activity but to integrate it in a more holistic understanding of swaraj and Gram Swaraj, or a vision of village development based on increasing resilience and self-reliance of rural communities.

1.4: Seed Self-Reliance and Seeds Sovereignty constitute essential, definite rights of farmers

If agriculture has a history of about 10,000 years, then for about 9,900 years, or 99% of this time, it was taken for granted that farmers have an inalienable right to save, exchange, grow year after year their seeds (perhaps occasionally sell too). These rights were accepted as so natural that there was no need to raise any questions about this. Seeds sovereignty and seed self-reliance were such an integral and taken for granted part of farming communities that there was no need also to coin any special words for this phenomenon which was a part of daily life and livelihood.

As seeds have been such an important part of life and livelihood, the choices of communities and people relating to seeds also reflected their social thinking and worldview, and festivities and rituals were associated with the selection, conserving and planting of seeds. Again, given the importance of seeds, there was high regard for knowledge and understanding relating to diversity of seeds, suitability of various seeds for diverse locations, for different kinds of food and dishes, for obtaining protection from pests or diseases or adverse weather conditions. Seeds were an important aspect of education, mainly oral education, and the heritage handed over from one generation to another. Hence seeds were a very important part of life and of culture.

Therefore, it is not at all surprising that in ancient literature we often come across examples of very diverse kinds of foods, crops and their seeds being celebrated and mentioned as indicators of progress and prosperity.

Recently Shanti Morrell-Hart, Associate Professor of Anthropology at Brown University, USA, spoke about one of her findings, in collaboration with Dr Stacie King of the University of Indiana, relating to discovering evidence of an ancient seed bank dating from 400 to 700 years ago in

mountains in Oaxaca. People here were not only collecting varieties of maize and beans, they were storing a huge suite of diverse plant foods that featured in their cuisines, which they could perhaps replant after a colonial incursion—grains, fruits, vegetables, pungent herbs, seasonings.

The findings of these researchers have some policy lessons for our times too. As Shanti Morrell-Hart Says (interview with Srijana Mitra Das, The Times of India, September 21, 2025), "When we look at deep time, the places that had the most trouble were large cities that relied on a few food crops which arrived through tribute or trade, serving people who had developed fixed ideas of food. The places with the greatest resilience were where people had access to more kinds of food—and developed diverse ideas of what composed food."

"Another aspect which emerges in our work", Prof Shanti adds, "focuses on the seed bank and buffering against risk by conservation through collecting different seeds—that helps diversity and flexibility and, over time, it preserves biodiversity."

Thus, apart from seeds being a very important part of daily life and culture, people had also developed deliberate systems for protecting this heritage and for safeguarding against risks like invasions and disasters.

Ignoring and violating these efforts and strengths of farming communities that had persisted over more than 99% of the times since agriculture has existed, during the last about seven decades or there have been deliberate efforts on the part of powerful interests to restrict seeds sovereignty and self-reliance of farming and rural communities and to give it a bad name, instead spreading an entirely different viewpoint of identifying agricultural progress more and more with big corporate interests getting more control over seeds.

It is in these difficult conditions that there has been a growing need to make more organized efforts to protect seeds sovereignty and seeds self-reliance of farmers, the rights to farmers to save, conserve, exchange, grow and re-grow and if necessary, sell their seeds in their local areas. The cause of protecting seeds sovereignty has been taken up by diverse organizations in various areas and there are several national and international campaigns regarding this.

In India *Beej Swaraj* campaign (literally self-rule and self-reliance in the context of seeds) has been carried forward by several organizations and farmers. This is a very appropriate word which captures two aspects. Firstly, that the rights of farmers in the context of seeds will be well protected by people and secondly, that farmers and all other people will also take forward the task of protecting and conserving the rich diversity of varieties of various crops. Hence both struggle and constructive work are involved here and with a combination of these efforts the Beej swaraj campaigns can fulfil very important responsibilities in very difficult times.

1.5: India's Steps towards Self-Reliance

In the middle of the controversy over the higher tariffs announced by Donand Trump (President of USA), on August 2 2025 the Prime Minister of India gave a call for promoting the spirit of the *swadeshi* movement seen during the struggle for independence from colonial rule.

The basic idea of *swadeshi* is that to the extent that the production of certain goods is viable at the local level, we should encourage and buy locally produced goods, instead of importing these goods or obtaining these from distant areas. Further, the production by smaller-scale, less capital intensive and less mechanized units generating more local employment per unit of production should be favoured by consumers and buyers. Mahatma Gandhi was quick to clarify that he is not discouraging trade nor is he denying the advantages of trade. However, in matters of meeting daily needs, he said, consumers must show a clear preference for meeting their needs from goods produced closer at home, as far as possible. While this helps to improve and increase the self-reliance of any country in meeting its essential needs, this also helps to increase the self-reliance of rural communities, another matter close to Mahatma Gandhi's concept of *Gram Swaraj* or village self-reliance.

Mahatma Gandhi was saying all this in the context of resisting the ravages of colonial rule which had destroyed India's famous crafts and artisan works (for example weaving and spinning in the context of textiles) and had also disrupted the community based rural systems. As Gandhi also combined his calls with practical action, he revived the *Charkha* (spinning wheel) and made *khadi/khaddar* (meaning hand spun and hand-woven cloth) the symbol of *swadeshi* movement. Both *khadi* and *swadeshi* movements spread far and wide in the country during the freedom movement, with women making a particularly important contribution.

In the present context, considerations of environment protection and the miles travelled by any consumer product have enhanced the importance of the concept of *swadeshi* in new ways. The related concept of *Gram Swaraj* based on self-reliance of rural communities is being considered increasingly important in the context of increasing resilience of rural communities and adaptation to climate change. In addition, this concept is sometimes being taken forward in ways which can contribute also in significant ways to climate change mitigation.

While there are several reasons to welcome the decision of the government to revive the swadeshi concept, there are also very serious questions regarding the ways in which the Indian government has violated the *swadeshi* spirit in the past.

Perhaps the most glaring example of this is that instead of conserving India's rich heritage of indigenous cotton varieties, the government has allowed the very wide spread of genetically modified cotton crop.

More recently, the government has been exploring the idea of introducing gene edited varieties for rice even though rice is the most important food crop of India. These are just a few indicators of very harmful compromises that have been made in recent years in violation of the *swadeshi* spirit.

Of course, it is well understood that *swadeshi* today cannot be the same today as during the freedom movement as the world has changed. Nevertheless, government policies must be respectful of the basic idea of swadeshi and the spirit of swadeshi. The concepts of both swadeshi and *Gram Swaraj* can be carried forward in significant ways by giving much higher importance to the promotion of natural farming based on conservation of indigenous seeds. (Natural farming cannot co-exist with GM crops). The khadi work can be carried forward by according much higher importance to a wide range of village industries and crafts, including those relating to processing the various crops produced under natural farming conditions.

The GM crops promoted by multinational companies and their collaborators and fronts-persons are completely opposed to the very idea of the concept of swadeshi and the government's commitment to swadeshi will be tested in the context of the decisions the government takes in the context of GM crops and gene edited crops.

India is a very good place for taking forward concepts of swadeshi, *Gram Swaraj* and khadi in very beautiful and creative ways as, compared to many other countries, India has many more skilled farmers, artisans and crafts-persons who can contribute to this in very important ways. In addition, talented villagers have shown that they can also contribute in new and innovative ways. Mangal Singh, a farmer scientist, made a very important contribution in the form of inventing Mangal Turbine which can lift water without diesel and electricity. This is very much in tune with the idea of *Gram Swaraj*, and at the same time can contribute a lot to climate change adaptation as well as mitigation. Yet years after a committee of the Union Rural Development Ministry (apart from other independent senior experts) had strongly recommended its widespread adoption and the topmost official (rural development secretary) had strongly supported this; the invention and its inventor are languishing in neglect.

So, the government will have to do a lot to improve its record before its swadeshi commitment can be seen to be marching ahead in the right spirit with sincerity.

2: Significant Contributions of VAAGDHARA

2.1: *Beej Swaraj* (Seeds Sovereignty) is Crucial for Agenda of Self-Reliance — Interview with Jayesh Joshi

Jayesh Joshi, founder and coordinator of VAAGDHARA voluntary organization, has been in the news recently as co-organizer of a national dialogue on self-reliance of rural communities and a series of village fairs to strengthen tribal communities' efforts for *Beej Swaraj* or self-reliance in seeds. These efforts acquire a special significance at a time of increasing worldwide concern regarding the concentration of the seed industry in the hands of a few giant multinational companies. What should be done in such a difficult situation to increase seed self-reliance or *Beej Swaraj* of rural and particularly tribal communities? What have been the efforts of VAAGDHARA in this direction? In this interview, Jayesh Joshi answers these and related questions.

There has been an increasing emphasis on policies of self-reliance in recent months or weeks in India and some other developing countries. How important is your campaign for Beej Swaraj in this context?

I think Beej Swaraj is of very high importance in this as well as wider contexts. In India and several other countries, when we seek self-reliance, then given not just the structure of economy and livelihoods or demographic factors but in addition cultural factors as well, the self-reliance of rural areas or Gram Swaraj is very important. This was emphasized a lot in the freedom movement and in the thinking of Mahatma Gandhi this is seen as the basis of regeneration of villages. What is important is to emphasize that despite all the years that have passed this thinking remains very important, and in fact there are new sources and new reasons for relevance as in the context of climate change. Now in this wider context of Gram Swaraj, I think that Beej Swaraj and seeds sovereignty are clearly of very high importance as Beej is the essence and the starting point of life, of farming and food. So, if you are badly dependent in matters relating to seeds you cannot really have Gram Swaraj.

Nevertheless, the fact remains that in India as well as in several other countries farmers have been becoming more and more dependent in matters relating to seeds. How do you hope to change this situation?

We work with tribal communities in Central India in three states where VAAGDHARA's initiatives have been welcomed and supported by people as they feel that these respond very well to their real needs. A helpful factor is that beejswaraj has been very much a part of their livelihoods, their farming and their culture in the past. However, due to a number of complex factors including exploitation of tribal communities in colonial times, their well-established systems were disrupted. Later there was a very different pursuit of development which ignored the strengths of tribal community systems and tried to impose new and alien systems including seed-dependence which were disruptive for the communities and their way of life. The new generation struggled to find ways of protecting community strengths as the more influential elites insisted that they have to give up their 'backward systems' for new 'development'. So, villagers were confused and in this confused state and amidst alienating influences it was difficult to protect their existing strengths.

In this situation when VAAGDHARA started its work we were very sure of at least one thing that we are not going to impose anything on people, and so we approached them with a spirit of understanding and learning. This helped us to understand that in the midst of various constraints and problems they faced, the communities had evolved methods and systems which were very suitable and made a lot of sense in those conditions. One important aspect was to carefully save the seeds of many diverse varieties of crops. However, these and other strengths were already in decline. So, what we have tried to do is to revive the strengths of communities, give

people confidence and support in this and then suggest improvements where needed which take this forward without being disruptive in any way.

What exactly is your approach to Beej swaraj?

Our approach is that this should be taken forward in a more holistic way along with many other important aspects which strengthen the communities and their farming system and its sustainability. Hence seed self- reliance is a part, a very important and in fact essential part, of strengthening communities, making the community and its farming system more self-reliant, with mobilization of groups of women and men at village and cluster levels being supportive towards each other. In this system there is encouragement for revival of traditional strengths of saving seeds, helped by traditional skills and also new understanding such as that brought by increasing interactions facilitated by VAAGDHARA. For instance, the research and documentation work which has listed nearly 100 types of traditional foods including uncultivated ones, the mixed farming systems and rotations associated with them, the various varieties and their characteristics, the nutritional analysis of various crops have been helpful. A very important role has been played by the seed's fairs or melas being organized every year, more recently as many as about 90 at the same time before the planting season so that more people have a chance to know more about what variety of seeds are available with whom and they have better chances of sharing and exchange of seeds. All this people really like and are happy to be involved with as, apart from its practical and economic uses, this has been a part of their culture which was unfortunately disrupted and now it is nice to be part of its revival.

Another wider context is that of promoting natural farming which is best achieved on the basis of the traditional diverse seeds of these communities.

How do you see all this to be helpful in times of climate change?

When communities are strengthened and their resilience is strengthened, when they have more self-reliance than their capacity to cope with climate change in the form of adverse and erratic weather also increases. This also happens when their recurring input costs decrease. Hence climate adaptation improves. In addition, climate mitigation is helped when the burden of fossil fuels reduces significantly. In traditional farming of the tribal communities we work with there was no burden of fossil fuels. This burden came only when outside influences changed the prevailing system. With the promotion of natural farming based on diversity of indigenous seeds, again we can realize the farming system which has very little of any burden of fossil fuels, and the soil conservation natural farming promotes is also useful in this context.

How can we take forward Beej swaraj?

Surely this is not a question of economics only, this is even more integrated with culture and with a way of life, and so should be taken forward in a more holistic way. Again, this is not a question of any one organization or any single community. This is a much bigger issue at a national level and world level as our basic thinking about seeds needs to be changed in the direction of regarding seeds as the heritage of humanity to be shared, and never to be used as an instrument of maximizing profits or control over others.

2.2: Many-sided Efforts to Protect Heritage of Seeds

In many rural communities, particularly tribal communities, there has been a rich tradition of saving seeds but in more recent times due to several external factors this has been weakening while the dependence on purchasing seeds from outside has been increasing. This was also the situation in several villages of Central India inhabited by Bheel and related tribal communities when a voluntary organization VAAGDHARA started working among them.

VAAGDHARA's overall development perspective is that of Gram Swaraj and increasing self-reliance of rural communities and self-reliance of seeds or Beej swaraj is considered to be a very important component of this, VAAGDHARA was very keen to protect, revive and strengthen the traditions relating to saving seeds in these communities. These efforts of VAAGDHARA in turn gave increasing confidence to the communities to revive their healthy traditions which have become even more important in present times. Hence with mutual cooperation the seeds self-

reliance in many villages could be strengthened significantly and many of these are now by and large self-reliant in meeting their seed needs. In addition to saving their costs they are able to avoid the kind of distress they experienced when the seed purchased from the market turned out to be of very poor quality. Now they can trust the seed saved by them. In addition, they are able to use the protected indigenous seeds as the most important base for practicing natural farming as seeds of their traditional varieties are most suitable for natural farming. This effort is helped further by the organization of seed festivals in this and neighbouring villages before the planting season. At these seed festivals various farmers bring seeds of various varieties and exchange information regarding the characteristics of various varieties. This further helps the exchange of seeds involving a larger number of farmers including women farmers. Talks with several villagers revealed that they really like these seed festivals and fairs and also find them very useful. As Sharda from Amlapada village said, the exchange of seeds and the ability to get the seed one really needs is greatly facilitated by these seed fairs.

> *"At these seed festivals various farmers bring seeds of various varieties and exchange information regarding the characteristics of various varieties. This further helps the exchange of seeds involving a larger number of farmers including women farmers.*

Founder and coordinator of VAAGDHARA Jayesh Joshi say, "When we started working among these communities, we were impressed by the traditional wisdom relating to several farming practices including saving seeds but we could also see that due to several adverse factors these very useful traditional practices were coming under strain. Hence, we introduced several initiatives which facilitate the continuation and strengthening of these traditional practices while at the same time giving communities a confidence in maintaining their traditional strengths."

While seed festivals and fairs are one step in this direction, research and documentation work of VAAGDHARA also helps in better sharing of good practices and knowledge relating to seeds and diverse varieties with their special characteristics.

One Hindi publication brought out by VAAGDHARA has given details of how seeds should be cleaned, dried and stored in a community managed system, what are the various traditional practices for safe storage and how these can be further improved with sharing of information. The emphasis here is on using those materials which are available easily with the community such as use of pots made of clay or bamboo, or using hollowed bottle gourds for storing some kinds of seeds, or using neem leaves or ash for protection from harm. Similarly, those

precautions are recommended that can be easily accepted by people.

Another Hindi publication gives information on different varieties of crops, how to get their good yield and ensure protection to them while adopting natural farming practices. As and when information on new varieties becomes available, this is also included in the shared information.

VAAGDHARA sees its Beej swaraj portal https://beejseawaj.in as a key tool for saving, sharing and recording indigenous seeds. This portal has details of many native seed types including cereals, spices, forest produce, fodder, oilseeds, pulses, vegetables, fruits and nuts. The portal adds further to the ability and the efforts of VAAGDHARA to share information on seeds. It describes and facilitates the organization's efforts to have a community-based system of protecting seeds, with emphasis on quality of seeds and climate resilience. In the course of meetings information on various seed varieties and their characteristics is collected and then it is verified, involving technical and scientific expertise. The portal describes various methods adopted by communities traditionally for storing seeds such as storing seeds of lentils in pots while adding ash, hanging vegetables like onions and garlic and sprinkling wet seeds on teak leaves or on walls. It tells us about the reach out of VAAGDHARA's efforts to 1168 villages located in 12 development blocks. It tells about the very important role of exchange of seeds and how this has been promoted in various ways such as the organization of Saksham samoohs or self-help groups, by regular meetings on this and related issues and by organizing seed festivals, and by trying to ensure that the more vulnerable households or those unable to save seeds are also able to save seeds. The portal tells us about not only the community seed efforts but also about policy advocacy efforts so that the possibilities can increase regarding the much wider spread of sustainable farming and a system of self-reliant development and particularly self-reliance in seeds based on this. While much of what the portal tells us is highly encouraging, there is also need for a lot of caution to ensure that while interacting with wider systems, the basic objectives of self-reliance based on community strength and empowerment are not compromised.

According to VAAGDHARA documents, the VAAGDHARA Gene Bank Framework is a plan to protect and use genetic resources for sustainable farming and saving biodiversity. Further it is stated, "It supports our Gene Bank initiative which aims to save native and traditional crops. The goal is to encourage farmers and researchers to use these crops in their work, keeping them vital for future of farming and biodiversity. The framework gives guidelines on how to collect, record, store and use these genetic resources. It helps with food security, supports local communities, and adds to global efforts for sustainable growth."

According to the data base of VAAGDHARA, in 2023-24 in the rabi season the Community Seed Bank in Sara Nangal village (Banswara district) was able to distribute 800 kg. of gram seeds, 1840 kg of wheat seeds and 36 kg of matar or pea seeds. The households who received this returned this to the community seed bank at the time of the harvest after adding some more as their contribution, thereby ensuring the sustainability of the community seed bank and its ability to help people. This can be particularly helpful at the time of crop damage caused by adverse weather conditions.

VAAGDHARA estimates that about 20,000 women are at the core of its movement to save indigenous seeds. Among them some highly respected elder women with more experience and understanding of issues relating to saving seeds are recognized as Seed Mothers.

These seeds related efforts are helped by wider efforts to protect healthy traditions of tribal communities such as halma which emphasizes voluntary work and cooperation for common good. Another healthy and useful tradition is that of the hangdi system of mixed farming under which a dozen or more crops are planted around the same time together and then harvested at various times of the year. VAAGDHARA has also helped in the revival of traditional markets called haats so that this avenue which is more linked to community needs continues to function.

All this has been helpful for creating conditions where communities have more inclination and confidence for protecting those strengths of their traditions which are helpful for them as well as

for the wider good of society. Thus, while the farming system we see today in Amlipada village is good for these farmers' sustainable livelihoods, it is also very helpful when seen as response to the crisis of climate change. The increasing self-reliance and reduced farming costs and cooperation contribute to improved climate adaptation. Diversity of traditional varieties and mixed farming systems are better for coping with adverse and erratic weather conditions.

At the same time this farming is very useful for climate mitigation as there is hardly any burden of fossil fuels in the farming system in Amlipada. Hence apart from the contribution this and other neighbouring villages like this are making to protecting biodiversity, their contribution in terms of very effective response to climate change is also very important and deserves wide support and encouragement.

2.3: Amlipara women show the way forward in saving seeds

Anita Damor is a farmer of Amlipara village, located in Kushalgarh block of Banswara district (Rajasthan). Her farming provides such a fine example of progress in the direction of ecologically protective farming and self-reliance of villages that when she spoke about this at a national level conference on village self-reliance this was very highly appreciated.

I recently visited this village and met Anita in a group of about a dozen women. I realized that while Anita I s like a group-leader, other members of the group also farm in a similar way and cooperate closely with each other.

One common characteristic of their farming is that they practice natural farming methods. They do not use chemical fertilizers, pesticides and weedicides. They prepare organic manure on their own farm.

Secondly, they grow a great diversity of crops despite having small plots of farmland—generally about one or two acres (in addition, small kitchen gardens). Anita, for example, is able to grow about 30 crops in the form of cereals, millets, pulses, oilseeds, spices, vegetables in the crop cycle of a typical year. In addition, she has some fruit trees as well. Hence her family and most families of this group are very largely self-reliant in growing highly nutritious, healthy, organic food for their self-consumption, and in addition have a little surplus for sale.

Thirdly, these households save the seeds of their traditional varieties of crops. Women in particular play an important role in this. Anita proudly shows the different seeds she has saved for the next year. Thus, they do not have to buy hybrid seeds sold by various commercial

companies every year. This is a very important part of their self-reliance. As Sarita, another woman of this group says, their experience has shown that self-saved and preserved seeds are the most protective.

Fourthly, these farmers avoid the use of tractors or other expensive machines. Bullocks are used instead to plough the fields, for threshing and carrying loads. They are also helpful in removing some of the weeds.

Even otherwise farming is well-integrated with animal husbandry. Anita has two bullocks, two calves, one buffalo, eight goats and several poultry birds. Bullocks are highly valued in these households and are never considered a burden.

Instead of being sent out for processing, most of the crops are processed using simple implements within the village, so that organic crop residues serve as healthy feed for crops.

There are high levels of cooperation among various households and particularly among women. When extra work is needed at a farm, women get together to contribute voluntary work. They also exchange seeds with each other.

This strong tradition also helps them to get together to raise their voice for government support in a strong way. Hence, they could get together to demand and receive solar pumping set to lift water from a local rivulet for irrigation. Similarly, they are able to together raise demand for employment works (NREGA work), adding to livelihood and development opportunities in the village.

These households place a lot of emphasis on education. In my group discussion, all women said their children are going to school. Two women, Sharda and Anita (a different Anita) said having done very well in their high school exams, their daughters have received scooties (two-wheeler vehicles) as prize and to help them in accessing higher education.

Thus, the village development effort has a fine combination of strengthening good traditions and initiating new efforts (including access to renewable energy).

While the path shown by this village would be a very good learning in any circumstances, its significance has increased further in times of climate change. With its emphasis on minimizing fossil fuel-based inputs (almost eliminating these), a farming pattern which protects and conserves soil and grows more trees this village provides a model for climate change mitigation. With its emphasis on more sustainable livelihoods, reduced costs, increased self-reliance, more diversity this model also contributes greatly to climate change adaptation. Its overall pattern is cyclical, with wastes returned to soil and soil fertility obtained from this for maintaining and increasing food production.

While the people and particularly the women of the village deserve the most praise for these achievements, a very important contribution has also been made by VAAGDHARA. As Sarita, one of the women explained, “due to a number of factors the village was moving away from its rich traditions but then VAAGDHARA helped us to find the wisdom of protecting our roots and the results have been really good for us.”

VAAGDHARA helped these women to form a self-help group or Saksham samooh to coordinate their activities and take forward their common livelihood concerns in a more organized way.

Jayesh Joshi, founder director of VAAGDHARA says, “Our effort is not that we are going to villages only to teach something. We go among people with a spirit of learning. This enables us to have a good understanding of the richness of traditional wisdom of tribal communities.”

Thus, it has been able to evolve a system based on retaining the richness of traditional wisdom, combined with contributions from modern science and development initiatives which too are welcomed as long as these are not disruptive for the traditional systems which evolved keeping in view understanding of local needs and environmental conditions.

Unfortunately, among some powerful persons there is instead a different tendency to regard traditional systems of tribal communities as backward and so they only think in terms of imposing their own thinking here. Instead, with some humility, if they look around with a true

scientific spirit, they will find that they have a lot more to learn here. As I realized in the course of my long group discussion with the self-help group or Saksham samooh of Amlipara village, there is so much to learn here, so much wisdom among very ordinary looking villagers.

2.4: A Family Committed to Protecting Indigenous Seeds

Baal Singh is an elder of Bhil Adivasi community in Kushalgarh area of Banswara district in Rajasthan who is widely respected for his knowledge and understanding relating to traditional farming practices of his community.

Recently when I went to meet him at his home in Nisnawat village, he asserted in strong terms that the base of tribal community's farming should be in traditional time-honoured diverse varieties of crops which should be conserved and saved. He was equally emphatic that the trend of getting hooked on hybrid crop variety seeds purchased from the market has been very harmful for farmers of his community and should be checked.

He explained—these hybrid seeds sold by companies are generally meant to be grown with chemical fertilizers and pesticides. These seeds make us dependent on expensive market purchased inputs and increase our costs and debts, thereby endangering our viability and survival as small farmers. These often also require more water. Several of these seeds and the methods used for growing them have proved to be harmful for soil. These seeds are also more susceptible to attacks from pests. Sometimes farmers have lost heavily as these seeds did not grow properly.

In sharp contrast, Baal Singh adds, we can trust our traditional seeds, as we have saved and preserved them, and we know the characteristics of our diverse seeds. We know how to cultivate them well, and how to look after their plants and crops. These can be grown using lesser water and these are less susceptible to harm from pests or diseases. These can be grown in very low-cost ways using inputs from within the villages. Neither these seeds have to be purchased nor other inputs need to be purchased to grow them. For small farmers like us keeping costs low and avoiding unnecessary increase of costs is very important.

Baal Singh continues—Maize is our most important food, and there have always been traditional diverse varieties of maize to suit different tastes and preferences. Our young generation should also know more about them.

Baal Singh then took me to his nearby farm to show a field in which the traditional Hangdi pattern cultivation is practiced. As he explained, in this small field nearly a dozen crops had been sown together at the same time, including millets, pulses, oilseeds, vegetables etc. Now these will be harvested at different times of the remaining year so that the family will continue to get some crop or the other at different times.

Such practices have been helpful for small farmers for a long time, and on the basis of seeds of traditional varieties saved by them over the generations, they know which crop can be grown together in such mixed farming systems and what kind of rotations can be most suitable.

This is an intricate system based on understanding of many generations ad should never be uprooted. The younger generation should also understand its importance, he asserts.

Some years back when VAAGDHARA came to work in this region along similar lines, Baal Singh was very happy at this development and he became an enthusiastic supporter of such efforts. Village level swaraj or self-reliance groups were formed in various villages and Baal Singh became an active participant in these groups. At the same time his daughter-in-law Pushpa also became an important participant in the self-help groups of women or Saksham samoohs devoted to promoting similar ideas of low-cost, self-reliant and ecologically protective farming among women farmers.

Dinesh, son of Baal Singh, is also very committed to taking forward his father's ideas. He says—these are not old or outdated ideas but instead I feel that these ideas are very important for protecting the interests of our generation and the future generations also. We must understand the importance of saving our seeds, saving our

heritage based on this, and natural farming practices. There is so much talk of environment protection, but here in our village we are able to contribute in our daily life to this.

At a time when disruptive technologies imposed from above have played havoc with the farming communities of many parts of the world particularly the global south, it was very encouraging in the course of my recent travels to meet such a family which is so highly committed to protecting the heritage of its traditional seeds at several levels of two generations. Such efforts of saving and conserving the diversity of traditional seeds and crops or plant varieties should be widely encouraged.

2.5: Thousands of farmers participate in seed festivals

Nearly sixty villagers are sitting on an open floor covered by a roof for shade but otherwise open on all sides. Women and men are present in equal numbers but the visibility of women is higher because of their colourful dresses.

These are mostly Bheel tribal community members from India who have gathered here to be a part of a seed festival (Beej Utsav or Beejostav) that is aimed at strengthening the efforts of many rural and tribal communities to protect the diversity of their indigenous seeds.

In the front on a few tables' various diverse indigenous seeds, particularly of millet crops, are displayed. Farmers, particularly women farmers who are even better informed about seeds, have brought these seeds with them. The seeds they brought will be taken away in small amounts by others who need them, while they will take away those seeds brought by others which they lack but need. Then they will in turn also tell other farmers of their village about what they heard and learnt at this meeting, and share a few seeds with them. Hence in a very nice way indigenous seeds as well as information about seeds gets exchanged at a meeting in which typically 40 to 80 farmers from 3 to 15 villages may participate. At the end of the meeting these farmers also take a pledge regarding their determination to protect and save indigenous seeds.

This is a scene from a seed protection community meeting in Sera Nagal village located in Banswara district (Rajasthan) which this writer attended recently on June 20. However, this could have been a scene from any one of the nearly 90 seed-protection village meetings that were organized recently from June 18 to June 22 in the tri-junction area and meeting point of three states in India—Rajasthan, Madhya Pradesh and Gujarat. A significant part of the population of this region consists of tribal communities who are known for their rich heritage of indigenous seeds, particularly of millets.
These seed-protection meetings were organized

by VAAGDHARA and various community-based organization linked closely to it.

These 90 meetings could achieve the participation of nearly 1000 villages and hamlets where VAAGDHARA voluntary organization works.

At these meetings various farmers and those with specialized knowledge of various seed varieties took turns to speak, giving useful information about these indigenous seed varieties as well as regarding the urgency of protecting indigenous seeds.

This is widely seen and understood by these communities as an important time and opportunity for bringing back to these communities something of great value that has been lost to a significant extent in recent decades.

These rural and particularly tribal communities traditionally cultivated a wide diversity of indigenous seeds but after the advent of the green revolution this diversity of indigenous seeds was rapidly eroded. Hence the invaluable heritage of farm bio-diversity and indigenous seeds, the great achievement of the combined efforts of several generations of farmers continuing for hundreds, possibly thousands, of years was very badly eroded and substantially lost, at least on the fields of farmers. Incredibly, all this took place while officially celebrating the 'achievements' of the green revolution.

However, once communities realized the extent of the loss they had suffered, several efforts started to protect the heritage of indigenous seeds on the fields of farmers (not just in gene banks). The efforts that VAAGDHARA organization has been making for indigenous seed protection have been widely appreciated, particularly as these have also been accompanied by efforts to spread natural farming practices and to improve the self-reliance and resilience of rural communities, particularly tribal communities. The concept of largely self-reliant rural communities, called Gram Swaraj, which was emphasized a lot by Mahatma Gandhi during the freedom movement, has been adopted by VAAGDHARA as one of its leading precepts and the concept of seed self-reliance and protection of indigenous seeds is an integral aspect of this.

Hence while VAAGDHARA has been working with continuity for protection of indigenous seeds for several years, the recently organized festival of indigenous seeds and the related bio-diversity is being regarded as a very significant step forward on this path as about 90 village assemblies could be held on this issue within just five days and the response of farmers, particularly women farmers, was very enthusiastic. The demand for annual organizing of such a seed festival has also been raised. One hopes that such indigenous seed festivals will become a symbol of hope and determination to protect the vast diversity of indigenous seeds.

2.6: Beej Swaraj and Strengthening Communities

VAAGDHARA's journey has shown that such important objectives as Beej swaraj can be best achieved if a conscious, clear and determined choice in favour of building on the strengths of tribal communities is made.

In the wake of the increasing seriousness of the environmental crisis as well as increasing economic inequalities, the search for alternative paradigms of development has increased. Historical reviews have revealed the hitherto largely hidden strengths of indigenous cultures, which with better understanding and appreciation can contribute much to evolving alternative development paradigms and pathways. At the same time more recent studies have also confirmed important ways in which several aspects of the culture and thinking of indigenous communities, as also their social structures and practices, can be helpful for creating a more just and sustainable society. Some senior farm scientists have stated that their closer and participative understanding of some farming practices of remotely located tribal communities revealed to them a lot of wisdom inherent in practices which earlier used to be ignored or dismissed as mere rituals.

With this realization the folly of imposing alien development without even trying to realize the strengths of indigenous and tribal communities, particularly in terms of their own environs and needs but often also in terms of their wider relevance for deeply troubled humanity, is increasingly realized, at least among significant

sections of concerned people, activists and scholars. It is also increasingly realized that neglectful and imposition-oriented tendencies of the past are likely to have resulted in serious mistakes, leading to much avoidable harm, and urgent corrective actions are needed.

Hence it should be increasingly realized that real progress of tribal communities is to a significant extent a re-discovery and a re-assertion of traditional strengths of these communities, strengths which have been weakened in more recent times due to a complex of factors. Revival of these strengths in important respects like saving seeds, self-reliance in seeds and Beej swaraj is in turn truly possible in a sustainable way only by re-asserting the self-reliance of these communities. The Indian constitution and laws like PESA (Extension of Panchayati Raj to Scheduled Areas) provide sufficient scope for this and the challenge is open to people's organizations, particularly those sincerely and deeply committed to the welfare of tribal communities, to utilize these opportunities and tap this potential. At the same time, in terms of the practical reality and power structures, there are very influential forces and trends which work against such a self-reliant development path which increases self-reliance and inherent strengths of tribal communities.

Those who try to build on the strengths of tribal communities may face formidable opposition from these forces. However, if on the basis of their dedicated work they can show and prove the success of their approach in contributing much to real progress, not only in terms of the established human development indicators but also in terms of less tangible but nevertheless important indicators such as increase in voluntarism and collective work for the common good, then such gains are bound to gain wider acceptance despite the present-day opposition to them from some powerful forces.

VAAGDHARA and Its Area of Work

VAAGDHARA is an important voluntary organization working in the tri-junction tribal belt of Rajasthan, Gujarat and Madhya Pradesh which has made a clear choice in Favor of working on the basis of strengthening of self-reliance and strengthening of tribal communities in terms of the best utilization of the opportunities afforded by the Indian constitution and highly democratic laws like PESA, thereby contributing also to strengthening democracy and decentralization in the country.

This can be achieved in several ways, with different priorities, and the path which VAAGDHARA has chosen is that of emphasizing improvement of nutrition, health, livelihoods, education, childhood related opportunities and well-being. Clearly these include some of the more important aspects of the life of tribal communities and if improvement in these can be achieved, life in more comprehensive terms will also improve significantly.

The area chosen is one which has been generally regarded to be at the lower end of human development indicators, particularly in terms of nutrition which is a key concern of the work of VAAGDHARA.

Over the years tribal households have been losing several of their more nutritious foods, as well as the biodiversity in farms and forests which made available the nutritious foods. The dependence on rations provided by the government has increased, which are heavily dominated by two cereals wheat and rice. Giving up their diversity of nutritious food crops in farming, many households have taken up the cultivation of cotton as a cash crop which is often a GM variety or Bt cotton. As is well known, there are several serious risks involved in this, as well in the overall drift from food crops to cash crops.

Hence there are several indications that this region before the interventions of VAAGDHARA had begun to resemble closely a region which has come under the influence of an imposed model of development, not just ignoring the strengths of the tribal way of life but in fact to some extent even assaulting this way of life. Hence the intervention of VAAGDHARA has come at an opportune time when this alien or imposed model of development has to be challenged and an alternative is to be offered.

Pattern of Interventions

VAAGDHARA's interventions have been based on forums of tribal communities called Jan Jatiya Vikas Manch (JJV) and community organizations called Jan Jatiya Swaraj Sangathan (JSS). These organizations have played a very important role in organizing several colloquiums, marches and meetings accompanying these marches.

In 2015 the first such colloquium or Tribal Sovereignty Conclave was organized in Banswara, attended by around 6000 persons. An issue which got particular prominence here was that of saving and spreading indigenous seeds as this provides the base for self-reliant livelihoods. A Beej Swaraj Manch, or forum for self-reliance and sovereignty in matters relating to seeds, was started. An exhibition of diverse traditional seeds was organized. Several positive aspects of traditional health care were also taken up for discussion.

Next year in 2016 Kisan Swaraj Yatra was organized. This march contacted about 7000 persons in the course of visits to 30 villages. The main theme of this march was the creation of a nutrition sensitive farming system.

In 2017 a tribal sovereignty conclave was organized. The event also included a yatra or march to many villages in the course of which a large number of people were contacted. In the course of these meetings greater clarity and agreement on the concepts of True Farming, True Democracy and True Childhood was achieved so that these concepts could represent the community's thinking on what they were trying to achieve in these important areas of their priorities. These meetings were also useful to prepare a citizens' charter of demands and to prepare a road-map for the work ahead. In terms of children's various needs, more clarity was sought to be achieved in terms of four rights of children-- survival, protection, development and participation. More emphasis was placed on strengthening local bodies for achieving better democracy or Lok Tantra.

The next Tribal Sovereignty Conclave was organized in 2018. A tribal farmers' sovereignty dialogue was organized in the form of a march which reached about 200 villages and meetings were held in almost all these villages. Indigenous seeds were most discussed, but also other issues including animal husbandry and how government help can be obtained for marketing of various produce which are more important in these areas. Improvements in NREGA also received attention. Various cultural issues and in this context also issues of gender justice were discussed. A strong message against child marriages emerged from these meetings. Improvements in school, ensuring presence of adequate number of teachers, providing sports facilities were emphasized in the context of childhood concerns. Skill enhancements and better linkages of education to employment were also emphasized.

Better status for traditional healers or gunis, availability of ayurvedic medicines close to villages, better utilization and availability of herbs, diversifying ration provided by government to improve its nutrition content, ensuring supply of natural rather than refined cooking oils were some issues that were emphasized in the context of health and nutrition. In the course of discussion better spread of nutrition kitchen gardens and agro-forestry were also advocated.

In the Tribal Sovereignty Conclave of 2019 as well as other efforts which increased during this year, the cumulative target of reaching out to about 100,000 families in around 1000 villages was realized. Contributions which PESA, indigenous seeds and an improved health system can make were widely discussed while child well-being got even more attention. Discussions were focused not just on improving Anganwadi's, preventing school drop-outs and other aspects of school improvement but also on more comprehensive understanding of child friendly conditions in villages as well as schools. The tradition of halma or voluntary contribution of labour was revived particularly in the context of improvement of schools and their environs. Village Development and Child Right Committees were formed, signifying high importance accorded to children. School management committees were improved. Ways of modifying and improving school curriculum to give more attention to local realities, needs and aspirations were discussed. Another important issue of discussion was to approach the government to resolve the financial difficulties and other problems students from

tribal communities faced when they applied for government jobs. Improvements in Child help-line were also sought.

The concepts of True Democracy, True Childhood, True Health and True Farming also became clearer in this conclave. Several learned thinkers and activists as well as senior persons in the academia and the government were invited and their views expressed in the conclave also helped in preparing the agenda and increasing support for this. To take forward these issues, apart from JJV and JSS, nearly 300 community persons and 3000 volunteers became active by 2019 so that what emerged from meetings, yatras and conclaves could be taken forward in the form of follow-up actions.

To take forward these various issues, messages and emerging agreement points, a community radio program called Vagad Radio made a very important contribution. Subsequently Vagad Radio also received a prestigious national award.

In 2021 an important nutrition campaign was launched to reach about 67,000 children with important nutrition messages for them as well as their parents, particularly their mothers. This campaign was focused most on how to make better use of available nutritious foods. As a result of increasing exposure to market and subsidized rations, attention had been moving away from several highly nutritious, locally available foods. Recipes based on these were not just discussed but were also used to prepare nutritious and tasty dishes which were served on the spot to children. In this Poshan Swaraj Abhiyan a lot of knowledge drawn in the first place from tribal communities was taken back to them or re-emphasized because of the emerging tendency to neglect this. In addition, the opportunity provided by these gatherings and meetings was also used to convey or re-emphasize important messages relating to other aspects of child nutrition as also hygiene, immunization and health. This was a short duration campaign but it could reach as many as 750 villages. This has been accompanied by a campaign to steadily reduce consumption of tobacco, including smokeless tobacco, and liquor on a continuing basis.

To take forward the spirit of self-reliance among tribal communities in particular, in 2023 about 8000 tribal community members and 14 experts on various relevant issues from many parts of the country gathered for a conclave on Krishi aur Adivasi samaj or farming and tribal communities. Several questions were raised and discussed in detail by the experts and others, leading to the emergence of several ideas and suggestions which will help future work and initiatives.

An Over-view of Efforts

To recapture what has been achieved so far, we may say that the first phase was to increase awareness that something precious in the knowledge base and collective strengths of tribal communities was being gradually lost or eroded, and there was a need for interventions to prevent or check this loss or erosion. As the wider systems are much stronger than those of tribal communities, there is a risk of tribal systems being overwhelmed by them at various levels, and the cultural loss of tribal communities may be such that they can lose the capacity or even the will to check this. Hence there is a need for an intervention which clearly shows the risks relating to this and emphasizes the need as well as the possibility for checking this.

Secondly, as merely identifying the challenge and the task is not adequate, a dialogue has to start on how to revive and protect the strengths of tribal communities, and how these can be related to a better life, a better path- way for future, a better world-view. This dialogue has to be taken to hundreds of villages and hamlets and to tens of thousands of people, men and women, youth and children. Certain issues have to be prioritized and strengths of communities have to be linked to these. This effort tried to achieve this with conclaves, yatras and village meetings.

Merely discussions and the emergence of ideas from this are not adequate. This has to be followed up by various community actions and taken forward at various levels—in terms of direct improvements by the community (for example mobilization of volunteers for improving schools and their environs, saving indigenous seeds and spreading their use and cultivation) or influencing policy makers for their wider spread. VAAGDHARA's efforts have been striving to achieve all this.

Thirdly, these efforts can create conceptual clarity and understanding which can influence wider change. In the context of this initiative there have been step-by-step and participatory efforts to achieve greater clarity and understanding, in the course of which a very large number of persons have contributed as well as benefited, regarding the four pillars of this initiative—True Democracy, True Childhood, True Health and True Livelihoods (Farming related). A comprehensive understanding is sought to be formed which is also related to the needs of these tribal communities. This can make a wider contribution and be helpful to several somewhat similar efforts.

Wider Debates on Alternative Paradigm

At a time when in view of wider environment crisis and increasing inequalities need of alternative development paradigm is being widely discussed, such initiatives should also be seen in terms of the wider contribution they can make to such an important dialogue and search for answers. This is all the more so in the present context as several aspects of this debate have been concerned with cultures and worldviews of indigenous and tribal communities.

In the case of agriculture, for example, the agro-ecology and social agro-ecology concepts have been increasingly seen as a solution for several problems of ecological ruin as well as injustice associated with the agricultural systems that have evolved in recent years. The True Farming thinking of this VAAGDHARA initiative is actually quite close to the concept of social agro-ecology and hence can be identified with the solutions that are emerging at a much wider level.

What is no less significant is that such an approach to farming and related activities is also seen to be of growing importance in the context of climate change mitigation as well as adaptation. Hence its importance and relevance are likely to increase further in the future.

In terms of nutrition this invitation takes a much broader view instead of looking in terms of only government programs like Anganwadi. Thus, farming itself is sought to be made more nutrition-sensitive and special campaigns are launched to re-emphasize the nutrition value of several neglected traditional foods. At the same time, there is a desire to make full use of existing programs like Anganwadi and so its centres are demanded for smaller villages as well, but the mistake of placing too much reliance on just one or two government programs is avoided and instead a more holistic approach to nutrition is avoided which is much more realistic and useful. Such a holistic approach is also emphasized in some recent literature.

The very high prioritization accorded to True Childhood and to the creation of child-friendly villages and higher involvement of communities in improving schools and social education is a very important feature of this initiative and this should be welcomed as ultimately children are the future of community. This initiative contributes to child welfare in several ways, but at the same time also makes children more aware of their community's needs and increases a sense of responsibility towards the community.

Avoiding Pitfalls

Such an initiative runs the risk of interpreting assertion of tribal community's strengths in problematic ways such as irrational glorification of any king or ruler who was very powerful, or irrational/romantic depiction or conceptualization of tribal communities' way of life to an extent that even any real problems associated with it are sought to be somehow justified or deliberately ignored. This initiative has tried to avoid such an approach and if any problems arising from some tribal customs are identified, then attempts to reduce and check these problems are also made.

Another possible pitfall is of presenting autonomy or sovereignty issues in such a way that this start conflicting with law and constitution, or lead to avoidable misunderstandings or unintended conflict situations. This initiative has avoided this pitfall and its efforts are instead to strengthen further the constitutional safeguards and protections for tribal communities as well as to ensure better implementation of important and widely praised laws like PESA.

Conclusion

There are a growing realization and better appreciation of several neglected strengths of indigenous and tribal communities which can contribute to creating a better world by helping to resolve several serious conflicts and problems of present-day world. In this context efforts to identify, revive and protect these strengths have an important and growing relevance in our troubled world. One such effort by VAAGDHARA voluntary organization studied here is important both in terms of its immediate context of improving the life of local tribal communities in several meaningful ways as well as in this wider context.

2.7: Seed Protection Increases with Reduced Migrant Labour

The systems of self-reliance including seed self-reliance had started breaking down due to many villagers being forced to turn into migrant workers due to a complexity of factors, but VAAGDHARA's efforts to reduce significantly this dependence on migrant work were successful in several villages and these villagers were also motivated to return to systems of self-reliance including natural farming and seed self-reliance.

Anandpuri block in Banswara district (Rajasthan) is known for high concentration of tribal communities, particularly Bhil communities. Their traditional livelihood and farming patterns based on biodiversity and self-reliance were well-suited to local conditions, but these suffered under exploitative systems of colonial times. Freedom from colonial rule brought some relief, but the dominant development thinking still neglected special needs, conditions and concerns of tribal communities and hence the development programs imposed on them were not in keeping with either their strengths or their needs. In these conditions some of the traditional strengths of communities were eroded and they became increasingly dependent on migrant labour to meet their basic needs.

In these conditions VAAGDHARA started working here about two decades back with an understanding of recognizing first the needs as well as strengths of tribal communities and then working for them and with them on the basis of this understanding. This has helped to create close understanding of trust and working together. Emphasis is on strengthening sustainable livelihoods on the basis of the tribal systems of high levels of biodiversity and self-reliance and in ecologically protective ways. This also helps to reduce costs and minimize external inputs. Such an approach has helped several tribal households to get back their strengths based on self-reliance and reduce their dependence on migrant labour.

Amritlal is one such farmer of Bhundri village who had become very heavily dependent on migrant labour till about a decade back. At this stage he came in contact with VAAGDHARA activists who prevailed upon him to instead devote his time and energy to working on his increasingly neglected farm. Amritlal agreed to try this, attracted also by the fact that the technology being recommended was a very low-cost one. Following this advice, he planted several kinds of fruit trees but in addition he also planted trees which provide fodder, fuel, small timber and met other needs. He also started making organic manure and pest repellents in improved ways on his farm using cow dung and cow urine, saving in costs incurred on market purchased inputs. He planted a wide range of crops to become almost self-reliant in meeting the food needs of his family and in fact improving the family nutrition significantly.

By gradually moving on this path of natural farming and self-reliance, today Amritlal and his wife Surta are able to meet their needs from their four *bigha* farm and have no need for migrant labour. In fact, they are strong enough economically now to lease in some extra land as well for cultivation. While there is a rich diversity of cereals, pulses vegetables and fruits on their farm which brings a steady income, to face sudden difficulties they also have the option of selling bamboos and goats.

Amritlal believes firmly in the path of self-reliance and sustainable livelihoods he has chosen, and has become a very effective messenger also for spreading these ideas, as what he has to tell others is supported by what he has achieved on his own fields. He is seen as a motivational force behind the planting of several

“By gradually moving on this path of natural farming and self-reliance, today Amritlal and his wife Surta are able to meet their needs from their four bigha farm and have no need for migrant labour.

thousand trees by others, and for this he received the Ummedpur Lodh Environment Award too.

In Nanamukhia village of this block, another farmer Ramu Maharaj and his wife Naani follow much the same pattern of rich biodiversity on their farm but they are constrained by water shortage to some extent. So Ramu says that while he has no compulsion now for migrating, once in a while he may go out for earning a little extra. His farm is also largely self-reliant and entirely organic, he says.

In various villages women have formed groups called Saksham Samoohs to take forward these objectives of self-reliance and sustainable livelihoods. These hold regular meetings to take forward development tasks and resolve any pending problems. In Nagli Sera village, Kanchan, who is also a facilitator for VAAGDHARA, says that compulsion of going for migrant labour has declined in a big way while farm-based livelihoods have improved. Kali Devi says that while practicing organic farming on her 7 *bigha*s of land she has been able also to purchase two buffaloes, an indicator of economic improvement. In the same village Susheela said while mentioning the diversity of crops grown by her on 5 *bigha*s of land that leaving aside salt and edible oil she is self-reliant in meeting all the family's food needs.

In Sundraav village Usha and Ambalal are also firmly on the path of self-reliance. One part of their 10 *bigha* farm is already organic, while on the other part they are moving towards this. Ambalal says organic cultivation is the right path but as it is difficult to change suddenly, he is moving more gradually towards this. They also have two buffaloes and enough surplus milk to feed kittens and cats regularly. The traditional Halma system of various farmers helping each other at the time of peak work instead of hiring cash paid workers is still working well in this village, Ambalal says.In the case of almost all these family's kitchen gardens which provide a lot of nutritious vegetables and some fruits for home consumption have been playing an important role in terms of improving nutrition significantly. Kailash Chandra says that once there were no trees even for a little shade in front of his home but after he was motivated by VAAGDHARA to plant trees, he worked with dedication to create a garden and now there are trees of jackfruit, blackberries, custard apple, sahjan, guava, lemon, papaya and other fruits, also giving shade, cool breeze and fragrance. Women farmers such as Kanku Devi have been very active in protecting and preserving seeds, using and also reviving several traditional methods for this, contributing further to self-reliance.

To take forward the concept of self-reliance and swaraj in various ways, swaraj groups have been formed in various villages and these together form a Janjati Vikas Manch or forum for development of tribal communities. Man Singh, who heads this, says that diversity of organically grown vegetables and fruits have made a remarkable contribution to improving nutrition without incurring cash expenditure. Several millets grown here earlier such as *Ragi, Kaang, Kutti, Bati* and *Kodra* are to be revived here. Efforts to check soil and water erosion have contributed much in these villages. Efforts to make better use of government schemes like MGNREGA are consistently being made. In addition, social reform issues like checking wasteful ceremonial expenses have been taken up successfully. Micro plans for several villages have been prepared.

A big priority is to ensure school education and other child rights. Children who were out of school for some reason were educated in special schools and then integrated with mainstream schools. Helplines and other means are used to rescue and rehabilitate distressed children. Special schemes like Paalanhaar have also been utilized well here to bring help to orphans. A special priority has been to try to ensure that youth do not get alienated from their communities and are able to contribute to them when they grow up and have successful careers.

These efforts, which by no means are confined to villages of just Anandpuri block but have extended to several other blocks as well in the tri-junction area of three states—Rajasthan, Gujarat and Madhya Pradesh—present a model of self-reliant, ecologically protective and Swaraj based sustainable development whose importance has increased further in these times of climate change.

3: Other Encouraging Efforts

3.1: Saving Seeds in Himalayan Region

While protection of environment and biodiversity is important for farming everywhere, it is all the more important for Himalayan villages. With varying altitudes, slopes and land conditions available within a village and with forests existing close to many villages, Himalayan villages are particularly valuable for conserving rich biodiversity. At the same time, nutrition needs of Himalayan villagers doing hard manual work have to be met from limited availability of cultivation land and hence its biodiversity including several millets should be well-protected. Agro-chemicals can more easily and rapidly spread pollution to Himalayan water sources like springs. On the other hand, if good soil and water conservation practices are adopted in the Himalayan region on a large scale, their benefits can extend all the way to the plains below.

These considerations were very much there in the minds of several Gandhian social activists of Henvalghati (valley of Henval river, a tributary of the Gangariver visible from Rishikesh- Chamba Road in Uttarakhand) who started a movement for eco-friendly agriculture and saving diversity of traditional seeds (called 'Save the Seeds Movement' and better known by its Hindi name Beej Bachao Andolan or BBA). Earlier these activists such as Vijay Jardhari, Kunwar Prasun, Dhum Singh Negi and Sudesha Devi had been involved in the Chipko (hug the trees) movement for saving trees. Now a strange development alerted them to the needs of protecting their diversity based traditional farming practices.

Some officials had started emphasizing that the mixed farming system existing here was a backward system which should be replaced with soybean monoculture. In reality the mixed farming system was a very rich system that made use of hilly land in very thoughtful ways to grow a mix of about a dozen millets, legumes and oilseeds which had a very important role in meeting the food and nutrition needs of people. This mixed farming system was rooted in linking needs of people for diverse kinds of nutrition to the available resource base in very wise and creative ways. It had been developed over several generations and was known popularly as barahanaza which means 12 foods, although sometimes even more than 12 foods were grown together on small farms. These were grown in such a way as to be supportive to each other. The legume crops with their nitrogen fixing abilities can make available those nutrients used by other crops. The creepers of legumes use the stem of chaulai (amaranth) as a support. Mandua plant's roots grip the soil firmly and prevent soil erosion, contributing to the strength of the entire barahanaja system.

The BBA activists drew attention to these strengths of barahanaja and as facts and science were certainly on their side, gradually their view started prevailing and today the merits of barahanaja are recognized to a considerable extent at the official level as well.

The more fertile valley land is generally used to grow rice and wheat but here too the tendency was to increasingly grow green revolution varieties which in turn required increases doses of chemical fertilizers and pesticides. However, the participatory research conducted by BBA activists involving farmers including women farmers, who have a very important role in Himalayan agriculture, revealed that there were traditional varieties which could give equal yield compared to green revolution varieties and that too without using chemical fertilizers and pesticides. When rice was obtained from paddy, traditional varieties yielded more rice per kg. of paddy and what is more, the fodder obtained from the traditional varieties was also higher. Farmers said that they feel better and stronger after eating food based on traditional varieties and can work harder and for longer period. They also found the traditional varieties much tastier and nourishing compared to the green revolution varieties.

More and more villagers started realizing the importance of the essential message of BBA related to ecologically protective farming and biodiversity. Several volunteers came forward

to join foot marches which went from village to village with the messages of saving diversity of traditional seeds as well as adopting ecologically protective farming practices. In the course of these marches a lot of information of traditional varieties of various crops could be collected and actual exchanges of seeds also took place. The longest of these marches was from Askot to Arakot and one of the leading activists, Kunwar Prasun, walked the entire length of this march from one end of Uttarakhand to the other.

It was found in the course of these travels and foot marches that people of Jaunsar Bawar place very high value on their chwatu variety of red rice (also known as chardhan and chwaria, famous for its special flavour. In Kairaro valley thapchini rice variety is highly regarded for its high yield and good flavour. Barahai variety can give good yield with less water. Zeeri variety was known for its exceptionally good taste. Jhailda and Khimanand Ki Ghori varieties were found to have special ability to withstand hailstorms while Jarakhya variety was known for its tolerance of windstorms.

In the context of wheat, Mishri variety was known for very good taste, coping well with snowfall and limited availability of sunshine. Thang variety was found to be more suitable for growing in less productive land.

Within its limitations of non-funded work BBA tried it's best then to save as many seeds on fields and also documented the work. Kunwar Prasun and Vijay Jardhari have also written books on these and related issues in Hindi. Kunwar Prasun wrote an essay which has documented over 100 rice varieties of this region with their various characteristics.

BBA's efforts were helped by and integrated with the earlier efforts of the Chipko movement in Henvalghati to protect forests. Very courageous efforts of the villagers of Henvalghati were involved in saving the forests of Advani and Salet from being axed, and for preventing some forests from being auctioned to contractors. This was followed by efforts for regeneration of degraded forests. Forests protect farmland from soil erosion and landslides, provide fodder and leaf manure, help in maintaining good flow of water springs and rivulets and supplement food security, particularly in the context of poorer households, by providing many kinds of nutritious and tasty uncultivated food.

These villagers also resisted mining contractors who came to mine limestone and other stones in the Henval river. If this mining had gone on increasing, this would have caused landslides and ruined farms as well as small irrigation channels called guls which are created by a lot of hard work over generation and are very important for farming. At the same time, BBA activists also went to other villages like Nahin Kala where there was much bigger threat from destructive mining and helped to save farms and forests there from being ravaged by indiscriminate mining.

Another important learning from BBA related to the important role of women farmers. While in normal times thy play a very important role in Himalayan agriculture, experiences revealed that when it comes to protecting biodiversity, forests and environment then their contribution to these efforts can be particularly important and they are highly responsive to these concerns.

The contribution and lessons emerging from BBA and from other related efforts and movements can be very important for deciding the proper priorities of Himalayan agriculture. The overwhelming message of these efforts is clearly that of placing very high priority on ecologically protective farming and on preserving the rich biodiversity of Himalayan agriculture.

3.2: In Search of Lost Seeds

Note—This section has been written together with Madhu Dogra

The steep trek to the home of Kunwar Prasun in a Himalayan village had been difficult to negotiate but once we reached there a cool breeze and beautiful surroundings quickly made us forget all tiredness. We walked to a field where Prasun and his wife Ranjana had been trying to grow some traditional varieties of rice which he had searched and found with a lot of difficulty. He intended to share these seeds with other farmers so that they can also grow these varieties and these can be saved in the fields of farmers.

"Seeds cannot be saved by just keeping them in gene banks", Prasun told us. " The most

sustainable and trusted solution is to make them available in the fields of farmers so that these are saved on farms and farmers also benefit."

We were standing near a small terraced farm in Rampur village of Tehri Garhwal district of Uttarakhand. Prasun explained that here as in other villages the diversity of traditional seeds had eroded rapidly as government policy in recent years had favoured exotic varieties with a narrow genetic base. Hence there were concerns that many traditional varieties which had evolved for their special suitability for this region may be lost for ever.

This valley of Henval river is well known as an important action scene of Chipko movement for saving trees. Some of the senior activists of this movement like Kunwar Prasun, Vijay Jardhari and their teacher Dhum Singh Negi got together to start the Save the Seeds Movement (Beej Bachao Aandolan). They organized foot marches to several remote villages. These helped to spread the message of saving threatened seed varieties. Some seeds were shared with local farmers and seeds found here were collected.

Back at his home, after a delicious meal of red beans and rice, we sat down to study the careful documentation of nearly many rice varieties of Uttarakhand which Prasun had prepared after visiting very remote villages and talking to countless farmers including a large number of women farmers. This included information about special merits and other characteristics of these varieties. Clearly this information was very important for saving threatened seeds. We later helped to publish this documentation so that it could become more accessible to people. Prasun told us that in some remote villages he had found farmers cultivating very delicious and nourishing varieties while in some places the yield was found to be exceptionally high without using chemical fertilizers and pesticides.

Early next morning we left for Nagni village which is close to the Jardhar village of Vijay Jardhari. Here Vijay with his wife Kamla he had been trying to grow several threatened traditional varieties of various crops. They told us that traditional varieties of as many as a dozen crops are sown together in an intricate mixed cropping system which has evolved over several

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generations in keeping with the nutrition needs as well as soil, water and climate.

One crop which takes nutrients from soil is complemented by another one which gives nutrients to soil. Many types of highly nutritious foods become available from a small plot of land. The creepers of some of the crops can get the support of tall stalks of some other crops.

Despite the great utility of such a system some officials were insisting that this should be given up in favour of monoculture cropping pattern. This would have led to heavy erosion of diverse traditional crops and their numerous varieties. Understandably this official stand was strongly resisted by the Beej Bachao Andolan. Subsequently the government also accepted the stand of the Save the Seeds movement to a considerable extent but initially the conflict of the two views was sharp.

When we researched this issue in detail, we found that while the overall government policies in many countries including India are not helpful for on-field protection of diversity of traditional seeds, several scientists have been raising their voice to warn about the dangers of rapid erosion of seed diversity. They have said that if this continues then one day genetic diversity most needed for ensuring food security will simply not be available, or else will be available only in corporate controlled gene banks which will use this with a heavy profit orientation to suit their narrow ends.

Dr. R.H. Richharia was one such scientist who had increasingly emphasized the importance of saving diverse traditional varieties of rice as well as expressed concern over their rapid erosion as well as loss to narrow control by a few international agencies, in turn linked to corporate control . He was earlier the director of the Central Rice Research Institute, Cuttack and later the director of the Madhya Pradesh Rice Research Institute, Raipur.

After losing both his senior jobs due to his spirited stand on protecting the interests of farmers based on protecting the seeds evolved by several generations of farmers, this never-to-be-defeated scientist had continued his research efforts at his own farm near his home in Bhopal and in addition he was trying hard to complete his documentation of over 17000 varieties and cultivars of rice mainly of Chhattisgarh, Madhya Pradesh and nearby areas.

Visits to his home and farm were invaluable for understanding the importance of saving seed-diversity, and when he honoured us with a return visit, we could add further to our understanding of this important issue. Briefly the conclusion of this eminent scientist, who was amongst the first and the youngest to get his doctorate in Botany from Cambridge in record time, was that in keeping with diverse conditions very diverse varieties of rice have evolved over many generations thanks to the efforts of many experienced and committed farmers with a lot of knowledge of local seeds. It is these indigenous varieties which should be used for ensuring good and secure rice cultivation.

On the other hand, most problems in rice cultivation have arisen, this eminent scientist said, because this advice has been ignored time and again. He said that farmers having good knowledge of these indigenous seeds should be involved to work closely with farm scientists in a highly decentralized system of agricultural development in which scientists are very close to farmers and there is mutual learning particularly with respect to local seed diversity.

In this system the work of saving seed diversity for now and for future generations is very well integrated with the overall agricultural development effort and there is a lot of scope of utilizing and benefiting from knowledge of local villagers. After some time, we could put his ideas and experiences in the form of a book so that these can be accessed conveniently by more people.

A lot of the exciting research work of Dr. Richharia had taken place in Chhattisgarh. Later an organization Rupantar tried to implement a seed conservation and farm development effort based on his ideas in Nagri Sihwa region of Chhattisgarh. Two demonstrations cum seed multiplication farms were set up here. Nearly 270 varieties of rice were being grown here. By pure line selection good quality seeds were obtained so that farmers in several villages could be self-reliant in good quality seeds.

This work was being taken forward By Dr. Binayak Sen and Dr. Ilina Sen helped by a young botanist Suresh Sahu . A visit to this site revealed that it was progressing very well up to a point but when the authorities became very unhelpful towards Rupantar this work could not progress beyond a point. However, in recent times more efforts of saving traditional seeds have been coming forward as consciousness about the need for such efforts has increased. Some encouraging efforts from Andhra Pradesh, Jharkhand and other parts of the country have been reported.

There was ample evidence of this at the recently organized Organic World Congress at greater NOIDA near Delhi. It was the first time that this important international event on organic farming was organized in Delhi. Many visitors said that the most vibrant part of this event was the section on seed conservation and protection efforts. Several organizations which are engaged in this work in various parts of the country had set up their stalls here and they attracted a lot of attention and inter-actions from visitors. The participants could also learn much from each other's experience.

Many of them are members of Bharat Beej Swaraj Manch (BBSM), an alliance of several such seed protectors in different parts of the country. This alliance brings together voices of seed conservation and protection, farmer rights over seeds and seed exchange, eco-friendly and self-reliant farming. BBSM is firmly opposed to GM crops. The BBSM, established in 2014, has been involved in the organization of several seed festivals and seed declarations. This alliance has about 100 dedicated seed committees in about 18 states, including farmers, seed savers, scientists and citizens committed to saving of seeds in various contexts. Jacob Nellithanam, as a senior member and coordinator of BBSM as well as of Development and Justice Institute or in the course of his independent work, has been involved in advocacy for seed conservation and farmers' seeds for many years.

Some health programs like those of Jan Swasthya Sahyog have also taken a keen interest in protection of indigenous seeds and rice varieties, keeping in view their importance for sustainable rural livelihoods, nutrition and health. Dr Debal Deb, a scientist who on the basis of his farm lab Basudha and community seed bank Vrihi in Odisha has contributed a lot to saving over 1500 rice varieties in danger of becoming extinct, has been widely acclaimed for his work.

In a different context in an effort, they call Vanvadi, Bharat Mansata and various friends have been involved in the regeneration of a forest in Sahyadri Western Ghats, identifying 120 traditionally useful species and 52 uncultivated foods, making their plants and seeds available to others.

The Organic Farming Sourcebook mentions several other encouraging efforts including Annadana in Trichy, Kokepelli Association, Organic Farming Research Centre in Shivamogga (Karnataka), Aurobrindavan Auroville, The Green Foundation and Janadhanya Seed Savers.

In addition, we must not forget to mention Navdanya and at a personal level Dr Vandana Shiva, activist writers like Claude Alvares and in the context of Bundelkhand region, Dr Bhartendu Prakash and Vigyan Shiksha Kendra, and in the context of Eastern Uttar Pradesh, Dr Shiraz Wazih and the Gorakhpur Environment Action Group. Of course, there're many other persons and organizations doing very encouraging work in their own way.

At the international level a very important contribution has been made by La Via Campesina which has been described as the largest peasant movement in the world. International campaigns for seed rights of farmers and saving indigenous seeds have been pursued with great commitment by organizations like GRAIN. The Gaia Foundation's Seed Sovereignty Program is based in UK and Ireland. Organizations like AFSA are leading the efforts for seeds sovereignty in Africa with several community seed programs.

Such alliances and organizations of seed diversity protectors will be called upon to play an increasingly important role as at the international level the seed industry is getting increasingly concentrated and only stronger mobilization of farmers and seed protectors at the grassroots can salvage the cause of protecting and saving traditional seed diversity and free access of farmers to this diversity.

4: Dr Richharia's Invaluable Efforts

4.1: Rice Plan Based on Protecting Indigenous Seeds

At a time when GM/GE (genetically modified crops and gene editing) technologies are being widely opposed in the context of India's agricultural policy, in a general context as well as in the context of the most important food crop of rice, there is increasing interest in safe alternatives which are ecologically protective and can also help farmers by keeping down costs of cultivation. In this situation, a plan titled 'A silent rice revolution - a specific plan of action for increase in productivity of rice' formulated by Dr. R. H. Richharia, one of the most eminent rice scientists, appears as a ray of hope. While this plan was prepared in the context of India, a lot of what it says has a wider relevance for several other countries which grow rice as a leading crop. This specific plan of action was formulated by Dr. Richharia at the request of the Prime Minister's office in 1983-84. However, following the tragic assassination of Mrs. Indira Gandhi in 1984 somehow the plan got neglected. This is a particularly suitable time to revive this plan keeping in view new emerging risks.

Dr. Richharia who lived and worked independently in Bhopal at that time soon suffered great health deterioration in the Carbide gas leak disaster and could not follow up the matter on his own. However, when this writer met him well before his death he still had hopes that one day this document will prove very helpful for rice farmers and farming. In any case this will always remain an invaluable document for all concerned sincerely with the task and there should be wider information about this.

An idea about the stature of Dr. Richharia can be had from the fact that even though in the era of the false hopes of the so-called green revolution the government victimized him while he was holding the top rice scientist job in the country, his learning was considered so important that the government was constrained on three occasions to recall him from his retirement to seek his advice and give him important responsibilities. He was for several years the Director of Central Rice Research Institute (CRRI-Indian's more important centre of rice research) from where he retired in the mid- 1960s. He was first recalled to head a national task-force on rice breeding, then to set up a rice research institute in Raipur (Chhattisgarh) and then finally he was contacted by the Prime Minister's office to prepare a plan for improving rice yields.

Now we come to Dr. Richharia's 'specific plan for action for increase in productivity of rice'. First, he identifies the factors which have retarded the increase in rice productivity despite so much increase in investments in the form of fertilizers, pesticides, irrigation, research, extension etc. Then he gives his plan. In brief Dr. Richharia's plan has four basic components:

1. Rice development to be based on the rich diversity of indigenous rice varieties which should be saved on farmers' fields and a lot of priority and attention should be given to this aspect;
2. A highly decentralized extension approach;
3. Large scale adoption of clonal propagation technique to spread improved indigenous varieties and
4. Very high levels of involvement of rice farmers with special emphasis on encouraging those farmers who have special skills and interest in protection and promotion of diverse indigenous varieties.

According to Dr. Richharia (all quotes from the plan) "The main constraint has been the hurried introduction of the undesirable new rice material, the HYVs or High Yielding Varieties (dwarfs) on which we based our strategy, forgetting at the same time unexpected drought situations, under which the HYVs lowered the yields. In addition, under heavy fertilization and irrigation the HYVs proved to be susceptible to diseases and pest which cannot be controlled easily thus again pointing towards reduction of yield. Further, unlike wheat and sugarcane, the concept of

'wider adaptability' in rice has a limited scope for application (not exceeding 10 per cent of the rice area). This has naturally led to local preferences of different types of rice and socio-economic adjustments, developed in course of time." So, Dr, Richharia concludes, when the base is itself weak (meaning the new rice material) a mansion built on it must collapse. In other words what he was stating was that rice development should not take place on the limited genetic base of exotic green revolution varieties.

Fortunately, indigenous high-yielding varieties adapted to local environment are available in the country. In a survey carried out in Madhya Pradesh (which then included Chhattisgarh) between 1971-74, 8 per cent of the indigenous rice types were observed to fall under the category of high yielding types, fixing the minimum limit of 3705 kg/Ha. In view of this there is a need to redefine 'HYVs' which hitherto have been officially identified only with the exotic dwarf fertilizer - responsive varieties so that indigenous high-yielding seed varieties can be recognized more clearly. Many of these varieties are also widely appreciated for their other distinctive traits such as better cooking quality of various kinds, aroma, fragrance etc.

Dr. Richharia recommends strongly, "It is high time that the country's 1964-65 breeding program which nearly stands suspended to exploit the rice indigenous rice germplasm, is also resumed in the light of the observations, recorded above, when about 445 improved varieties, bred for specific stress situations, showing environmental resistance to diseases and pests were available, and would be still available, in the country. It is not too late and the strategy formulated in this program, mainly based on our rice genetic resources may be accepted which also contemplates that the indigenous germplasm in its hybridized form (hybrid rice) has also bright future to enhance rice productivity."

Selection work (genetic upgrading) with indigenous rice types was resumed by Dr. Richharia in 1968 after leaving Cuttack "About 1500 improved types (improved versions) and eleven composites were developed and made available by 1978 selected from about 7800 principal indigenous rice cultivars. As approach was to release this hidden production force which remains unnoticed, un-recognized and confined to certain localities with individual growers."

"For high yield potential genetic upgrading of their adapted rice varieties (indigenous rice germplasm), with certain manipulation, such as the evolution of new hybrids and exploiting hybrid vigorous utilizing pure material of local types, is the only course left for speedy recovery of loss, to stabilize rice production at a higher level, instead of waiting to replace our rice by other rice material of doubtful nature which may or may not get adapted to stabilize yields in the environments under which rice grows in variable situations in India."

In the area of research as well as extension, Dr. Richharia recommends a highly decentralized approach. This, he emphasizes, is inherent in the nature of the rice plant. To quote, "If we were to think of a single characteristic feature of the rice plant which yields food for millions, it cannot be anything else but its variability in the form of thousands of its cultivars, spread in India and in other rice growing belts of the world. This is because of the rice plants flexible genetic make-up and mutational power of adaptation." So, he recommends the establishment of a wide network of "adaptive rice centres" in all rice growing areas.

"The adaptive rice centres will be the custodian of all local rice cultivars in respective localities, assembled immediately, supplemented, if necessary, by the already available materials of the locality at different research centres. They will be maintained under their natural habitat to safeguard the future. They will be known as local treasuries of rice germplasm, (a term suggested by Dr. Frankel of Australia)."

The function of the centres will be:

(a) To maintain the evolved rice genetic material for future studies and use as it is practically impossible to retain it in its original form at a central place in India or abroad. It can only be maintained in its original condition at its natural habitat only seeking help of the rice growers themselves.

(b) To educate the young farmers to appreciate the value and importance of their own material adding new ones as their hobby.

On the basis of his wide experience Dr. Richharia says "Invariably I found in rice areas several rice growers taking keen interest in their local rice varieties as they are very much absorbed in them and they have all praise for them, so much so that they trace back the history of individual rice varieties to their ancestry with their utility and such selected and devoted rice farmers will be put in charge of the centres. I also observed that some of them identify their rice varieties in their own way (not in terms of the modern knowledge of Botany) which amount to thousands. This inherent and intuitional facility of selection and maintenance of thousands of rice cultivars gradually being accumulated and descended upon for unknown centuries, ever since the rice first originated must be preserved and exploited for the advantage of the present generation and to ensure the safety of those still unborn."

"On the practical side a beginning may be made in M.P. (the state of Madhya Pradesh which then included Chhattisgarh region where a lot of the work of Dr. Richharia was done) where upgraded material already exists in the form of about 1500 improved types made from growers' own rice cultivars which can be distributed in different centres for work to be started immediately, to obtain advantage as early as possible and to prepare the hybrid material for the next season." On the basis of his experience in Madhya Pradesh, Dr. Richharia stresses that women will prove to be the most important link in introducing this technology. At Adaptive Rice Research Centre in Baronda, Dr. Richharia noticed that women workers absorb new methods and ideas very quickly. Here he had specially promoted some women workers as supervisors for managing the germplasm of over 17000 rice cultivars in the field and the practice of clonal propagation.

For rapidly spreading improved upgraded varieties and for exploiting their hybrid Vigor the clonal propagation technique can give very good results. "It will also be demonstrated that the healthy seeds, obtained by clonal propagation for a full crop of rice to follow, give nearly 20% higher production for any rice variety." Further hybrid clones for exploiting hybrid Vigor can be obtained. Hybridization work will be carried out by the trained field workers of the adaptive centres.

"Whereas clonal propagation in rice as a mean of raising pure seeds to offer 20 per cent higher production and the extension of this technology to exploit hybrid Vigor to obtain 50 per cent increased yields, remain unexploited, a great discovery of immense value is left unheeded, in the form of 19 thousand rice cultivars coupled with their 1500 improved versions representing intense variability, assembled from the least understood rice areas of M.P. (Chhattisgarh, Bastar, Abhujmal tracts etc. inhabited mostly by tribals."

In a big part of the country the rice crop is ruined by drought conditions and in another significant part by flood conditions. In this context Dr. Richharia's plan is all the more invaluable as it incorporates resistance to floods as well as drought conditions, not to mention disease and pest invasions.

Dr. Richharia's documents of the days of his work at Raipur mention the several droughts - resistant indigenous varieties discovered in the course of field - work in Chhattisgarh region, and above all the immense diversity of the rice varieties grown. A special advantage of this in distress situations such as drought is that while some varieties suffer, some survive and so yield doesn't go below a certain level. Regarding flood situation the clonal propagation method offers special advantages. It has been demonstrated that rice clones show resistance to submergence.

Dr. Richharia further expressed his support for organic farming and several local practices of farmers. He wrote that under this plan "the agronomic practices such as biasi, rotation of crops, mixed cropping will remain common and will not be disturbed ,emphasis being on the use of organic manures, such as compost, green manure, neem cakes and oil cakes etc."

Dr. Richharia attached 17 documents based on his earlier research to support his plan while submitting it to the then Prime Minister. In addition, he mentioned his Encyclopaedia of Rice

Cultivars on which he was still working. He also offered his services on an honorary basis for implementing this plan.

However, the collections of improved rice varieties he mentioned (mostly arising from his own work and the work of his colleagues) may not be available to the same extent today compared to the time when this plan was prepared. Similarly, the knowledge of indigenous varieties in villages may be comparatively less now. However, this is all the more reason why the implementation of this plan should not be delayed any further as with the passage of time the neglect and loss of indigenous varieties may make such tasks and initiatives even more difficult.

4.2: Efforts to Protect Endangered Rice Varieties

According to recent reports the Himachal Pradesh government has decided to initiate efforts to save endangered indigenous traditional red rice varieties by growing it in government farms and then distributing seeds to farmers. These rice varieties are widely believed to have exceptional nutrition and even medicinal values and with growing realization of this are fetching a high price in the market as well. Why with these exceptional qualities the red varieties started becoming endangered should also be investigated.

What is particularly encouraging about the effort of the state agriculture department, as reported, is that it will be trying to ensure protection at the level of fields of farmers. In the past some efforts to save endangered varieties were only at the level of gene banks from where these were very conveniently procured by multinational companies who said thank you and went on to use this genetic wealth to build their own empire which exploited farmers of developing countries with their patented seeds. So, it is very good that the efforts to save traditional seeds should spread to the fields of farmers and should not be confined to gene banks.

However, the government should realize the suitability of various regions or fields for these varieties instead of trying to spread indiscriminately. The beauty and wisdom of diverse traditional varieties is related precisely to there being different varieties for different types of field conditions and if we ignore this simple precept in the case of varieties for which a high price has suddenly become available then this will create problems which are best avoided.

One hopes that the state agriculture department will extend this initiative to a wider campaign, utilizing well the wisdom of experienced and elderly farmers. In the neighbouring state of Uttarakhand, a great contribution to protection of traditional rice varieties (as well as other crop varieties) was made by the Beej Bachao Andolan (save the seeds movement). Vijay Jardhari took the lead in this initiative which soon had the enthusiastic participation of all the Chipko movement colleagues of Hemvalghati region, and then spread more widely. These activists took out foot marches in various parts of Uttarakhand to spread consciousness regarding the need to protect indigenous varieties while at the same time collecting various traditional seed varieties to grow and share. Kunwar Prasun, leading activist of Chipko movement and this

> *It is not only the yield but the taste, nutrition, health benefits, suitability for special needs, suitability for particular growing conditions, costs of growing and a host of other factors which need to be considered for understanding the true value of very diverse traditional varieties.*

movement, documented 328 traditional rice varieties,(including red rice varieties), with their various characteristics and very useful as well as interesting details. These notes in his handwriting were given to us by his family members and then soon published as the first chapter of a collection of his writings soon after his untimely death (book in Hindi titled Zindagi Ek Andolan—Kunwar Prasun Kaa Rachna Sansar—edited and published by Madhu and Bharat Dogra).This documentation of varieties includes several varieties which give high yields without using chemical fertilizers and pesticides, but what Prasun used to emphasize was that it is not only the yield but the taste , nutrition, health benefits, suitability for special needs, suitability for particular growing conditions, costs of growing and a host of other factors which need to be considered for understanding the true value of very diverse traditional varieties. A discourse based only on yield is a very narrow, unscientific and one-dimensional discourse, he often told me.

If we consider these diverse aspects then of course the diverse traditional varieties provide a much more useful and richer base compared to the green revolution HYVs with their narrow genetic base. There is absolutely no doubt about this. But if one is to persist with the narrow, unscientific, one-dimensional discourse based on high yield alone, even then there is a lot of evidence of several traditional varieties giving high yields (equivalent to or greater than green revolution HYVs, that too without using chemical fertilizers and pesticides).

During the early 1970s, at an early stage of the green revolution in Madhya Pradesh (which at that time included Chhattisgarh), an eminent scientist Dr R.H.Richharia, former director of Central Rice Research Institute, drew attention to this. Dr Richharia's research, as part of his leadership of a program of the MP government, revealed that several indigenous rice varieties gave high yields without the use of chemical fertilizers and pesticides. This information is provided in Table 1.

Table 1: Potential of some high yielding varieties of Indian rice with special reference to MP and Chhattisgarh

S. No.	Original Rice Variety	Improved Version No	Paddy (Kg./ Ha.)	Rice Grade	Maturity
1.	Lalloo	Bd.12	7024	Medium Fine	Early
2.	Dhour	Bd. 23	6136	Medium Fine	Early
3.	Koyalari	Bd. 811	7350	Coarse	Early
4.	Nungi	Bd. 813	7623	Coarse	Early
5.	Cross 116	Bd. 30	4000	Coarse	Medium
6.	Kalam	Bd. 368	5510	Medium fine	Medium
7.	Beni Kath	Bd. 452	4080	Short fine	Medium
8.	Tedhi Banko	Bd. 207	6290	Long fine	Late
9.	Kala Mali	Bd. 108	7600	Coarse	Late
10.	Safri	Bd. 200	5520	Medium	Late
11.	Dubraj	Bd. 153	4958	Medium fine	Late
12.	Tedhi Banko	Bd. 207	6250	Long fine	Late
13.	Kariya Chini	Bd. 366	5550	Medium fine	Late

Unfortunately, these traditional high-yielding varieties were not given official recognition. As Dr. Richharia noted, 'In fact in every rice growing locality, the growers themselves tell us which of their own varieties are high yielding to which they stick. But under the extension services, the definition of high yielding rice variety is different which necessarily involves a dwarfing gene and, therefore, growers' own high yielding varieties are not recognised which are estimated to be 8 or 9 percent in M.P."

Writing in the specific context of rice, India's most important food crop, Dr. Richharia said that the importance of traditional wisdom of farmers is tied up with the fact that different varieties are needed for different conditions. He wrote, "If we were to think of a single characteristic feature of the rice crop which yields food for millions, it cannot be anything else unless it be its (1) variability in the form of thousands of its cultivars, spread in India and in other rice growing belts of the world. This is because of the rice plant's flexible genetic make-up and mutational power to adaption. This means the concept of ;wider adaptability' does not work in rice and (2) The rice farmers stick to their own varieties, as they (rice farmers) possess their deep knowledge to harvest a crop even under the most stress situations and they also possess high yielding varieties of their own which are generally not included in extension programmes (a major lapse) e.g., in a survey, carried out in Madhya Pradesh between 1971-74, 8 percent of the indigenous rice types were observed to fall under the category of high yielding types, fixing the minimum limit of 3705 kg./Ha."

An important publication, written by Dr. R.H. Richharia in 1977 was titled 'A strategy for rice production to ensure sustained growth in Madhya Pradesh(including Chhattisgarh). This publication emphasized the ready availability of several indigenous high yielding varieties with yields (obtained at much less expense) comparable to or greater than the exotic high yielding varieties.

"During 1975, nucleus seeds of 967 improved cultures under BD. (Baronda) series were sent out to different locations (government seed multiplication farms and farmers' holdings) in 17 different districts, mostly tested under normal fertility with no plant protection measures applied. The result, obtained from eleven districts, only are presented in Appendices 1 to 5 of A.R.R.C. Note No. 9. The average of 121 entries works out to be 3984 kg/Ha of paddy grain or 2669 kg/ha. of rice. In terms of the definition of a high yielding variety in respect of yield 3705 kg/Ha, as accepted by the M.P. Agriculture Dept., the improved material recommended here can be accepted as high yielding." Comparative high yields observed in some trials are also detailed in this publication including some extremely high yields.

"There are many good cultures tested at Seoni Malwa during 1978 which can be quoted to establish that very productive germ-plasm exists in different parts of Madhya Pradesh which can be utilized in increasing rice yields."

This document offers "direct proof to establish that the selected material in the form of Bd: series possesses superior yield potential which can from the basis to increase rice production in immediate future with added advantage that they are palatable and they show resistance to pest and to periodical drought to some extent.

"They have been bred under no plant protection umbrella. This production potential must be tapped and antagonism against indigenous types has to disappear."

Then this document goes on to separately describe the already identified indigenous high yielding varieties, early-maturing varieties, drought - resistant varieties, scented varieties, special flavour varieties etc.

"The surveys carried out so far have disclosed the existence of over 237 scented varieties, maintained by the growers in the state. Such scented varieties are Chinnor of Balaghat (village Kaidi), Dubraj of Sehawa Nagri and Kali Muchh of Dabra (Gwalior) are well known."

All this information is very important for initiating a new phase of real and genuine progress in cultivation of rice and other crops based on indigenous crop varieties, providing safe and healthy food without dependence on unhealthy agro-chemicals.

5: Our Plants, Their Profits

5.1: Natural Wealth of Global South Controlled by North

Many countries which are economically poor due to a complex of factors have been well endowed by nature in many ways. However, the exploitative use of natural resources over a period of several decades or even centuries generally in conditions of colonialism or neo colonialism contributed to a large extent to the poverty that exists today. One natural resource the value of which is being increasingly realised is the diversity of plant wealth. The diversity of plant wealth has been extremely rich in many economically poor countries. With the emerging importance of biotechnologies and increasing application of plants in medicine and other areas, this richness would have emerged as a very important resource base for existing developments in several important areas. But now when this importance is being fully realised, a heavy erosion of genetic diversity has already taken place and many of the varieties earlier found in the natural environs of these countries can now be found only in labs and gene banks of the developed countries.

This is one of the most devastating examples of the weaker countries losing their natural advantage to the stronger countries to such an extent that now their own resources are being sold back to them at a fat profit. Let's see how this happened.

Pat Roy Mooney, a researcher who has received the Right to Livelihood Award for his pioneering work in this field, explains how various parts of the world have been endowed very differently by nature in this respect.

"With the exception of a small area around the Mediterranean, the industrialized world is excluded from the centres of diversity. The reason for this botanical poverty stems from the time of the ice age, i.e. while the vegetative assets of the temperate zones were frozen, the tropical climes flourished in genetic diversity. The resulting differences in plant life would be difficult to exaggerate. Dr. Norman Myers of Nairobi tells of one small Philppino Volcano, Mount Makiliang, which has growing on its slopes more woody plant species than are found in the whole of Canada, The Amazon River contains eight times

> *It is a raw material like any other in the world. It has not been bought. It has been donated. It has been donated by the poor to the rich. The donation has been made under a noble banner proclaiming that genetic resources form a part of the heritage of all humanity, and thus can be owned by no one."*

as many living species as the Mississippi system and ten times as many as are in all of Europe."

In view of this it is not surprising that scientists in developed countries have been using the genetic material derived from poorer countries for not only improving their crops but also for protecting them from highly destructive diseases and pests. For example, in the early 1970 the U.S. Dept. of Agriculture acknowledged how US cucumbers depended heavily upon introductions from Korea, Burma and India, the common bean grown there obtained disease resistant strains from Mexico, Syria and Turkey while the disease resistance in peas came from Peru and Iran. The same report noted that the U.S. spinach industry "has been rescued repeatedly from disaster through new introductions from India, Iran and elsewhere."

Meanwhile, due to the combined impact of destruction of natural forests and the introduction of green-revolution type agriculture, which replaced local varieties over large areas by new monocultures, genetic erosion was taking place on a massive scale even in the countries which have been the original source of much of the plant diversity. Soon thousands of varieties of plants were lost to these countries for ever. However, already several of these had been stored carefully in the labs and gene banks of the developed countries whose scientists had been engaged in these collections for several years. Suddenly, in the time span of a few decades, the natural advantage which some parts of the world had enjoyed for millions of years appeared to have been reversed.

Today several experts agree that more than two-thirds of collected genetic diversity is stored in gene banks in Europe and North America. In a handful of high-security institutions in the developed countries the world's most valuable raw material is stored, and it is unlikely that the countries of origin from where most of this material came will have free access to it. Pat Roy Mooney brings out the glaring injustice of this situation.

"It is a raw material like any other in the world. It has not been bought. It has been donated. It has been donated by the poor to the rich. The donation has been made under a noble banner proclaiming that genetic resources form a part of the heritage of all humanity, and thus can be owned by no one."

"But as the primary building blocks of agriculture, genes have incalculable political and economic importance. Industrialized governments--often overruling the intentions of their scientists-have come to hoard germplasm and to stock seeds as part of the arsenal of international power diplomacy. Private companies in the North--though glad to receive free genes are loath to divulge or share the adaptations they draw from these donations."

Several examples can be cited of how the countries which are now in control of plant diversity are using this as a lever of pressure against those from where the wealth originally came. An effort was made to exclude countries of Southern Africa from benefitting from a Sorghum and Millet germplasm development programme in the region. A trade embargo of Nicaragua also included a gene embargo including the seed which Nicaraguan farmers had donated and entrusted for safe keeping in the North.

Thus, both the ways in which the control over plant diversity has shifted and the way in which this shift of control is being used against these countries which are already economically poor is highly unjust and urgent steps have to be taken at the international level to correct this injustice. The big advances being made in biotechnology and the wide impact which these breakthroughs are likely to have in the near future make it all the more important that these steps are not delayed.

5.2: Transnationals' Tightening Grip on Plant Resources

Recent decades have seen a fast erosion in the diversity of the plant wealth with which many poor countries had been favourably endowed by nature, combined with the attempted preservation of many of these plant varieties in the gene banks concentrated heavily in developed countries. This trend by itself would not have been too harmful if the genetic material (or germplasm) stored in the gene banks of developed countries had remained accessible to other countries on equal basis, but the reality is quite different, especially in the case of germplasm which is under the control of the transnational companies.

These companies have been well aware of the great commercial potential of germplasm collections and have devoted a lot of effort to building up these collections. The FAO once reported that a single company had about two-thirds of the world's banana germplasm in storage. Serious concern has been expressed in recent times that by utilising this resource base mainly from the point of view of maximizing private profit these corporations may be not only earning millions of dollars for themselves but in addition may also be creating a lot of problems for farmers and for environment. This concern has increased in recent years because of the rapid advances in biotechnology and of the control exercised over this technology by the transnational companies. Another related area of concern is that the control of a handful of transnationals over the seed industry is increasing more and more, especially the control of those companies which specialize in the production of agro-chemicals like pesticides and weedicides. It is feared that many of these companies orienting their seed production to the requirements of selling more and more agrochemicals produced by them or their associates, despite many-sided health and environmental hazards linked to these agro-chemicals, are causing huge harm to environment and health. Heavy-handed efforts to increase the sale of herbicides linked to seeds have come at a time when strong evidence has linked these to very serious health risks resulting in a very large number of legal cases against the companies selling these.

Pat Roy Mooney, one of the foremost researchers on this subject, has said, "With new developments in biotechnology it is now less expensive to adapt the seed to the chemical than to design new chemicals for the seed. The emphasis of corporate research is now on creating genetically uniform and patentable seeds that can be the conduit for one or more chemicals--and to engineer seeds that will tolerate spraying by otherwise toxic herbicides."

Giving a specific example Mooney has written, "In Ethiopia one international chemical company came to the homeland of sorghum offering to sell a hybrid sorghum seed drawn from the seeds donated by Ethiopian farmers. This hybrid seed which farmers could never save for another year and which would create an annual dependence on the company for new seeds was to come coated in chemicals intended to make the seed amenable to the company's leading herbicides."

Such efforts are being actually helped (instead of curbed) by new legal arrangements being reached in some developed countries, especially the USA. The New Internationalist magazine reported, "Companies have been assisted and encouraged in their research by the 1980 ruling of the U.S. Supreme Court allowing genetically engineered micro-organisms to be patented. This means that virtually any life-form on this planet can theoretically become the private property of the company or person who creates it. One of the greatest threats of the new bio-sciences is that life will become the monopoly of a few giant companies."

Unfortunately, even some international agricultural research centres, instead of trying to resist these trends, are themselves moving in the direction of seeds patenting. 'Seedling' journal which specialises in this subject reported,

"The Green Revolution Institutes which brought us the 'miracle crops' of the 1960s have built their 'successes' on free access to genetic material developed and handed over to them by Third World farmer for free. In turn the new varieties developed by the Centres were made freely available. But now the IARCs want to get hold of the new biotechnologies being developed in the laboratories of the North which are anything but freely available. The IARCs figure take out patent rights over their own creations, in order to be in a better position to do deals with the companies and universities over biotechnologies. The centres are so intent on seizing the holy grail of biotechnology, that they are willing to abandon the principles by which they have operated for thirty years."

The efforts of the transnational companies towards consolidating their hold over the seeds industry are likely to be helped by these trends in the international research centres. It is all the more important that the efforts to keep open the germplasm collections for free use by the scientists and farmers of poor countries from where much of the material originally came should be strengthened to be able to pressurise the transnationals and the international research institutes to give a fair treatment to the farmers of poor countries.

5.3: Biotechnology and The Rights of Farmers

Many poor countries have experienced a rapid genetic erosion of their plant resources in recent decades while during the same period impressive collections of these genetic resources have been built up in the labs and gene banks concentrated heavily in developed countries. This leads to the strange situation that to obtain their own plant resources the poor countries have become dependent on the rich countries. Pat Roy Mooney, an authority on this subject, has written.

"A F.A.O. study concerning the sources of wheat held by the U.S. Department of Agriculture demonstrates the absurdity of the Third World's position. By 1970, the USDA boasted material from 27 nations, only five (of these) were not in the Third World. American gene banks had stored more wheat varieties than were in identified collections in 16 of the 27 countries. Fourteen countries, all Third World, had none of their own native wheat material in storage. Put another way, as Afghanistan, Egypt and Korea watch the natural diversity of their agriculture become increasingly uniform, they will discover that virtually all of their rescued indigenous wheat varieties can only be obtained from the United States."

The farmers of present day poor countries have made a very important contribution over a period of several centuries to create the resources which were taken away freely by the developed countries not just for preservation but in addition, as it is being increasingly revealed, as a base for building a highly profitable seeds and biotechnology industry which intends to squeeze profits from the very farmers from whom the base material was taken free.

Rene Salazar, a veteran farm organizer and biotechnology researcher, has stated, "May be a third to half of the plant varieties on government recommendation lists are either chance mutations or the product of informal community breeding programmes. A Pioneer or a Sandoz Company can walk into a farm community, take plant samples, patent the most interesting ones and then throw the community in jail if they continue to use the plants, they themselves created."

Pat Roy Mooney also emphasizes the unjustness of the entire situation, "What has been donated generously by the South is becoming private property in North. It is unacceptable to argue that the work and human genius involved in developing new crop seeds in industrialised countries constitutes intellectual property while the labour and genius of 500 generations of dedicated farmers in the Third World is either dumb luck or an act of God. This is not just. This must be changed."

The apprehensions regarding the adverse effects on farmers as a result of big transnational companies gaining more and more control on seeds and biotechnologies and using these for-profit maximisations are based on the following grounds:

1. Farmers in poor countries will be deprived of any share of the profits made on the basis of using their resources. What is worse, they may themselves have to pay large amounts of money to buy back modified versions of their own resource which was earlier obtained free from them. A wild tomato variety taken from Peru in 1962 is estimated to have contributed 8 million dollars a year to the US tomato processing industry, but none of these profits were shared with Peru. Then there are examples of grain and legume seeds from Kenya and forage seeds from Libya being taken free to Australia, and then improved varieties based on these being sold at commercial terms to the farmers of these countries.
2. Farmers may be forced to come to the market each year to purchase the seed marketed by companies, instead of using their own seed. According to Henk Hobbelink, writing in 'Biotechnology and Third World Agriculture', "Patented varieties would make it illegal for farmers to use part of their harvest for next year's sowing, as the germplasm in the seeds would continue to be owned by the patentee. The farmer would have to return to the market each year to purchase seed, as is now the case with hybrid crops. It would also be illegal for a farmer to pass on harvested seed to his neighbours or sell it on a limited scale. This would virtually eliminate a widespread farming practice, not only in developing countries but also in the North."
    a. "The result of the extended property protection would be to increase greatly the farming community's dependence on the plant breeding and biotechnology industry. It would also mean the total loss of the genetic diversity that is maintained in the field by farmers through the selection and use of their own seed."
3. Farmers may be forced to growing varieties which increasingly demand more and more chemicals for their growth. A report by a biotechnology working group in the U.S. has concluded that the first major products of agricultural biotechnology instead of ending dependence on toxic agricultural chemicals, threaten to entrench and extend the pesticide era.

The report stated many biotechnology companies are now using genetic engineering to modify major crops to make them tolerate lethal doses of herbicides.

Widespread use of herbicide tolerant crops will perpetuate and even broaden the use of herbicides the report 'Biotechnology's bitter harvest' said. Herbicides are chemicals intended to be poisonous to weeds, but they have been found to contaminate food and groundwater and available studies link them with birth defects, skin diseases and cancer. The report has also warned that widespread adoption of herbicide tolerant crops in the Third World could erode the genetic diversity of crop and wild plants and exacerbate pesticide caused human and environmental problems.

Once in widespread use, the exchange of herbicide tolerance genes between domesticated crops and weedy relatives could result in herbicide tolerant weeds which could make weeds even more difficult to control, this report warned.

If herbicide tolerant varieties are widely marketed and cultivated in the Third World, these products also threaten to displace existing varieties, the report said. The increased use of some herbicides which would accompany the use of herbicide tolerant plants raises concern about the health of agricultural workers and environmental problems associated with their use, it said.

Last but not the least, biotechnology has also opened up new opportunities for developing substitutes for some of those crops on which several poor countries are heavily dependent for their export crops. The substitutes or their threat can also be used to keep down the international price of commodities. Ironically the source of the now substitutes comes in many instances from the poor countries themselves.

Giving one such example, Kunda Dixit reported in New Internationalist, "Indeed one big European company 'took' the genes from a wild berry that grows in Nigeria and is producing 'thaamatin', a sweetener nearly 2000 times sweeter than sugar. When the firm goes into industrial production with its 'super sugar', the Nigerians will not get a share of the spoils, and worse, the livelihood of many sugarcane farmers in the Third World could be threatened."

6: Unjust Seed Laws

6.1: GRAIN Exposes Misuse of Seed Laws

In a recent paper GRAIN, an organization widely known for standing up for rights of small farmer communities and ecologically protective farming, has exposed the many-sided misuse of seed laws to increase control over famers and erode their rights. In this paper titled 'The pitfalls of trying to protect farmers' seeds through laws' (published in August 2025), GRAIN has stated that the seeds industry has grown and consolidated tremendously in the last few decades. Today, four companies control 56% of the global market, which is worth US$50 billion. To increase their profits and control, such companies use intellectual property rights and marketing laws. "These are rules that prevent farmers from saving, exchanging and selling seeds, in the case of intellectual property schemes, or that can discourage the use of anything but certified commercial seeds, in the case of marketing law."

This paper tells us that an aggressive wave of corporate-friendly "seed laws" is being unleashed globally. "Usually, states that are home to multinational seed companies, or the firms that own them, pressure other countries to adopt these laws, to expand their sales. One way they do this is through trade agreements. These are powerful tools to impose new policies on trading partners. But foreign debt and development aid, as pushed by donor governments or agencies like the World Bank, can also be used as leverage to force countries to change policies."

As this paper explains, in most countries, seed laws cater to a uniform seed system, where the main actors are companies or research institutes at the expense of farmers' seeds and biodiversity. (Uniformity is key, because that's what serves big industry and global trade.) Farmers' seeds generally don't fit these rules and get marginalised.

More specifically, GRAIN points out

1. "Patents provide a 20-year monopoly on any use of an invention. This can apply to seeds, plant cells, breeding processes or genetic sequences. Farmers growing patented seeds do not have any rights over what they plant. They often have to sign contracts saying they will not save, resow, exchange or even experiment with seeds from their harvest. Also, plant breeders cannot use patented seeds for further research without a licence. This is the most radical form of intellectual property, as it locks everyone out.
2. Plant variety protection (PVP) is a "soft" patent system, developed specifically for plant breeders. It gives them a 15–30-year monopoly over plant varieties that are new, distinct, uniform and stable. The International Union for the Protection of New Plant Varieties (UPOV), set up in Europe in 1961, runs a harmonised PVP system internationally. Under its latest revision (1991), UPOV does not allow farmers to save, reuse, exchange or sell PVP-protected seeds as a general rule. Member countries may make limited exceptions to this rule, as long as breeders are paid. The point of this system is to make sure that companies can make a profit, by making it illegal for farmers to freely reproduce and reuse seeds as they would normally do. This is privatisation. It ignores the fact that farmers are the original plant breeders of all our crops and therefore the source of all "new" seeds that the industry produces."
3. Seed marketing laws define the criteria that must be met in order for seeds to be sold on the market.
4. In Kenya, it is a full-blown criminal offence to sell or exchange seeds that are not certified by the government.

As this paper argues, generally in practice "these laws tend to undermine the ability and knowledge of farmers to breed, produce, grow, save and exchange seeds – which has kept humanity going rather well for the last 12,000 years. In Southeast Asia, statistics show that open-pollinated maize, which small farmers prefer, yields more than "high tech" genetically-modified maize. In Mexico, 62% of the farmers currently use indigenous maize varieties while less than 15% use so-called "improved" seeds. This drives home the point that, if well supported, farmers' seeds have a lot to offer – and that the real purpose of these laws is to strengthen the control of seed corporations and create dependency on them."

Pointing out adverse impacts, this paper argues that "the imposition of intellectual property rights and marketing rules that cater to seed companies creates major obstacles to innovation by farmers. It threatens agricultural biodiversity, deforms the function of public research away from social needs and outlaws the development of farmers' seed systems, the very backbone of food sovereignty. As such, seed laws, as many countries have shaped them, are not just about taking away rights, but also about endangering the livelihood, welfare and even survival of the majority, including urban people."

6.2: Debating False Solutions and Real Ones

As corporate control over seeds has become an increasingly serious problem for small farmer communities and their livelihood, there have been several responses in which several organizations have claimed to reduce this injustice in various ways. However, instead of taking such claims at their face value we need to examine their claims more carefully so that farmers do not become the victims of further deceptions. At the same time, those efforts which truly defend seeds sovereignty must be appreciated.

A recent paper by GRAIN titled 'The pitfalls of trying to protect farmers' seeds through laws' has also emphasized the need for such caution so that false solutions can be distinguished from real ones.

The FAO International treaty on plant genetic resources for food and agriculture, or briefly the FAO seed treaty, was set up in 2001 to regulate access to the world's wealth of crop biodiversity and ensure that seed companies pay back some of the profits they make from its privatisation and use. Reviewing this treaty GRAIN says, "The treaty pays tribute to farmers' rights but makes them "subject to" national laws, which firmly protect breeders' rights. Since it was established, social movements have been trying to turn this phrasing into something meaningful and effective. But it's proven difficult. In April 2025, 150 farmers and civil society organisations voiced serious concerns over the treaty. Where it initially applied to a small range of crops, to see how it would work, it will now apply to all crops and even genetic sequences, with little to show in terms of benefit sharing, accountability or transparency. This makes the treaty a tool for "bio-piracy", the groups say, rather than a means to protect farmers' rights."

(More recently, on September 12 a world-level coalition of farmer organizations and civil society groups has written to the FAO Director General warning that the current draft package of measures under negotiations threatens farmers' rights and national sovereignty over seeds, while making the Treaty more attractive to multinational companies. Over 7 million seed samples have been accessed at global level, without any significant benefit to farmers, while multinational companies have used this to claim intellectual property rights, often without detection.)

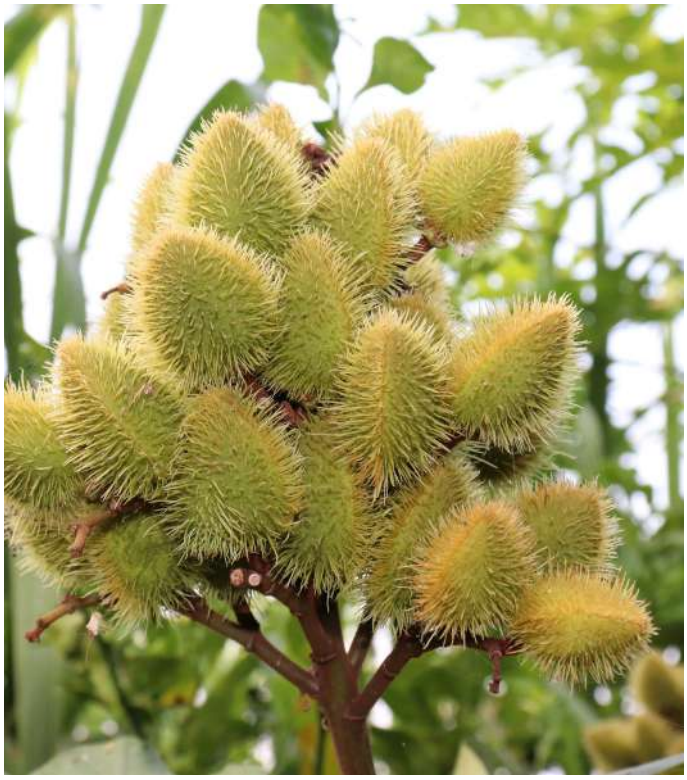
Further, coming to other such efforts, GRAIN says, "National PVP laws have come into vogue ever since the World Trade Organisation mandated all members to provide intellectual property protection for plant varieties. Many countries joined UPOV as a ready-made solution. Others created their own "sui generis" laws. Some, like the Philippines', are based on UPOV, but allow farmers to save, breed, use, exchange and sell protected seeds. Others, like India's, offer legal protection for farmers' seeds. Yet even India's "progressive" approach has yielded little tangible benefit for farmers, despite thousands of farmers' seeds being registered."

What is more, GRAIN says, "Making farmers'

rights a part of an intellectual property system, or subject to trade negotiations, is fiercely objectionable. Farmers seeds are a collective heritage – some say a "common". As such, they should be strenuously protected from privatisation and legal monopolies, not turned into one. Additionally, legal frameworks rely on state actors, often influenced by or serving powerful elites, corporate interests and geopolitical agendas. What control could small scale farmers possibly have over these? Even when they do emerge, laws and regulations to protect farmers' rights and farmers' seeds in the public interest run the risk of being diluted, degraded or deformed."

Further, "another approach that groups have tried is the promotion of "open source" seeds, using licenses in a fashion similar to those using copyleft or creative commons for software, books or other works. The goal is to prevent the privatisation of seeds by declaring them not appropriable through labels, pledges or other conditionalities…Companies can still tweak farmers' seeds and register them as their own. Similar critiques have been levied at those who promote "free seeds", understood as a free market for seeds with no rules at all."

GRAIN rightly points out that "the challenge of how to stop privatisation and corporate abuse is even greater in the era of digital technologies. Today, companies can download genetic sequences from public databases, develop new seeds with that information and commercialise the results without needing to get hold of physical seed samples or compensate the source country or communities. African countries are facing this pressure rather forcefully right now. The African Union has drafted a protocol on intellectual property rights over seeds that forms part of its continental free trade agreement. The text, currently being considered by member states, tries to balance breeders' rights with farmers' rights, making farmers' rights a form of intellectual property. This is antithetical to the idea of seeds being a common, under the control of peasant communities themselves. Formalising such rights in neoliberal trade agreements and digitising African seed registries, as the Bill Gates-funded AGRA is now doing, risks putting peasant seeds in greater peril of corporate takeover."



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GRAIN says strongly, "Local seeds are generally more adapted to local conditions like soils, pests, disease and climate. Promoting them strengthens biodiversity and resilience in the food system, protects community health through better nutrition, and lets farmers manage risks. Using farm-saved seeds, even with industrial varieties, helps farmers control the cost of production, which can clearly benefit consumers as well. Rather than trying to formalise farmers' rights in state-administered laws that may work against farmers' interests and be far beyond their reach, we should be aggressively fighting to roll back the privatisation of seeds and investing in practical measures to strengthen and promote farmers' seeds."

Giving an example of the kind of efforts that are needed, the GRAIN paper has written, "MASIPAG, in the Philippines, provides a good example of how this can work. They have been working to defend farmers' seeds against the Green Revolution and industrial agriculture since the 1980s. In their view, seed laws focus on protecting seed as a commodity and what the market wants. They are not seen as protecting small farmers, whose knowledge and culture is embedded in the diversity of local seeds, nor the systems used to pass this knowledge on. MASIPAG works to strengthen public support for farmers to have the power and freedom to breed, save and exchange seeds – and not only traditional varieties – that they need on their farms as a common practice that should not be restricted by anyone or any law. By doing this as a partnership between farmers and scientists, they are continuing the practice that farmers have carried out for millennia but which was suddenly declared "illegal" when the Philippine government adopted a Plant Variety Protection Act. In MASIPAG's view, it is more effective and more relevant to strengthen such social and community-based protections, which allow farmers' practices to thrive and allow farmers to retain power and independence."

Similar practices pursued by many other communities in various parts of world are a step in the right direction.

The writer is Honorary Convener, Campaign to Save Earth Now.

According to GRAIN, "The fight for farmers' rights and farmers' seeds is clearly a fight for power. That power needs to be built at the grassroots community level. It will not come from laws and state apparatuses that farmers may never control. While it may be tempting to push for policies that will recognise farmers' seeds as a fundamental right or a public good, the past thirty years of experience shows that the odds are massively stacked in favour of making this subservient to corporate interests."

6.3: Corporate Control of Seeds is a Huge Problem

Over the centuries a vast diversity of seeds suitable for various needs and locations were saved by many generations of farmers, including women farmers, with wisdom, skills, commitment, creativity and love. These were saved carefully for own use but also shared freely with other farmers or exchanged with them. Hence diversity of seeds as per the needs of farmers could be available to them, without imposing any economic burden, year after year, thereby ensuring self-reliance in the context of the most important requirement of farming.

In recent decades, However, there has been a big drift towards increasing corporate control over seeds, particularly with big multinational companies and their collaborators getting a huge share, assisted with patents over life forms that were unthinkable earlier. This control has been becoming a huge problem in the path of what the world really needs –a farming and food system based on small farmers producing safe food in ecologically protective and sustainable ways.

In such conditions having a very narrow framework of discussion based on benefit sharing will not take us towards the truly needed reforms at all. Such discussion, including what has been seen at several international fora like the plant's treaty deliberations, is focused on whether corporate seed interests are willing to share benefits with farming communities, more likely in terms of sharing a small part of their profits. If such is the narrow framework of discussion, then even if a successful 'reform' outcome emerges, this is more likely to be in the form of a somewhat higher share of the profit being shared, if at all (the bitter reality is that

ways and techniques of avoiding even this are actually being sharpened).

This, However, is not the main issue at all and if the main issue is not even placed on the discussion table, then you cannot have real reform that is truly needed.

As the history of the corporate control over seeds shows, all the way from the smaller companies to the domination of huge multinational companies with ambitions of world-level control, the main aim of these multinational companies, broadly speaking, is longer-term huge increase of profits and this is best achieved by increasing control over the seeds assisted by patents and technologies like genetic modification.

However, this is not at all compatible with protecting the livelihoods of small farmers, or protecting environment and ensuring safe and healthy food. Instead seed companies push in the direction of increasing the burden of seed costs as well as herbicides and other inputs that are often linked to the sales of their seeds. So, farming becomes more expensive and increasingly also ecologically destructive with more harmful chemical inputs being used and more monocultures being promoted instead of decentralized, diversity-based approach being followed. Where seed multinationals have been very active and strong, there have been reports of many-sided adverse impacts on farming communities.

In addition, there have also been several reports of seed multinational companies gaining access to the genetic diversity of the global south in highly unfair ways.

Thus, the issue is not just of benefit sharing but more of changing a highly unfair system of control over seeds which is only a few decades of old but has been threatening in serious ways the common heritage of humankind, the result of the work of hundreds of generations of farmers. Instead of changing such a horrible new system in such ways that we can regain the previous system in which seeds are the common heritage of all humankind, it makes little sense to try to gain some more acceptability for an inherently wrong and unjustified but nevertheless fast spreading system.

Hence instead of wasting our time on a discourse of benefit sharing, we must move towards the truly needed task of creating a system of seeds based on the conservation of diversity of seeds on the farms of farmers and their ability to have the kind of diversity of seeds they need on the basis of their saved, shared or exchanged seeds instead of having to go to the market to buy expensive seeds, that too often engineered to serve highly suspect motives of pushing polluting and costly chemical inputs. It is such a system based on farm-based seeds conservation, protecting diversity, sharing and exchange that we should strive for.

6.4: Farmers Must Unite to Resist Corporate Control Over Seeds

The most important input in the entire farming and food system is that of seeds. Whether farming and food will be the base for supporting sustainable livelihoods linked to production of safe and healthy food or whether farming and food system will be dominated by a few giant multinational companies which harm farmers as well as consumers will be decided to a large extent by the kind of seed system that is created. If the vast diversity of seeds protected by generations of farmers is well-protected on the farms of tens of millions of small farmers, then this greatly increases the chances of sustainable livelihoods linked to production of safe and healthy food. If seeds are increasingly controlled by a few big multinational companies and their collaborators, then we can say good-bye to protecting sustainable livelihoods of small farmers or ensuring safety of food systems.

Understanding the key role of seeds, the big agribusiness corporates have been targeting increasing control over the seeds sector for decades. While they have succeeded to a large extent in increasing control over seeds in the course of the journey from the spread of the green revolution to the spread of GM crops and the setting up of gene banks to which big corporates have gained easy access in various ways, there has also been some resistance to their relentless manipulations for higher and higher control, and as a result of this resistance their control is not yet to the extent desired by

them. The issue of protecting farmers' seed rights has become important in a significant part of the global south. On the one hand there is a struggle of farmers to protect seed rights and on the other hand this is supported by several creative and beautiful efforts to conserve and protect diversity of seeds.

Looking at this situation, the powerful corporate interests and their collaborators and agents are trying to use several manipulative methods and are using technology advances not to help farmers but to increase their control further.

It is against this background that some of the issues being discussed at the ongoing plant treaty talks (July 7-11, 2025) being held at Lima, Peru, must be seen. Behind the cleverly woven facade of benefit-sharing and other such terminology, there is a continuation of the efforts on the part of the corporate interests to further enhance their control over the crucial seeds sector.

The UN's International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA) is often briefly referred to as the Plant Treaty. The 11th Session of Governing Body of this treaty will be held in November this year (2025). Partly as a preparation for this, the 14th meeting of the Ad-hoc Working Group of this treaty is taking place at Lima from July 7 to 11. In these talks and in the discussion before this, the issue of Digital Sequence Information (DSI) or genetic data extracted from seeds has been a very controversial one. This has been pointed out as a means that is increasingly likely to be used by several big corporate interests to increase their control over seeds, perhaps even bypassing benefit sharing, providing an example of how new technology can be used in highly unethical ways.

In addition, the issue of dual-access system has been much discussed. This is based on two systems. Firstly, there is a subscription model based on fixed fee for broad access. Secondly, there is a single access model, based on payments made only when a product is commercialized. While more concern has been expressed regarding the single access model, there has also been concern regarding the possibilities of opportunistic use of the two systems by corporate interests to maximize their gains in shrewd ways. However, what may be more important overall is the overall power-politics context in which decisions are taken. Some countries which host the most powerful multinational companies have been behaving in increasingly arrogant and arbitrary ways while asserting their power and it is possible that they try to bully several of the smaller and more vulnerable countries in ways that confer highly unfair advantages to their corporate interests at the costs of the farmers of the global south in particular.

Hence clearly it is time for broad-based unity of farmers all over the world to protect their seed rights in particular but in addition to also resist the other adverse impacts and aspects of the increasing dominance of food and farming system by multinational companies helped by powerful countries. As everyone needs safe and healthy food, this resistance by farmers should get the support of all of us. In addition, very creative efforts with high participation of women farmers must be increased to promote village-based conservation of wide diversity of seeds.

7: A Disaster called GM Crops

7.1: Urgency of Checking Spread of GM Crops

As consciousness regarding the many-sided adverse impacts and high hazards and risks of GM crops have grown, some promoters allied to the same big business interests and multinational companies directly and indirectly have instead started trying to push for gene editing technologies but as these to have similar adverse impacts and risks to a large extent therefore these too must be rejected. This is supported by scientific research as well as court decisions.

In a study published in Nature Biotechnology, scientists from the Welcome Sanger Institute in the UK found that new genetic engineering techniques like CRISPR may cause 'genetic havoc'. Researchers found large deletions and rearrangements of DNA near the target site that were not intended. Earlier studies also found that gene-edited plants such as soybeans had off-target effects in which gene-editing occurred at unintended locations. Friends of the Earth found on the basis of the actual applications of these techniques that this was in the direction of further increasing chemical intensive approach to agriculture.

Gene editing can also be used to construct 'gene drives' which aim to spread genetically modified genes across wild populations faster than normal inheritance allows. Once released, gene drive organisms cannot be recalled. This can have very adverse impacts and there have been several demands for moratorium on this. Use of this technology on mosquitoes and insects has proved very controversial and there have been several adverse impacts and high risks reported regarding this.

In fact, the entire trend and tendency of big business interests and multinational companies gaining control over seeds and agriculture must be firmly opposed by farmers, health and environment activists all over the world because big business operates in ways that are harmful for sustainable livelihoods of small farmers, for environment and health. On the one hand they try to spread inherently unstable, unreliable, disruptive and dangerous technologies like GM and gene-editing and on the other also market herbicides and agro-chemicals that are expensive as well as harmful for health and environment.

One of the most eminent scientists of India on this subject Dr. Pushpa Bhargava has clearly stated that the available evidence is overwhelmingly GM crops. Dr. Pushpa M. Bhargava was the founder of the Centre for Cellular and Molecular Biology and in addition he was also the Vice Chairperson of the National Knowledge Commission. Many people's science movements looked upon him as their mentor. He had been appointed by the Supreme Court of India as an observer in the Genetic Engineering Appraisal Committee as he was widely perceived to be not only a very accomplished expert on this issue and that too of the highest integrity but in addition he was also seen on the basis of his past record as a very strong and persistent defender of public interest.

Therefore, it is very useful and interesting to see what this very senior scientist with a comprehensive understanding of this issue had to say about GM crops in an article written for a leading newspaper The Hindustan Times. He wrote, "There are over 500 research publications by scientists of indisputable integrity, who have no conflict of interest, that establish harmful effects of GM crops on human, animal and plant health, and on the environment and biodiversity. For example, a recent paper by Indian scientists showed that the but gene in both cotton and brinjal leads to inhibition of growth and development of the plant. On the other hand, virtually every paper supporting GM crops is by scientists who have a declared conflict of interest or whose credibility and integrity can be doubted."

In addition, in a review of recent trends titled 'Food Without Choice' (published in another leading newspaper The Tribune) Prof. Pushpa Bhargava drew pointed attention to the "attempt by a small but powerful minority to propagate genetically modified crops to serve their interests and those of multinational corporations

(read the US), the bureaucracy, the political set-up and a few unprincipled and unethical scientists and technologists who can be used as tools." Further he warned, "The ultimate goal of this attempt in India of which the leader is Monsanto, is to obtain control over Indian agriculture and thus food production. With 60 per cent of our population engaged in agriculture and living in villages, this would essentially mean not only a control over our food security but also over our farmer security, agricultural security and security of the rural sector."

The strong stand of Dr. Bhargava against GM crops is supported by other eminent scientists in various parts of world. A group of eminent scientists organized under the Independent Science Panel have stated in very clear terms, "GM crops have failed to deliver the promised benefits and are posing escalating problems on the farm. Transgenic contamination is now widely acknowledged to be unavoidable, and hence there can be no co-existence of GM and non-GM agriculture. Most important of all, GM crops have not been proven safe. On the contrary, sufficient evidence has emerged to raise serious safety concerns, that if ignored could result in irreversible damage to health and the environment. GM crops should be firmly rejected now."

The Independent Science Panel (ISP) is a panel of scientists from many disciplines and countries, committed to the promotion of science for the public good. In a document titled 'The case for a GMO-free Sustainable World' the ISP has stated further, "By far the most insidious dangers of genetic engineering are inherent to the process itself, which greatly enhances the scope and probability of horizontal gene transfer and recombination, the main route to creating viruses and bacteria that cause disease epidemics. This was highlighted, in 2001, by the 'accidental' creation of a killer mouse virus in the course of an apparently innocent genetic engineering experiment. Newer techniques, such as DNA shuffling, are allowing geneticists to create in a matter of minutes in the laboratory millions of recombinant viruses that have never existed in billions of years of evolution. Disease-causing viruses and bacteria and their genetic material are the predominant materials and tools for genetic engineering, as much as for the intentional creation of bio-weapons."

Several scientists involved in studying the implications and impacts of genetic engineering got together at the International Conference on 'Redefining of Life Sciences' organised at Penang, Malaysia, by the Third World Network. They issued a statement (the Penang Statement, or PS) which questioned the scientific basis of genetic engineering. This statement said, "The new biotechnology based upon genetic engineering makes the assumption that each specific feature of an organism is encoded in one or a few specific, stable genes, so that the transfer of these genes results in the transfer of a discrete feature. This extreme form of genetic reductionism has already been rejected by the majority of biologists and many other members of the intellectual community because it fails to take into account the complex interactions between genes and their cellular, extracellular and external environments that are involved in the development of all traits.

> *"The limited ability to transfer identifiable molecular characteristics between organisms through genetic engineering does not constitute the demonstration of any comprehensive or reliable system for predicting all the significant effects of transposing genes."*

Highest Europe Court Ruling Confirms Serious Risks of Gene-Edited Crops

"It has thus been impossible to predict the consequences of transferring a gene from one type of organism to another in a significant number of cases. The limited ability to transfer identifiable molecular characteristics between organisms through genetic engineering does not constitute the demonstration of any comprehensive or reliable system for predicting all the significant effects of transposing genes." Highest Europe Court Ruling Confirms Serious Risks of Gene-Edited Crops

At a time when more and more people in the world are becoming concerned about the serious health risks and numerous other adverse impacts of genetically modified (GM) crops and genetically modified organisms (GMOs), the enormously powerful billion dollar GMO multinationals tried again to introduce confusion and uncertainty in public mind by coming up with the concept of gene-edited crops and claiming that these should not be subject to the same restrictions as GM crops. However, in July 2018 the highest court in Europe ruled that gene-edited crops should be subject to the same strict rules and regulations as GM crops.

Earlier a review of the legal and scientific facts surrounding this debate by Dr. Janet Cotter and Dr. R. Steinbrecher(published in the Ecologist) had concluded, " It is clear that gene-edited crops and animals need to be assumed as GMOs in the same way as current GM crops." The court verdict is along similar lines.

With gene editing researchers can add, delete or modify bits of an organism's genome. The European Court said that any crops edited using CRISPR or other gene-editing techniques must abide by the same laws restricting the use of GMOs. More specifically the Court concluded it " considers that the risks linked to the use of these new mutagenesis techniques might prove to be similar to those that result from production and release of a GMO through trans-genesis ,since the direct modification of the genetic material of an organism through mutagenesis makes it possible to obtain the same effects as the introduction of foreign gene into the organism (trans-genesis) and these new techniques make it possible to introduce genetically modified varieties at a rate out of all proportion to those resulting from the application of conventional methods of mutagenesis."

Welcoming the court verdict Franziska Achterberg , Greenpeace EU's food policy director said, " Releasing these new GMOs into the environment without proper safety measures is illegal and irresponsible, particularly given that gene editing can lead to unintended side-effects… The European Commission and the European governments must now ensure that all new GMOs are fully tested and labelled, and that any field trials are brought under GMO rules."

A spokesperson of Friends of the Earth said, "We applaud the European Court of Justice for this forward-looking decision."

7.2: Threat of Genetic Contamination

The extremely serious issue of the threat of genetic contamination caused by genetically modified or engineered (GM or GE) crops finally reached the Supreme Court of India on November 30 2024 in the context of on-going cases relating to the introduction of GM Mustard in India. Advocate Prashant Bhushan, after pointing out the serious implications of this risk in a country where high bio-diversity of mustard exists, pleaded that to avoid genetic contamination, the GM mustard plants already planted should be uprooted.

It was important to raise this issue in court as in the recent debate on GM crops, one factor that has not received adequate attention is that due to the threat of contamination, it is difficult for normal crops or organic crops to remain free from the impact of GM crops once these have been released. As worldwide concern for food safety grows, it is likely that there will be increasing demand for organically grown crops and crops which are not contaminated by GM crops. Therefore, we will be surrendering premium world markets if we allow our crops to be contaminated. This is why organizations like those of rice exporters have also got involved in the campaigns against GM crops. Star Link (corn engineered to contain a Bt toxin pesticide) was planted on less than 0.5% of US corn crop area, but its recall cost hundreds of millions of

dollars, and even then, the recall was not entirely successful.

Several eminent scientists representing the Independent Science Panel have also warned against the serious threat of contamination by GM crops - "Extensive transgenic contamination has occurred in maize landraces growing in remote regions in Mexico despite an official moratorium that has been in place since 1998. High levels of contamination have since been found in Canada. In a test of 33 samples of certified canola (oilseed rape) seed stocks, 32 were found contaminated. New research shows that transgenic pollen, wind-blown and deposited elsewhere, or fallen directly to the ground, is a major source of transgenic contamination. Contamination is generally acknowledged to be unavoidable, hence there can be no co-existence of transgenic and non-transgenic crops."

"Crops engineered with 'suicide' genes for male sterility have been promoted as a means of 'containing', i.e., preventing, the spread of transgenes. In reality, the hybrid crops sold to farmers spread both male sterile suicide genes as well herbicide tolerance genes via pollen."

It is due to the serious threat of contamination that even trials of GM crops are considered unacceptably risky.

Eminent scientist Prof. Pushpa M. Bhargava, founder of the Centre for Cellular and Molecular Biology, had explained this threat in the context of Bt brinjal, and this is also relevant in the present context—"Eighty four percent of our farmer community consists of small and marginal farmers with a holding of less than four hectares land. According to Monsanto data, Bt brinjal pollen can travel for 30 meters and could thus easily contaminate the neighbouring non-Bt brinjal field. In course of time we would be left with no non-Bt yield even if the farmers do not want the transgenic crop." In this way, the distinguished scientist went on to explain, farmers will lose the market of all health-conscious, safety conscious consumers, at home and abroad.

Prominent environmentalist Sailendra Nath Ghosh has written, - "In view of the virtual impossibility of preventing contamination, even the open-field trials ought not to be permitted. According to independent geneticists, the isolation distance needed to be both in time and space. The land on which the GM crop is to be grown should not sow a crop in the previous or the succeeding year. Cross-pollinating crops, unlike the self-pollinating ones, require isolation distance of three to four kms. The implementation of these requirements is impossible under Indian conditions. Farmers would not keep their lands fallow. Crops in adjoining fields are almost always planted up to the boundaries. The trials needed to be in greenhouses controlled by independent institutions."

Several of these threats were examined at an international conference of scientists involved in studying the implication and impacts of genetic engineering. This conference on 'Redefining the Life Sciences' was organized at Penang, Malaysia, by the Third World Network. These scientists and experts issued a statement called the Penang Statement (PS).

This statement listed a wide range of potential adverse effects of genetic engineering. Of particular concern is the difficulty or impossibility of recalling GEOs(genetically engineered organisms or GMOs) which have been released into the environment, or which have escaped from containment and later found to have adverse effects.

The potential ecological risks of applying genetic engineering to agriculture include the possibility that some transgenic crops could become noxious weeds, and others could become a conduit through which new genes may move to wild plants which themselves could then become weeds. The new weeds could adversely affect farm crops as well as wild ecosystems. Similarly, genetically engineered fish, shellfish and insects could become pests under certain conditions.

Plants are presently being engineered to contain parts of a virus in order to become virus-resistant. Some scientists have raised the possibility that widespread use of transgenic virus-resistant plants in agriculture may lead to new strains of viruses or allow a virus to infect a new host. There are concerns that the creation of new viral strains and the broadening

of the virus's host may increase the risks of new viral diseases that adversely affect crops and other plants. Mechanisms have been described whereby genetically engineered plants could plausibly give rise to new plant diseases.

In addition, this statement warns that the rapid spread of transgenic crops poses a threat to traditional crop varieties and wild plants that are the major sources of crop genetic diversity.

Some traits of organisms may take decades or even longer to manifest themselves. An organism declared 'safe' in the short term could eventually prove to be dangerous.

Another ecological risk is the possibility that field or forestry plants engineered to express toxic substances like pesticides and pharmaceutical drugs may poison certain non-target organisms. Transgenes for insecticidal or fungicidal compounds that are introduced into crops to inhibit pests may unintentionally kill non-target and beneficial insects and fungi. Transgenic crops used to manufacture drugs or industrial oils and chemicals could potentially harm animals, insects and soil microorganisms.

The possible chemical contamination of surface-water and ground-water by microorganisms or plants with unusual or accelerated metabolic processes is a special concern because of the crucial importance of water for all life. It may be impossible to recall and difficult to control harmful GEOs, especially those that may contaminate ground-water.

This statement adds that developing countries in particular face special risks : "Third World countries face even greater environmental risks than countries of the North because, in contrast, they have many wild relatives of many crops and thus there are more opportunities for various kinds of rogue species to be created."

Moreover, most Third World countries currently have less scientific expertise and legal or regulatory capacity to monitor, assess and control activities involving genetically engineered organisms, and are thus even more vulnerable to adverse impacts.

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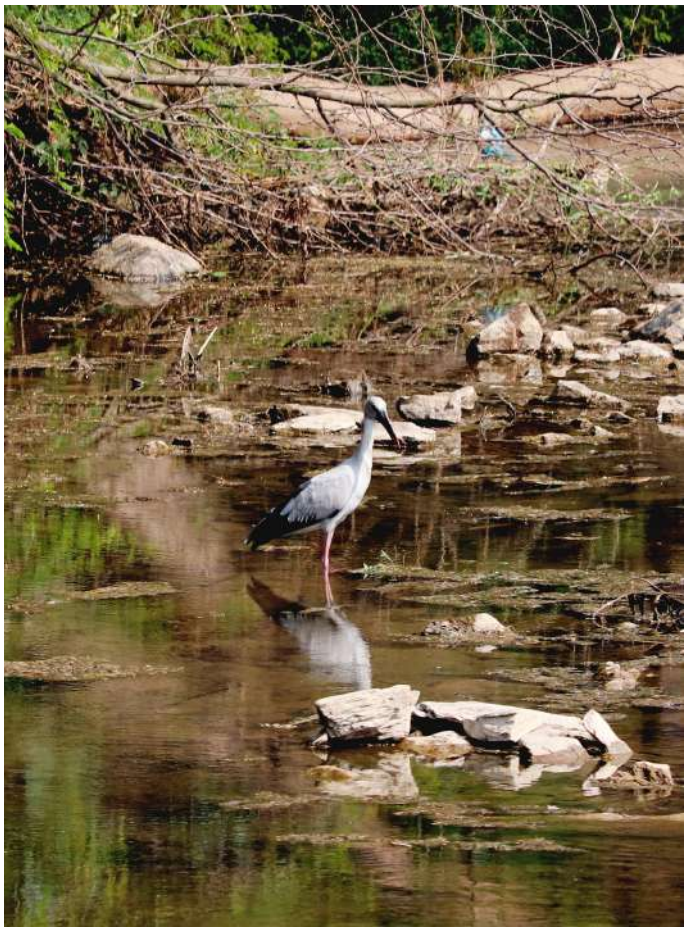

This issue should also be examined in the context of what has been called the 'terminator technology'. In widely discussed paper (published in the Ecologist, Sept/Oct 1998) Ricarda A Steinbrecher (Science Director of the Genetics Forum UK) and Pat Roy Mooney (widely acclaimed winner of the Right to Livelihood Award) summarized the implications of this most controversial use of generic engineering,

"On March 3rd 1998 the US Department of Agriculture (USDA) and a little-known cotton-seed enterprise called Delta and Pine Land Company, acquired US patent 5,723,765 - or the Technology Protection System (TPS). Within days, the rest of the world knew TPS as Terminator Technology. Its declared goal is to promulgate plants that will produce self-terminating offspring - suicide seeds. Terminator Technology epitomizes what the genetic engineering of food crops is all about and gives an insight into the driving forces behind the corporate campaign to control and own life."

Further this paper says, "Most alarming through is the possibility that the Terminator genes themselves could infect the agricultural gene pool of the neighbour's crops and of wild and weedy relatives, placing a time bomb. Temporary "gene silencing" of the poison gene or failed activation of the Terminator countdown enables such infection."

Clearly the threat from GM crops to natural farming systems and environment is so serious that we need to be very cautious. Unfortunately, as has been exposed already in the context of Bt cotton repeatedly, the tendency of official policy, under the pressures of the powerful GM lobby, has been to think of safety later (if at all) and haste in introduction first. This explains why when sheep started dying after grazing in Bt cotton fields and dairy animals too experienced many highly distressing adverse effects after consuming Bt cotton oilcake, inquiries revealed that essential research and tests needed in this context were still to be carried out. In the absence of efforts to find out any relationships and impacts, we have no means of knowing the adverse impacts of huge consumption of cottonseed oilcake by dairy animals as confirmed by official research (even though independent research has established the likelihood of highly adverse impacts), or adverse impact on the health of human beings who consume the milk of these animals, or adverse impact of rampant use of cottonseed oil for preparing human food particularly in the form of snack food sold commonly in the market. Why are governments prepared to endanger the health of people and farm animals when they should be guided by the precautionary principle? In the case of GM mustard the risks are much higher as this is entirely a food and medicinal crop—not just its oil and oilcakes but even its leaves are widely used to prepare a much-relished green leafy preparation and it is put to several medicinal uses. With the government system entirely in the grip of the GM lobby, the only hope is now from the judiciary (the good news has just come in that the high court in Kenya has checked the recent decision of the government there to open up the country to GM food), the farmers' movement and other people's movements opposing the onslaught of GM crops and food in India.

8: Revisiting the Green Revolution

8.1: Learning the Right Lessons from the Green Revolution

The so-called Green Revolution was heralded with exotic seeds that were supposed to give higher yields with high doses of chemical fertilizers and also requiring high doses of chemical pesticides. This ignored the big harm to environment and health and what is more, neglected and deliberately ignored the possibilities of several traditional seeds and crop varieties that were able to give equal or even higher yields without chemical fertilizers and pesticides. The fact that the green revolution involved the uprooting and gradual vanishing from farms of the vast diversity of traditional seeds and crop-varieties to which many generations of farmers had contributed and which presented the collective achievement of the work and wisdom of farmers of several generations was widely ignored while singing highly undeserved praises of the so-called green revolution.

While evidence has been pouring in from many parts of India that excessive chemical fertilizers, chemical pesticides and weedicides have been very harmful for sustainable and low-cost development of agriculture as well as for health and environment, those with narrow business and career interests have managed to spread their lie that the green revolution seeds (often called HYVs, although these are better referred to at their best as HRS or high response varieties) tailored to the needs of excessive use of chemical fertilizers and pesticides were necessary to produce adequate food and to increase farm productivity.

The reason why narrow interests have spread this lie is that they want the high-cost, high big business input technology which brings profits and subsidies to big business interests to continue. However, if our real aim is to help farmers and to protect environment, then we have to expose these lies so that our policy can always be in Favor of eco-friendly, low-cost, self-reliant , affordable technology which will help farmers to reduce their costs while also protecting environment.

The green revolution started spreading significantly around 1967. The available data shows that the increase in farm productivity in the period before this was greater than in the period after this.

An overview of the situation of farm productivity before and after green revolution is provided in the official 12th Five Year Plan document of India in two important tables (See Tables 1 and 2). Here we can see clearly that despite the much higher use of chemical fertilizers, pesticides etc. in the green revolution phase, the growth of farm yield on the whole during this period was in fact lower.

Table 1: Average Annual Growth Rates in Yields per Hectare

Crop	Pre-Green Revolution 1951-52 to 1967-68	Green Revolution 1968-69 to 1980-81
Rice	3.2	2.7
Wheat	3.7	3.3
Jowar	3.4	2.9
Bajra	2.6	6.3
Maize	4.8	1.7
Coarse Cereals	2.6	1.5
Pulses	2.3	-0.2
Oilseeds	1.3	0.8
Cotton	3.0	2.6
Sugarcane	1.6	3.1

(Source : 12th Plan Document)

Table 2: Growth of Value of Output (2004-05 Prices), (Period averages of annual growth rates)

Crop	Pre-Green Revolution 1951-52 to 1967-68	Green Revolution 1968-69 to 1980-81
Cereals	4.2	3.4
Pulses	3.0	0.7
Oilseeds	3.2	1.8
Sugars	3.3	4.1
Fibres	4.4	2.5
Non-Horticulture crops	3.2	2.7
Horticulture	2.6	4.2
Oilseeds	1.3	0.8
Cotton	3.0	2.6
Sugarcane	1.6	3.1

(Source : 12th Plan Document)

In fact, it was very evident even in the early stage of the green revolution that what was taking place was very harmful for India's agriculture.

By the mid-sixties the Central Rice Research Institute (CRRI) had emerged as clearly the most important centre of rice research in India, and one of the most important such centres in the world. It was around this period that research relating to a very important technology-clonal propagation of rice-was reaching a very important stage under the able guidance of the CRRI director Dr. R. H. Richharia. The technology being tried held the exciting potential of significantly increasing rice yield based on rich diversity of indigenous rice varieties, eco-friendly and low-cost methods of cultivation and rapidly spreading the improved varieties over a very wide area.

Nearly two decades later the CRRI director Dr. Richharia recollected the goings - on around him at a seminar on the 'crisis of modern science' held in Malaysia in November 1986. He stated that "the possibility of exploitation of hybrid vigor by the application of clonal propagation in rice in later generations was demonstrated at CRRI and the results were published in a British Journal 'Nature' in 1962 entitled "Clonal propagation as a practical means of exploiting hybrid vigor in rice". The technique was also explained by Dr. Richharia at a seminar held at an international research Institute in 1963. "We were systematically proceeding with the work at eleven different centres in India with success. We had just reached the stage to revolutionize rice production, but all the centres were closed down…" Instead HYV program with dwarfing genes was launched suppressing the CRRI work.

Dr. Richharia stated at this conference that at the later part of his stay in CRRI, he passed his time in great distress because he opposed the interference imposed by an international research institute authorities who were promoting green revolution rice in a big way. This international research institute imposed on CRRI their program and took away its initiative and supremacy which Dr. Richharia resisted to protect the wider interest. The international program dealt exclusively with the rice culture with dwarfing genes and sought to replace the indigenous rice varieties by HYV series and under the pretext of exchange program to collect the entire rice germplasm directly and indirectly through trainees, visitors, etc, bringing their rice cultures personally to India without quarantine certificates. In the words of Dr. Richharia, "My devoted band of young scientists soon alerted me and I realized that our program and findings on rice production technology which had reached a stage to introduce revolution in upgrading India's rice productivity were being suppressed, useful projects being withdrawn and being superseded" , instead giving preference to the international program. "I, as head of CRRI had no other option but to oppose this interference openly in the interest of my country on the food front."

So, it is clear from this testimony of the senior most scientist of the most important food crop that much better alternatives compared to the green revolution technology were available and had reached an advanced stage to increase productivity in a sustainable way, but these were not allowed to progress and were even sabotaged.

All this proved very harmful for India's agriculture, and the results became evident all too soon. The massive damage becomes so worrying that a special task force on rice

breeding was constituted of eminent experts in 1979 to examine this issue. These experts met at the CRRI in February. Dr. Richharia was called back from his retirement to head this task force as his advice was considered invaluable. This task report stated clearly and firmly, "Most of the HYVs are derivatives of T(N) 1 or I.R. 8 and, therefore, have the dwarfing gene of dee-geo-woo-gen. This narrow genetic base has created alarming uniformity, causing vulnerability to diseases and pests. Most of the released varieties are not suitable for typical uplands and low lands which together constitute about 75 per cent of the total rice area of the country. To meet these situations, we need to reorient our research programs and strategies."

"Referring to this problem of narrow genetic base at another place again the task force says, "A cursory look at the pedigree of the different rice varieties released in India reveals that a very narrow germplasm base is involved."

Thus, even though the earlier warnings of Dr. Richharia were now confirmed by the actual experience of about 13 years and supported by the country's eminent rice-breeders represented in this task-force, these warnings were still ignored to a large extent and the official rice programme/policy cantered on exotic dwarf HYVs with a narrow genetic base continued as before.

In fact, the history of the green revolution is full of such instances to draw attention away from the high potential of eco-friendly, low- cost and self- reliant agriculture based on indigenous varieties. One big continuity is that those policies and technologies which are in tune with promoting big business interests generally get most prioritized. A very important adverse aspect has been that farmers have been losing control over the invaluable heritage of diversity of seeds nurtured and protected by their ancestors while multinational companies with their local collaborators gain control over them and then they use the kind of new technologies which can enable them to obtain patents based essentially on this common heritage of humankind, to further increase their profits as well as control over world food and farming.

A time has come now to expose false myths about the green revolution to clear the path for agro-ecology and eco-friendly agriculture based on protection and spread of indigenous crop varieties as well as self-reliant, sustainable and low-cost successful farming by small and medium-level farmers.

8.2: Change of policy needed in favour of natural farming

The union government has often voiced its support for natural farming but this is not yet seen in real change in government's commitments. The government's subsidies in favour of agriculture are still heavily biased in favour of chemical fertilizers or overall agro-chemical intensive farming or 'green revolution' type farming. This farming also tends to use water and power in greater excess and hence gets a higher share of water and power subsidies, even in times of alarming decline of water table in many regions. Such farming also tends to use heavier machines more frequently and hence gets most benefits of such subsidies as well. Most of the government funds spent on agricultural research, education and extension are oriented towards such farming.

To provide equal benefits to natural farming, the government can calculate the subsidies it gives to green revolution type farming per hectare and provide the same subsidy in the form of conditional cash transfer per hectare to those farmers who are practicing natural farming and hence entirely avoiding chemical fertilizers, pesticides and herbicides and using water and power to a lesser extent. This is clearly justified by the avoidance of various forms of pollution, production of healthier food and above all by the improvement of soil quality, particularly the increase in organic content of soil so important for both climate change mitigation and adaptation. In fact, this would justify the use of climate change adaptation and mitigation funds also to a greater extent for natural farming and improving the organic content of soil which is linked closely to natural farming.

Here it should be made clear that I am not asking for a withdrawal of chemical fertilizer subsidy but only saying that at least similar, if not higher, subsidy benefits should be given to natural farming. Farmers who opt for green revolution

type farming should have no objection to such a proposal. In a democratic system many farmers, particularly the bigger ones, will always opt for green revolution type farming as they find this more convenient. So let them do their kind of farming which after all has been officially promoted for so many decades. At the same time, in view of the heavy environmental and health costs of such farming, it is very important from the perspective of the entire society to spread scientific, comprehensive information about the undesirable impacts of green revolution and the alternatives that are available. An essential precept of subsidy is that it should be given for socially desirable objectives. Hence to expect equal subsidy per hectare for natural farming is the least that those who practice and support natural farming should demand and expect from the government: in fact, they deserve more. Despite all its publicized support for natural farming, the government has not introduced such a system of support for natural farming.

One can understand, However, that there can be some practical problems in administering such a system of subsidies, particularly in corruption-ridden systems. Hence there is all the more need for trying various schemes of such subsidization to move towards the best ones, the aim being to ensure the entire subsidy to the genuine natural farmers without involving any intermediaries.

It is also very important to revise the farm mechanization policy. The government should stop any promotion and subsidization of heavy farm machines. Those who want to use these can do so, but the government should not promote, facilitate or subsidize this. The government should shift its focus to smaller improved implements, tools and machines which are more helpful in all small-scale farming but particularly in natural farming.

The government must clearly ban all genetically modified (GM) crops including gene edited crops as these, with or without their herbicides and agro-chemicals, are very harmful for environment and health, cannot co-exist with natural farming and can contaminate naturally grown crops as well.
The government needs to stop the further spread of such unscientific, anti-nature programs like those based on sexed semen technology which, if continued, can cause great harm within a few years.

The heavy corporate orientation of union government's farming policy with its obvious although unstated aim of increasing the hold of a few big multinational corporations and crony-capitalists in the production, hoarding, trade, processing and marketing of farm produce must be withdrawn and instead the government policy should be oriented in a very basic way towards enhancing the sustainable livelihoods of small farmers and processors (including the landless who can be helped to become small farmers) as well as protection of environment and health.

The present day over-centralized government policy is not suitable for natural farming at all which must be necessarily highly decentralized, keeping in view local requirements and allowing full room for the creativity and innovativeness of farmers in keeping with local conditions.

> *"The food and farming system at the world level has been getting increasingly dominated by powerful corporate interests and the motives driving them of maximizing their profits and dominance. In the process the food and farming system has been moving away from the objectives of producing safe and adequate healthy food on sustainable basis while ensuring creative and satisfactory livelihoods.*

8.3: Urgency of Alternative Food and Farming Systems

"Men who can graft the trees and make the seed fertile and big can find no way to let the hungry people eat their produce - Men who have created new fruits in the world cannot create a system whereby their fruits may be eaten. And the failure hangs over the State like a great sorrow."
- John Steinbeck in 'The Grapes of Wrath'

The food and farming system at the world level has been getting increasingly dominated by powerful corporate interests and the motives driving them of maximizing their profits and dominance. In the process the food and farming system has been moving away from the objectives of producing safe and adequate healthy food on sustainable basis while ensuring creative and satisfactory livelihoods. In these difficult conditions several groups and individuals have been steadfastly working for creating an alternative food and farming system. It is useful to look at some of these efforts and their vision.

Several UK farming, consumer, organic, animal welfare, environmental and Third World groups have formed the Sustainable Agriculture, Food and Environment (SAFE) alliance. According to SAFE's campaign statement: "Agriculture is about more than simply producing food. It is a way of life and makes a vital contribution to the health of rural communities. SAFE seeks to switch farm subsidies away from price support towards payments for sustainable and environmentally enhancing farm management practices agreed on a whole farm basis. All the land on any one farm would be included in the scheme, and payments made would be tiered on an acreage basis. The effect of these whole farm management agreements, argues SAFE, would be to put smaller family farms (the mainstay of many rural communities) back on a level playing-field with much larger farms, and to remove the present in built bias towards increased farm size." Such agreements, argues SAFE, would both encourage participating farmers to modify their production methods to take full account of environmental factors, and also reward those, such as organic farmers, already practicing environmentally-sensitive methods. The SAFE Alliance has tried to define the requirements of good agricultural system:

- An agriculture that is supportive of rural communities, that halts the decline in full-time farm employment and provides a stable livelihood for farmers and farm workers;
- An agriculture that does not jeopardize the health of those who work or live on the land or the consumer through the use of polluting or toxic production methods;
- An agriculture that is capable of flexible response to national food and nutrition goals designed to improve public health;
- An agriculture that produces affordable food, of high nutritional quality and that minimizes chemical and microbiological contaminants;
- An agriculture that does not lead to the reduction of soil fertility, that minimizes reliance on non-renewable resources and that is sustainable;
- An agriculture that both conserves and enhances the countryside, not only in its visual aspect but also in terms of its resources and wildlife;
- An agriculture that respects the welfare needs of farm animals;
- An agriculture that does not threaten the development and maintenance of food security and sustainable agriculture in other countries, especially those in the Third World.

A good food and agricultural system are one which makes available satisfactory livelihood to all members of the farming community and wholesome, nutritious food to all people in a sustainable way ensuring welfare of farm animals, protecting the soil and its fertility for future generations. Unfortunately, at present there is a lot of economic tension and uncertainty among farmers not only in developing countries but also in some of the richest countries like the USA. A significant share of the farming community is landless (or near landless) and it is deprived of a fair share of the farm income. Many landholders are themselves in danger of losing control over their land.

Again, even in the richest countries, care of soil is badly neglected. The machines that have taken over most of the work on farms can produce

more food but cannot protect soil for future generations. As more and more skilled peasants are being driven away from agriculture, it becomes more and more unlikely that enough people will be available not just to produce food but also to protect land. Farm animals are being treated just as a commodity with least concern for their welfare.

On the consumption side, not only do poverty and inequalities deny adequate food to a large number of people (probably in the neighbourhood of one billion) but even those with enough purchasing power find it increasingly difficult to get wholesome, nutritious food due to the domination in markets of food which has been heavily treated by chemicals or subjected to other processing (or adulteration) which have peeled off valuable nutrients while adding some harmful substances.

So, the basic priorities of improving the farm and agriculture system should be:

- Empower those who work on farmland to maintain their close links with land.
- Support them to get an adequate livelihood from cultivating the land and protecting its soil.
- Establish harmony between the welfare of farm animals and economic returns of farming. In other words, make such productive use of farm animals as can bring economic returns without causing any cruelty to them.
- Establish direct links of farmers and consumers so that consumers can get good quality food and farmers can get a fair price in return. Monitor trade, processing and middlemen interests carefully to ensure that interests of farmers and consumers are not violated.

Unfortunately, almost all these concerns are being neglected and existing distortions are getting worse due to the domination of quick profit interest of agribusiness in policy matters while ignoring the wider, longer-term and much more significant interests of ordinary farmers and consumers. A lot of the confusion arises from treating agriculture much like an industry (or even mining) with a single-minded pursuit of maximizing short turn production and profit. The fallacy of this widely held view has been very aptly exposed by Wendell Berry, farmer- philosopher from the USA, "The farmer differs from the industrialist in that the farmer is necessarily a nurturer, a preserver of the health of creatures."

"The economy of industry is, typically, extractive. It takes, makes, uses, and discards, it progresses, that is from exhaustion to pollution. Agriculture, on the other hand, rightly belongs to a replenishing economy, which takes, makes, uses, and returns - it involves the return to the source, not just of fertility or of so-called wastes, but also of care and affection."

Arguing why this basic understanding of agriculture is so widely missed these days Wendell Berry writes, "The 'free market' - the unbridled play of economic forces- is bad for agriculture because it is unable to assign a value to things that are necessary to agriculture. It gives a value to agricultural products, but it cannot give a value to the sources of those products in the topsoil, the ecosystem, the farm, the farm family, or the farm community. Indeed, people who look at farming from the standpoint of the 'free market' do not understand the relation of product to source. They believe that the relation is merely mechanical because they believe that agriculture is or can be an industry. And the 'free market' is helpless to suggest otherwise."

There are thus very strong reasons why several economists, other allied experts and politicians advised by them are unlikely to see and appreciate the true nature of agricultural work. This also explains why governments are so reluctant to implement the really needed agricultural reforms, even though many experimental initiatives of farmers are providing a strong case for much needed reform.

9: Pollinators as Friends of Farmers

9.1: Save Pollinators Campaign Needed

A silent crisis that has been building up over recent decades may ultimately assume the form of one of the biggest risks to world food and farming system if allowed to proceed unchecked. An increasing number of scientists and conservationists are issuing warnings on the basis of urgency that if the many-sided risks for bees, butterflies, moths, humming birds, other insects and birds, even bats, in fact all pollinators are not checked, then the natural processes for pollination will be severely disrupted.

Particular mention should be made here of the forgotten pollinators campaign launched by two scientists Stephen Buchmann and Gary Nabhan . Although their campaign has focused more on the USA and a few other countries, Buchmann says emphatically, "It is clearly a concern at the global level." This is certainly true of India where many of the important factors which have been listed as most important threats to pollinators are present. What is more, these factors are related to highly distorted policies being favoured by authorities and so their threat is likely to go on increasing, unless the policies are corrected at a more basic level.

The green revolution technology brought in more chemical pesticides and herbicides, exotic varieties, monocultures. All of these are harmful for pollinators. In the next phase GM crops like Bt cotton have been brought, again a threat to pollinators. In the forestry sector there has been a lot of deforestation and replacement of mixed natural forests with monoculture plantations as well planting of commercial species monocultures. All this is harmful in various ways including for pollinators. The authorities have consistently ignored complaints of serious hazards of non-ionizing radiation, another serious hazard for important pollinators like bees as well.

Risks are very high for bees which are known as very important pollinators. A sharp reduction in the number of honeybees and their colonies has been reported in many countries of world including India. Diversity of bee species is known to be related to diversity of plant species in forests and they exist in mutually protective relationships.

If natural pollination processes are disrupted then the threat to the potential of organic and natural farming will be very high as such farming depends more on protection of overall natural systems and on balance of nature. Hence it is really important to protect honeybees by reducing the impact of the factors that have been harmful for honeybees.

Two aspects of highly distorted farming practices which have been very harmful for honeybees are the introduction of genetically modified crops or GM crops and secondly the increasing use of chemical pesticides, insecticides and herbicides. At times these two factors are also related as the introduction of some GM crops is accompanied by the use of some very harmful herbicides like glyphosate . There has been a huge debate recently on the risks of glyphosate and those who have suffered have claimed and obtained huge damages due to the alleged poisonous impact causing serious disease. If these are so harmful generally one can imagine the great harm caused to very fragile honeybees and other beneficial pollinating insects like butterflies.

Another very adverse factor relates to the introduction of exotic bees which often has a very harmful impact on local honeybee species. There have been cases of diseases spreading in local species so that these perish in large numbers. At the same time the exotic species may not be able to perform their expected role in new settings and a different climate. When honeybees from a cold region have been introduced in a different region which is much warmer and experiences intense heat as well, the response of the exotic bee has been that I won't go out in such heat! The result is that there is very little pollination and very little honey-making. In fact, colonies of exotic honeybees sometimes collapse in a big way. Some of them may be artificially kept alive by feeding a lot of sugar and medicines, but overall, their survival has again been difficult.

> *There should be a comprehensive campaign for protecting all pollinators with steps at several levels. Promotion of organic or natural mixed farming, banning all GM crops, protection of natural forests, avoiding any cruelty or capturing or harmful practices relating to leading pollinators.*

It is important to learn from past mistakes and to take all protective measures to save honeybees as protecting honeybees is integral to protecting food systems and bio-diversity systems.

At the same time the concern of protection should not be restricted to honeybees alone but should instead extend to all bees including simple bees and wild bees. As far as pollination is concerned some of the bigger wild bees may be performing an even more useful role. In fact, too big a rise in commercially kept honeybees may even impede the survival of these wild bees or simple bees.

There should be a comprehensive campaign for protecting all pollinators with steps at several levels. Promotion of organic or natural mixed farming, banning all GM crops, protection of natural forests, indigenous tree groves, gardens and grasslands, avoiding indiscriminate introduction of exotic species and reducing risks of non-ionizing radiation, avoiding any cruelty or capturing or harmful practices relating to leading pollinators, avoiding chemical pesticides and herbicides not only in farms and forests but also in urban gardens and maintaining overall balance of nature will all contribute to protection of pollinators.

9.2: Why Butterflies Are in Rapid Decline?

Butterflies are recognized the world over as the most beautify insects. Just watching them fly or sitting on a flower is such a source of joy. Children can spend a long time doing just this, or running after them. Just as I was writing this, I heard a few children call out. They were looking with undiluted joy at a pair of butterflies flying together very fast in a zig-zag way as though playing catch-me-if-you-can. Two children saw this and called out to others to show them the delightful gymnastics of the pair in air.

However, butterflies are not just a source of joy and happiness. Butterflies and moths are also very important pollinators and contribute much to the well-being of farming and biodiversity as well as our essential food supplies.

So, it is very sad and deeply worrying to know that butterfly numbers are declining fast in most parts of the world. Various studies show declines of between 30 per cent to as much as 90 per cent. Several species of butterflies have become extinct; many more are on the verge.

This is happening due to many wider factors, as well as some cruel practices specific to butterflies.

The wider factors include the widespread use of chemical pesticides and herbicides, the introduction of GM crops, the loss of biodiversity, decline of many indigenous species of plants and flowers. Chemical pesticides have proved to be the most harmful for these gentle and fragile insects. Climate change is another adverse factor whose impact is likely to increase as the years go by.

In addition, there are very several important factors specific to butterflies. Ironically it is their very beauty which has become the reason for their cruel exploitation at the hands of cruel forces which see butterflies mainly as a source of commercial profit. According to a study of year 2005, illegal trade of butterflies was estimated at 100 million dollars in one year at world level. This takes the form of butterfly leaves being used in a range of products from ornaments to knick-knacks like paper weights, pen-stands etc. Some of the products are made in ways which involve a lot of cruelty.

A large number of butterflies are smuggled from several countries, including India. Even live butterflies are ordered, on-line or in other ways, by some persons. These are sent frozen conditions and may die in transit. Some procure large number of butterflies for their release on special events. These butterflies often die soon, or spread new diseases among local species. Others capture butterflies for study, experimentation and decoration.

All these factors are causing a lot of pain and distress to butterflies, and in addition also leading to their rapid decline. Butterflies need more ecologically protective conditions for their survival. All cruel practices against them should be strictly banned. This is all the more necessary in regions like the Himalayan region and the Western Ghats where several illegal activities are known to exist keeping in view also that these are regions are home to much sought-after butterfly species.

Breeding of butterflies in special butterfly farms takes place for conservation as well as for commercial purposes. The former may be useful to some extent but the latter are certainly harmful. However, even the former cannot be a replacement for the protection of butterflies and moth in natural and wilderness conditions. Sometimes breeding of exotic species proves harmful for indigenous species in direct and indirect ways.

For actual protection at all levels a ban or at least very big reduction in pesticides and herbicides is needed. All cruelty practices should also be banned immediately and the ban should also be implemented strictly.

9.3: Avoid Indiscriminate Introduction of Exotic Bees

Large scale death of exotic Italian bees has been reported recently in many apple orchards of Himachal Pradesh. This news has been highlighted in the local media mainly in the context of the economic loss suffered by orchard owners who had purchased boxes of these exotic bees to facilitate the pollination process in

their orchards. The death of bees has also been attributed largely to adverse weather conditions, including untimely heavy rain and hailstorms.

However, there are wider issues and policy matters involved here which have not received the required attention. These relate mainly to the wisdom of introducing exotic species of bees, more particularly the Italian Apis mellifera which has generally been introduced in India due to its higher honey yield. However, this potential may not be realized in conditions of excessive heat and rain or other adverse weather generally more often seen in India. In hot weather areas this exotic species finds it difficult to make visits in very hot conditions while in Himalayan region it finds it difficult to make visits in very cold conditions. However, indigenous species do not have these problems and issues. The bigger risk is that of spread of disease by exotic species in new places and as there is inter-action with local species, this disease can easily spread to local species.

The National Commission of Agriculture had examined this question and advised caution. The Commission stated—"The bee (Apis mellifera) is highly susceptible to various bee diseases, particularly to acarine disease caused by mite, mostly in the North. It carries the danger of infecting the indigenous species …" So, the Commission asked for giving more attention to indigenous species with their "promising potential."

However, government policy went on emphasizing the introduction of exotic bees, first 'establishing' them in Punjab and Haryana and then moving to South India. 15 colonies of Apismellifera were brought from Haryana to Karnataka in December 1990; by May 1991 only two survived. Later there were several reports of local bee species Apiscerana being infected by disease and dying in large numbers. A disease resembling Europian Foulbrood (EFB) in its symptoms was widely reported, and this is widely believed to be related to the spread of Apismellifera.

A bee master from Denmark, Jan Olsson, was working with some communities involved in beekeeping in South India and he was among those who drew attention to the spread of more diseases due to the introduction of Apismellifera. In his work with local communities, he also demonstrated how it was possible to obtain better honey yields from indigenous species by making some simple improvements.

Environment activist Pandurang Hegde was also working with traditional beekeepers around this time and drew attention to the dangers of introducing Apis mellifera and the harm that indigenous bee species and beekeeper communities had suffered due to this. It appeared that beekeeper communities had never been consulted by scientists in such matters.

The most important factor is not honey yield but facilitation of pollination. The National Commission of Agriculture had clearly stated that pollination is the biggest contribution of bees while honey and wax should be seen more as by-products. It is indigenous bees which make the most contribution to pollination and they make many more visits than exotic species. The reduction of indigenous bees and wild bees is likely to be very harmful for pollination, and hence for orchards, farms and forests. Apis mellifera is likely to be much more constrained by weather extremes, particularly increasing heat when it may not be inclined to venture out much.

Coming now to recent bee deaths in Himachal Pradesh, it would be advisable to look at these wider issues and not just at some adverse weather conditions. On the one hand heavy use of agro-chemicals and other factors are allowed to adversely affect indigenous bees and other pollinators; on the other hand, a lot of expenses (paying a rent of around INR 1600 per box of exotic bees for placing in an orchard for a month or so) are incurred to get boxes of exotic bees to place them in orchards to speed up pollination. Is there something very wrong in the priorities here? The recent large-scale deaths of bees should therefore be seen as more of a wake-up call for correcting policy and practice.

10: Learning from Other Countries

10.1: Mexico's Struggle against Imposition of GM Corn

How sweeping can unfair foreign influence become, and what extreme forms can it take? Can it even take such an atrocious form as to decide what people of other countries will eat? Can it become so draconian as to insist that people have to eat food that they do not consider to be safe, or are prevented from growing and eating food they consider to be safe? These are the extremely important questions at the heart of the intense debates on GM food in Mexico today.

In a review of the existing situation titled 'Mexico defends GM Corn restriction with Science' the Institute for Agriculture and Trade Policy (IATP) has stated, "Since Mexico imposed its restrictions on genetically modified (GM) corn in tortillas as precautionary measures to protect public health and corn biodiversity, the United States government has repeatedly justified its challenge to the policies under the countries' trade agreement with the claim that Mexico's policies are not based on science. Mexico has now filed its formal response to the U.S. in the trade dispute. Published March 5, Mexico shows that it has the latest independent science firmly on its side."(Review written by Timothy Wise, March 14 2024).

As the Mexican government notes in its 200-page response, "Far from there being a consensus on the safety of GMOs, scientific evidence points to various negative effects on health, on native corn and on the environment, derived from the cultivation and consumption of GM corn." (119 – quotes from the document are italicized and cited here by their numbered paragraphs).

The IATP review has highlighted some of the most important quotes in the text of the Mexican government response, and some views of key academic, civil society and government leaders, who have been instrumental in the decades-long effort to stop GM corn and its companion herbicide glyphosate.

This evidence collected and presented by the Mexico government includes:
Risks from direct consumption of GM corn: 13 pages of evidence that GM corn, particularly insect-resistant Bt varieties, poses potential health risks to humans through damage to the intestinal tract and other organs. The section includes 66 academic references from peer-reviewed journals. The documented risks arise from: direct exposure through foods; epigenetic changes that can be passed to the next generation; increased antibiotic resistance; and reduced nutritional content.

"Given the fundamental importance of corn as everyday staple food in Mexico, the population in Mexico is highly exposed and vulnerable to these risks due to the amount of corn grain consumed directly on a daily basis in the form of tortilla and other foods made with nixtamalized flour and dough." (24)

"Although the United States has attempted to trivialize and dismiss this body of scientific evidence, Mexico's assessment indicates that the risks are real and of particular concern to human health in Mexico." (382)

Risks from consuming glyphosate residues on GM corn: 16 pages of evidence, including 74 academic references, on the elevated risks to Mexican consumers from glyphosate residues on GM corn. Those residues have been documented to be present in Mexican tortillas already, even though it is illegal to grow GM corn in Mexico and the country produces nearly all its own white and native corn for tortillas. That evidence of traces of glyphosate, presumably from imported GM corn, is one of the main reasons for the GM corn restrictions.

Mexico's submission cites the growing mountain of evidence that direct exposure to glyphosate causes cancer, as jury after jury has found in damage cases against Monsanto and its owner Bayer.

Multiple academic references show risks from low-level exposures from residues on consumed food. "Mexico considers that the ingestion of residual glyphosate and other contaminants present through the direct consumption of GM corn grain represents a serious food safety risk in Mexico." (174)

Lax U.S. regulatory processes that fail to ensure safety for Mexico: Mexico questions the U.S. presentation of the science claiming safety: "The United States, far from proving that the measures identified are not based on science, presents information lacking scientific rigor, is outdated, or with conflicts of interest." (230-235). Many of the studies cited by the U.S. show conflicts of interest, indicating funding by biotech companies or researchers associated with biotech interests. U.S. regulatory standards are weak since they do not require animal studies or other

"Another approach that groups have tried is the promotion of "open source" seeds, using licenses in a fashion similar to those using copyleft or creative commons for software, books or other works. The goal is to prevent the privatisation of seeds by declaring them not appropriable through labels, pledges or other conditionalities.

safety assessments before a new GM variety is approved. The oft-cited "4,000+ studies that show GM safety" are rife with errors. Most come from companies' own tests when they sought approval from U.S. regulators to commercialize new GM varieties. Few are peer-reviewed. Fewer are based on long-term animal feeding trials.

Mexico highlights that the U.S. cannot produce a single academic study that shows that the long-term consumption of large quantities of minimally processed GM corn treated with glyphosate is safe to eat. That is why Mexico took the precautionary measures it did. As Mexico's Undersecretary of Agriculture Victor Suárez told Reuters:

"To this day we have not seen any scientific studies that have been presented by the U.S. and the companies on the safety of continued consumption over years. So, there is no scientific basis for the U.S. and the companies to claim that their corn is safe."

Mexico's careful risk assessment in accordance with USMCA guidelines: Mexico presents ample evidence that it has indeed done the risk assessment required by the trade agreement and that the agreement gives Mexico the right to determine the levels of protection it deems necessary, then interpret the available science in light of that commitment.

The absence of long-term studies with high levels of consumption forced Mexico to conduct its own risk assessment based on the available science. Mexico lists the documentation of that risk in a 31-page 2020 publication by the national science agency, which has been available for the U.S. government and the media to review. Mexico has constantly updated that evidence base in a publicly available databank that further informed its updated 2023 decree.

"The Risk Assessment evaluated the potential adverse effects on the health of Mexicans from the presence of contaminants, specifically glyphosate and GM proteins residues in foods made from GM corn commonly consumed by Mexicans." (403)

Risks to native corn varieties from GM corn: Mexico also presents extensive evidence of the risks to native corn varieties from cross-pollination by GM corn, including a comprehensive study by NAFTA's own environmental commission. Such contamination can undermine the genetic integrity of Mexico's native corn varieties, which it argues is a unique and endangered natural resource valuable not just to Mexico but also to the world for future plant-breeding. Mexico cites 13 distinct national laws and international treaties that obligate it to protect native corn. That obligation includes a special exception in the current trade treaty that allows countries to take actions that guarantee cultural and Indigenous rights, of which native corn is considered an integral part.

The IATP review also quotes several experts who have praised Mexico's response as a strong science-based justification for its policies:

"Mexico presents ample scientific evidence on the risks to human health and the environment of consuming GM corn with residues of the herbicide glyphosate. The government of Mexico has every right to determine the appropriate level of protection to protect human health," according to Fernando Bejarano, Ph.D., Red de Acciónsobre Plaguicidasy Alternativas en México (RAPAM)/Pesticide Action Network in Mexico.

"Mexicans are the largest consumers of corn, especially through tortillas. We have the right to prohibit the use of transgenic corn in the preparation of tortillas not only because of the presence of transgenic corn but also the higher concentrations of glyphosate residues. In addition, our country is the centre of origin and diversity of corn, the basis of our culinary culture, which has been declared a world heritage site. We have the right to protect this food and this cultural asset," stated Alejandro Calvillo, Poderdel Consumidor.

"We welcome this vigorous defence of Mexico's programs to transform its food system. The science they present backs up longstanding civil society campaigns for healthy foods and bio-diverse agricultural systems. There's a lot here that could contribute to more substantive debates on our food and agriculture system in the U.S., as well," observed Karen Hansen-Kuhn, IATP's director of trade and international strategies.

The IATP review concludes, “Ever since Mexico first announced its intentions to limit GM corn and glyphosate in its tortilla chain, the U.S. government has asserted that Mexico’s policies are not based on science. Mexico’s comprehensive response refutes that claim, presenting hundreds of academic studies that show cause for concern about human health and the threat to native corn diversity.”

Another organization Canadian Biotechnology Action Network has published a report titled ‘Mexico’s Precaution on GM Corn Safety is Justified’ (see Food Tank, report written by Lucy Sharratt).

This report says, ”The purpose of Mexico’s restrictions on GM corn is to safeguard the integrity of native corn from GM contamination and to protect human health. The purpose of the U.S. and Canadian challenge is to defend the interests of the biotechnology industry. The U.S. and Canada want to force Mexico to open its market to all genetically modified foods and seeds. Canada is supporting the U.S. challenge (as a third party in the dispute) even though Canada does not export any corn to Mexico.

“Mexico has the right to restrict the use of GM corn. The U.S. argues that Mexico’s actions are not based on scientific principles, but the government has sufficient science to justify its precautionary policies.

The Canadian Biotechnology Action Network (CBAN), is a large network of farmer and environmental groups that has been monitoring the use of genetically modified organisms (GMOs) for over 15 years, and it has extended strong support to Mexico’s restrictions.

CBAN’s analysis shows that Mexico’s ban is supported by the science. “Research continues to find indicators of potential harm to humans from eating GM insect-resistant corn. The science also continues to warn of health impacts from exposure to the herbicide glyphosate which is used in GM corn production.

“Most GM corn plants are genetically modified to kill insect pests. The GM plants express a toxin from the soil bacteria Bacillus thuringiensis (Bt) that is known to harm the guts of specific types of insects but not others. Farmers have long used Bt as a spray to kill pests but the Bt toxins in GM crops are different from this natural Bt in structure, function, and biological effects. In fact, peer-reviewed studies across the scientific literature continue to find that Bt toxins in GM plants can harm insects (spiders, wasps, ladybugs, and lacewings, for example) that are not the intended targets.

Very recently “new peer-reviewed studies further found impacts of Bt where there was assumed to be none. For example, a 2023 study conducted by a team of researchers from universities in Brazil and Colombia, funded by the Brazilian government, found Bt had many significant impacts on the health of wasps, even affecting the next generation. University researchers in China and Pakistan also found lower diversity of bacteria in the gut of wolf spiders exposed to Bt. This adds to a laboratory test published in 2023, funded by the French government, that found a particular Bt toxin disrupts normal growth and functioning of gut cells in fruit flies, raising the possibility that Bt toxins could harm the intestinal lining of animals, including humans.

“To add to these results, a number of animal feeding trials also find that Bt toxins and GM Bt crops could have toxic effects on mammals. Toxic effects and indications of toxicity have variously been observed in the blood, stomach, small intestine, liver, kidney, spleen, and pancreas, as well as immune responses, though the mechanism is not clear from these studies. Critically, animal feeding studies are not required by the U.S. or Canadian governments in order to demonstrate GM food safety. In fact, there are very few long-term and multigenerational tests on animals in the scientific literature.

“But Bt toxicity is not the only safety concern. GM corn production is also tied to the use of glyphosate and other herbicides that are linked to serious health problems including neurological diseases and some cancers. The International Agency for Cancer Research of the World Health Organization classifies glyphosate is a “probable human carcinogen” and, as successful lawsuits against Bayer/Monsanto demonstrate, there is ample evidence that direct exposure to glyphosate-based herbicides can result in non-Hodgkin’s lymphoma in particular. Critically,

evidence also points to danger from exposure to residues in food which is the concern highlighted by Mexico in relation to GM corn.

"…The U.S. and Canada essentially argue that if they have decided a genetically modified food is safe, then Mexico should agree."

Clearly in such conditions of a difficult struggle for food safety the Mexican government, farmers and activists need widespread support from all over the world.

10.2: Mexico's Difficulties in Protecting Safety of Its Food System

The difficulties that Mexico has faced in recent times for protecting its food safety should be an eye-opener for all other developing countries including India. These difficulties are particularly acute in the case of corn crop which is the staple food-crop of the people of Mexico.

After Mexico agreed to sign the infamous NAFTA trade agreement it was almost inevitable that the cheaper corn imports from the USA will threaten the livelihood of several of its own farmers. This, However, was seen more as an economic issue. Its implications as a health issue became apparent to a larger number of people later when they realized that the USA has embraced the GM crop technology in a big way and it has spread to its corn crop as well.

As many senior scientists have warned, there are very serious health hazards associated with the consumption of GM crops as food and with the use of herbicides like glyphosate which are used as a part of a package for growing some of these crops.

Mexico tried to reduce these health hazards by diverting a lot of the imported corn to industrial use and to feeding animals. But one way or the other, through meat or dairy food consumption for example, GM corn would still enter the food chain and health hazards would be there. Also imported GM corn could not be kept away entirely from direct consumption as it was much cheaper.

An even bigger concern for Mexico was to save Mexican farming of corn and its local varieties from genetic contamination caused by GM crops. So, attempts were made to ensure in various ways that the imported GM corn is not used as seed. But even these efforts could not succeed entirely and there were reports of risks of genetic pollution caused to some extent at least.

During 2004-09 the Mexican government came under a lot of pressure from multinational companies and made moves to grant permission for cultivation of GM corn crop but this was widely resisted by people and was challenged in courts of law and as a result this cultivation could not spread widely. The multinational companies tried to foster a strong GM lobby to support them within Mexico and also kept sounding their supporters in the US administration for support.

While on the one hand there were growing apprehensions regarding great risks to Mexican farming and food system, but on the other hand there were trends towards the revised NAFTA Agreement which would make it even more difficult to restrict genetically modified and gene edited crops and seed patenting too may tighten further.

In these disturbing conditions social and political mobilization for protection of food and farming systems grew. The present government as well President A.M.L. Obrador are committed to this as part of the promises made to people. The President re-affirmed such commitments to protect Mexican farming from onslaught of GM crops and the accompanying use of dangerous chemicals like glyphosate. In another announcement the President said later that Mexico is also planning to phase out imports of GM corn and other GM food.

While these efforts are widely welcomed by people, the concerned multinational companies are not only opposing these efforts in a big way but in addition they are trying to use key US officials to make things very difficult for the Mexican government if it persists with its efforts for protecting its food and farming system and the health of its people.

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It is heartening that several public interest groups in the USA have come to the support of the Mexican government and people. In a letter released in April as many as about 80 such US groups (representing important sectors like public health, agriculture, consumer protection and environment) have written to key officials in the Biden Administration asking them to " respect Mexico's sovereignty and refrain from interfering with its right to enact health-protective policies , specifically to phase out the herbicide glyphosate and the cultivation of genetically modified corn."

The difficulties and pressures being faced by Mexico in getting out of the trap of GM crops and food should be an eye-opener for other countries and prompt them to stay away from this trap in the first place.

10.3: African Farmers Favour Traditional Seeds and Agro-Ecology

The World Food Organization and the World Food Program recently released a joint review of the world-level acute hunger situation for the period October 2022—January 2023. This review starts by mapping the countries and regions worst affected by acute hunger and just a glance at this is adequate to tell us that the hunger hot-spots are most heavily concentrated in Africa. The most serious situation exists in vast parts of Somalia, Ethiopia, South Sudan and Nigeria. However, the situation is also serious in many parts of Kenya, Madagascar, Republic of Congo, Zimbabwe, Central, African Republic, Malawi and countries of the Sahel region. What is most frightening is that several hundred thousand people are now reported to be in the category of near starvation and possibility of loss of life. Some of them are reported to face catastrophic conditions and some, like in parts of Nigeria, cannot be accessed by humanitarian organization because of conflicts or other reasons.

Of course, the most urgent need just now is to rush emergency relief assistance to people so badly affected by hunger and in real risk of starvation. However, on a longer-term basis it is also important to assess why farmers, pastorals, fishers and other people of Africa are finding themselves in such difficult and vulnerable conditions, where development priorities have

gone wrong and what can be done to have the right priorities.

A leading organization of farmers, pastoral people and rural communities of Africa has recently issued some important statements which deserve wider attention. This is AFSA, or Alliance for Food Sovereignty in Africa, which is a network of several networks, and its constituents have a reach to nearly 20 million rural people in various countries of Africa. The Program Coordinator of this organization, Bridget Mugambe has stated, "Today the majority of the solutions put forth and funded by governments and donors to address these problems are, in the long run, making things worse. Industrial agricultural methods, dubbed 'climate smart agriculture', promote the use of excessive chemical inputs on plants and in the soil, carbon credit programs are being developed to legitimize pollution and to uproot communities from their land. These are just a few examples of the false solutions brought by the rich and the powerful."

It is of great importance that an organization representing such a large number of rural people of Africa is saying that most of the solutions being offered by the governments as well as donors are false solutions. Surely the path out of hunger cannot be found as long as such serious distortions persist, particularly when the situation is becoming more difficult due to climate change.

Mugambe has emphasized that now the urgency for correcting past distortions and moving to agro-ecology has increased further due to climate change. To quote, "Africa is enduring the effects of climate change every day. It is time for both African and international leaders to listen to our demands and prioritize agro-ecology as an African-led solution to feed our communities while also adapting to climate change."

Dr. Million Belay, AFSA General Coordinator, has provided a message of even higher hope by stating, " Africa could feed itself many times over. But agro-ecology cannot be and must not be overlooked by the decision makers as the most effective way to build resilience and enable small-scale farmers, pastoralists and fishers to adapt to climate change."

AFSA has used COP-27 as an appropriate venue to press for its demands. These demands have been expressed in more detail in a position paper on 'Adaptation, Resilience and Mitigation with Agro-Ecology'. AFSA has emphasized that agro-ecology can contribute not just to adaptation but also to mitigation in the context of climate change. This point is also brought out in a book 'The Climate Emergency—How Africa Can survive and Thrive', which has been very recently released by AFSA. Hence despite drawing attention to serious problems also, the approach of AFSA is on the whole optimistic and positive as it confidently asserts on the basis of its grassroots experiences that it is possible for African rural communities to not just survive but also thrive if only the right policy choices are made, backed by matching allocation of resources.

The roots of hunger and famine can be traced to the slave trade and colonial plunder, as well as the neo-colonial corporate disruptions which inflicted many serious harms on farmers, pastorals and other sections of rural communities, also creating many new situations of conflicts as old systems of mutual help and harmony were broken down by these changes. Right up to present times these impacts are not only continuing but are aggravated by continuing serious distortions in policies of governments as well as donors, as explained by AFSA. This has to be checked along with conflicts and replaced with policies of peace and harmony, equality and agro-ecology.

11: Another Path Exists

11.1: Can Green Revolution Belts Adopt Ecologically Protective Farming?

From time to time there are disturbing reports of environmental ruin in various green revolution belts of the country. The most prominent such belt is that of Punjab-Haryana-Western UP and Terai belt. Here from time to time we hear of very serious reports of water depletion and pollution, serious harm to soil health, burning of crop residues and other forms of environmental ruin. Such reports show increasing trends.

To give a recent example, The Times of India (Chandigarh edition) reported recently on December 3 (report titled Twice as many water samples fail test in Punjab)—"The percentage of water samples failing the quality test in 2021-22 has doubled compared to the previous year." This report further informed that there are 575 habitations of water supply contaminated with cancer-causing arsenic. From Western Uttar Pradesh there have been several reports of extreme forms of pollution of local rivers. There have been many serious reports from this entire region of increasing health hazards, including hazards relating to chemical pesticides. There is serious loss of biodiversity with vast areas now covered by monocultures of wheat, sugarcane, rice and cotton, grown with lots of chemical fertilizers and pesticides in ways that would definitely harm the natural fertility and organic content of soil, killing micro soil organisms and earthworms, requiring massive quantities of water while also polluting water sources, while at the same time displacing time honoured mixed farming systems and rotations which included nitrogen fixing legumes and helped to maintain soil and water balance. The new green revolution farming can be made economically viable in the short-term on the basis of subsidies, but clearly it is not sustainable in the longer term.

Hence for all those committed to sustainability and longer-term welfare of farmers, it is important to ask whether the farming system of

such a prominent green revolution belt can ever return to ecologically protective farming. In this context the efforts made by the Kudrati Kheti Abhiyan (KKA- Campaign for Natural Farming) in Haryana in recent years are significant. Although the reach in this campaign is still not at a vast scale, within the limits of its reach it has shown significant results and what has been achieved by these farmers is attracting more farmers and giving hope that a return to ecologically protective farming is possible.

It is all the more encouraging that this effort is funded neither by any NGO nor by the government. It is mainly supported by the efforts of farmers as well as some enlightened consumers and citizens. As Prof. Rajendra Chaudhri, Adviser to KKA, has written, what they have already achieved is that several farmers in different parts of the state have been able to maintain green revolution type of yields while adopting natural farming. This has been possible even in the case of wheat, a crop for which this has been considered more difficult generally. What is more, direct contacts of such farmers with urban consumers have been established and some of these farmers have been able to sell their entire surplus to these consumers at a fair price, a price better than the government procurement price. As the cost of production of these farmers is also lower due to entirely avoiding chemical fertilizers and pesticides, the overall per acre net income for them has been higher than for neighbouring green revolution farmers. Of course, not all such farmers are equally successful as some are learning and in an experimental stage.

KKA has made it clear that merely giving up chemical fertilizers and pesticides, herbicides etc. should not be equated to natural farming as this is only an essential condition, another one being to avoid the burning of crop residues. For natural farming to succeed much more in terms of providing adequate locally available organic nutrients, soil and water conservation, better composting methods, mixed farming, biodiversity, rejection of GM crops and more have to be ensured. It is important also that the farming systems should steadily move towards self-reliance instead of getting entangled in new forms of dependence.

KKA sees the new system as a much lower cost system but certainly not a zero-budget system as organic nutrients despite being based on local resources need some expenditure at least. Besides natural farming demands much more care, which However, can be very creative and absorbing work.

KKA has been bringing those engaged in and interested in natural farming together and encouraging successful farmers to be involved in training others. Earlier farmers in Haryana benefited from visiting natural farmers in other states and now they can learn from visiting the fields of successful, experienced farmers within their state. Meetings, discussion and training programs are regularly organized by KKA. Publications in easy language are brought out, inclusive of contact details of those who are progressing well with natural farming.

KKA believes that the expensive methods of handling crop residues being discussed as a solution to the problem of residue burning are not relevant as the ultimate solution is to return residues to soil to enrich soil. And this is best achieved in an overall system of natural farming.

KKA recommends that instead of trying to bring the entire farming to natural farming from green revolution farming in one sudden sweep, individual farmers may be better advised to spread this conversion over a few years, for example dividing their field in four parts and converting one part at a time in a year, learning the new system all the time as they do so. However, it should be emphasized that saving indigenous seeds must be a very important part of these efforts and farmers going towards natural farming must work with these seeds.

Thus, the experiences of KKA despite their limited reach so far are full of higher potential. Alternatives such as these should be carefully considered by green revolution farmers. Such alternatives are being worked out by some farmers and organizations in Punjab and Western UP also. As farmers of these three areas have come together in the course of the farmers' movement, they should use this unity also for the highly creative and constructive task of taking forward ecologically protective farming.

11.2: Bridging the Distance between Real Needs and Actual Policy

It is easy to have very wide agreement on the obvious fact that food and farming sector is one of the most important sectors, perhaps the most important sector, of human efforts and needs. But while the realization of this importance should lead to very caring and careful attitudes, the realization of the importance is actually being interpreted by very powerful forces in a very different way to try to increase their control and dominance over these systems, starting with seeds and leading all the way to the dining table. One very senior official of the USA went to the extent of infamously saying very bluntly—food is a weapon. This statement, incredibly enough, has been often quoted as a sign of strategic wisdom, emanating from the biggest food power.

Yes, it is extremely sad but equally true that the distance between what is clearly needed and what is actually happening in the food and farming sector worldwide is growing. In fact, it is no longer a matter of just increasing distance, it is truer to say that what is needed in this crucial sector is seriously at conflict with what is happening more and more at policy level, backed by law.

Most ordinary people would agree on what they want from the food and farming system. First and foremost, they want the food and farming system to provide them adequate food which is safe, healthy and nourishing, provides them adequate nutrition without endangering their health. Secondly, they want this food to reach them at a reasonable cost, without its price being manipulated and increased artificially by forces trying to earn unreasonably high profits, or creating artificial scarcities and scares to meet this selfish objective.

Thirdly, they would like to ensure the sustainability and reliability of this system, even in predicted times of more adverse weather and climate change. Essential conditions for this like soil health and water availability should be well protected. Next, they would like that the good quality supply of essential raw materials like cotton is also assured. Fifthly, hardworking farmers and farm workers should get satisfactory income and secure, sustainable livelihoods.

Sixthly, they would like to protect environment and bio-diversity and health-nourishing conditions of villages where farming takes place. Last but not the least, they would like to protect the welfare of all animals, birds, in fact all life-forms who contribute to our food system, as much as is possible, and in particular that cruelty should be always avoided, and the possibilities of animal-spread diseases is minimized or eliminated to the extent possible.

To this list some of the more ecologically conscious citizens would like to add that they would like farming to contribute more and more to checking climate change.

It is of course possible to agree on and honour these wishes of ordinary people. In this list interests of consumers and farmers, present and future generations, providing adequate farm produce and protecting environment are in harmony with each other.

But serious problems arise when big business interests who do not share these aims , or else regard these aims to be much less important compared to their aims of very high profits and control, want to dominate the food and farming sector, and are able to actually strengthen their grip and power over the sector to a very considerable extent, all the time striving to increase this further, clamping down on the voice of farmers, consumers and environmentalists who have a different view, using powerful and corrupt lobbying methods to secure the collusion of officials, politicians and ‘experts’, also making longer-term investments to have them on their side.

This is the primary reason why official policy, and the laws enacted to promote this policy, are increasingly at conflict with what is actually needed and also desired by most people. And this is why farmers, consumers, environmentalists and all citizens need to get together to resolve this conflict so that policy can be in harmony with what is actually needed. A very important part of these efforts should be the saving of indigenous seeds and their increasing availability to farmers, if farmers feel the need to move towards natural farming, then they must have seeds that are most suitable for this, and for these indigenous seeds are needed.

11.3: Heritage practices of small farmers helpful to check climate change but threatened by big business

In the middle of several increasing problems of food and farming sector, one reassuring aspect is that the various solutions do not conflict with each other and hence all the problems can be resolved simultaneously by adopting the right policies.

This becomes clearer by looking at the most desirable priorities and accompanying policies for the food and farm sector.

- Production of healthy, nutritious and safe food on farms,
- Its processing only in those ways which maintain health, safety and wholesome nutrition in natural ways without harmful additives,
- Protection of soil, maintaining and improving its organic content and porosity to conserve water,
- Conserving water, providing protective irrigation but at the same time avoiding excessive, wasteful irrigation and also avoiding commercial crops which are too water-intensive for any region,
- Protecting earthworms and micro-organisms which improve soil and water conservation, protecting all friendly insects, bees, birds and pollinators and maintaining balance of nature in the local environment in which even spiders, owls and vultures play their useful roles,
- Ensuring sustainable, healthy, creative and satisfactory livelihoods to all those who select food production and processing as their part-time or full-time livelihood,
- Maximizing the potential of local, village-based cottage and small-scale food processing,
- Regulation of food trade in such a way that firstly farmers and secondly cottage and small food processors (the two activities can also be combined in the same farm family or farm unit) get the bulk of the retail price that is realized while traders get a smaller but fair share,
- Farming technology should be made as self-reliant as possible in terms of using maximum official resources while at the same time input costs for farmers should be minimized; for this high priority should be given to saving indigenous seeds and ensuring their availability to farmers,
- The use of fossil fuels, whether in the form of chemical fertilizers, pesticides, diesel etc. should be minimized and no subsidy should be given specifically for this,
- All subsidies should be given directly to all small and medium farmers, and these should be the highest for those adopting the most ecologically protective policies and producing the most healthy, safe and wholesome nutritious food,
- All small and medium farmers who produce safe, healthy and nutritious food should be ensured a fair price for this, with a lot of this being purchased right within the village by government procurement agencies for supplying to local nutrition schemes and public distribution system of the village as well as of nearby towns as well as buffer stock storages,
- The concept of minimizing food miles should be carefully followed,
- As far as possible at least some farmland should be found for all landless rural families keen to cultivate it, and kitchen gardens for all should be promoted,
- Those landless households who still cannot get some farmland in the village should be involved in community efforts, supported by the government, of using vacant land in or near the village for growing a mix of indigenous tree species providing fruits, dry fruits, fodder, medicines, oilseeds or edible oil etc. and they should get rights over this land,
- Farm animals should be well provided for and enough healthy fodder and oilcakes should be produced at the village level for them, more attention

should also be given to having better pastures,
- Growing a wide diversity of crops and crop varieties in harmonious mixed farming systems (including trees) and crop rotations, giving topmost priority to local food and nutrition needs while also protecting and conserving a wide diversity of indigenous seeds and varieties.

Such a listing can certainly be expanded but this gives a good idea of desirable priorities. Being more familiar with conditions of India this writer has expressed a vision more in the context of India, but surely a lot of this would be relevant in several other countries too.

These priorities and policies taken together have two very remarkable features. Firstly, as pointed out earlier, all these policies and priorities are mutually consistent towards each other and can happily co-exist. Generally, these are also supportive towards each other, and there is certainly no conflict or contradiction among them.

This is because these are integral parts of a comprehensive thinking which seeks to bring together concerns of justice, peace, health and nutrition of all people, sustainability, protection of environment and of all forms of life, when applied to the food and farming sector.

Secondly, a no less remarkable aspect is that while all these priorities and policies were very desirable before climate change became a big issue, exactly the same policies and priorities have become even more relevant in the context of the very pressing need for climate change mitigation and adaptation. Whether in terms of reducing greatly the use of fossil fuels, or of absorbing of carbon dioxide, the comprehensive mix of policies and priorities (which can also be called heritage practices as a result of having evolved from the wisdom of several generations of farmers) which have been good for health and nutrition, for soil and water conservation, for justice and equality, are also found to be equally good for climate change mitigation and adaptation. Hence what climate change mitigation and adaptation in the context of farming and food involves is what several generations of farmers had already known well but had been discarding in recent times under the increasing impact of big business interests. Hence climate change mitigation and adaptation is very significantly also a process of getting rid of undesirable, imposed impacts and influences of big business interests whose main aim has been to advance their profits, control and domination of this sector while increasing fossil fuel use, pollution, monocultures, overexploitation of water and soils, loss of diversity of traditional seeds, uprooting of time honoured mixed farming systems and crop rotations, indebtedness and land loss among small farmers.

Despite such a widely documented record, big business interests are now demanding that they should be given the leadership role in climate change mitigation and adaptation in the context of this sector, so that they can heavily distort the entire agenda to make it even more suitable for even higher levels of their profits and control. This is the main threat that exists today in the food and farming sector-- of the entire agenda of desirable changes getting distorted by big business interests armed with highly disruptive technologies like that of GM crops. This threat should be widely opposed.

11.4: Sustainable rural livelihoods compatible with climate goals

One of the most remarkable aspects of the challenge of climate change is that often what is in any case needed in the interests of justice and sustainability is also compatible with and helpful for climate change mitigation and adaptation. If this does not actually appear to be so in a lot of the climate change discourse we encounter is because the big business interests have in many ways hijacked the discourse along the lines suitable for them, resulting in several serious distortions.

All this is most clearly evident in the food and agriculture sector. Agro-ecology is most suitable for protecting soil and environment, it also provides the most sustainable livelihoods. Agro-ecology cannot be practiced under the highly mechanized monocultures of big business.

The kind of caring and creative cultivation that agro-ecology needs is best provided by small farmers and family farmers, with a very special contribution by women farmers. Agro-ecology is best practiced on a land-owning pattern based on equal distribution of land among small farmer units, who work in cooperation with each other for common good. As is self-evident and is agreed by almost everyone, it is such a system of agro-ecology practiced by small farmers which is most likely to produce healthy and safe food, and which is also likely to provide the best food security to the rural community and its various members.

As has been increasingly shown increasingly by a number of studies, in terms of yield per acre also the agro-ecology system is capable of equalling and sometimes even surpassing the industrial farming system, all the more so if sustainability and longer-term aspects are also considered. The ability of the family farm system to minimize waste is also well-established.

At the same time, this is the system most likely to achieve very good results of climate change mitigation as well as adaptation. This system minimizes the use of fossil fuels in the form of chemical fertilizers, pesticides, herbicides, diesel and big, heavy machines. With its emphasis on integrating trees with crops and on various soil conservation practices this system enables a lot of absorbing of carbon. With its strength of food security and land rights of all or almost all people, this system is capable of increasing the resilience of communities in meeting more frequent adverse weather events. Its adaptation is also enhanced by the greater cooperation for more common good which is maximized under conditions of equality, in turn based on almost all rural households owning small plots of farmland, which can be adequately cared for and protected by those who own them and care for them. Adaptation is also enhanced by the fact that small farmers practicing agro-ecology do not have to spend a lot of cash on outside inputs or industrial inputs, and are by and large self-reliant in terms of their input needs. Hence the chances of their indebtedness and ruin related to big expenses incurred even in bad weather years are minimized. They are self-reliant also in terms of their seeds and skills; hence they can quickly adapt to weather conditions suddenly turning adverse and do not have to keep waiting for any

advice from the top. Their highly decentralized system based on local skills and understanding of local conditions is great for climate change adaptation, just as it is great for climate change mitigation.

Hence the compatibility and mutually supportive nature of all the requirements of a desirable food and farming system (healthy and safe food, adequate yield, satisfactory and sustainable livelihoods, climate change mitigation and adaptation) are well-established under small farmer agro-ecology system. This should be widely appreciated and understood for farm and food policy.

However, as big business is unable to extract its big profits and is unable to secure its dominance and control under such a system, it is opposed to such a system. It loses no opportunity to advance all sorts of highly suspect and even dangerous arguments to instead promote its own big business model as desirable or even essential for achieving food security as well as for meeting the challenge of climate change. These distortions spread by big business interests should not confuse and mislead food and farm policy, pushing it towards entirely wrong and harmful directions.

> *"Everyone agreed that the taste and flavour of traditional varieties grown using natural/ organic farming methods is much better and is relished by everyone. People said that nutrition also certainly appears to be better although they cannot establish this scientifically.*

11.5: Natural Farming the Best Option

According to recent official data of Himachal Pradesh government, its efforts to spread natural farming practices among farmers have led to 56 per cent reduction of costs of farmers and 27 per cent increase of income among farmers who adopted these practices. This happened under the natural farming prosperous farmers scheme (prakrit kheti khushhal kisan yojana). According to leading local newspapers this information was provided at the fourth task force meeting of this scheme held at the state secretariat at Shimla on April 19.

In addition, good results were also achieved by introducing natural farming methods in some apple orchards where these helped to prevent some diseases. About 121000 farmers and orchard owners have been brought under this scheme in 326 panchayats. Former Governor

Acharya Devvrat is reported to have made an important contribution to initiating this scheme in Himachal Pradesh.

In Uttarakhand the government is trying to declare about 30 per cent of farming area as organic farming area. Here some time back I had an opportunity to discuss with rural communities' comparison of natural farming using traditional indigenous seeds with green revolution type farming which uses chemical fertilizers, pesticides and exotic HYV seeds. Everyone agreed that the taste and flavour of traditional varieties grown using natural/ organic farming methods is much better and is relished by everyone. People said that nutrition also certainly appears to be better although they cannot establish this scientifically. What can be seen in the context of crops like rice clearly, they said, is that in traditional varieties we get more rice from paddy and when we cook rice then the spread is more in the case of traditional varieties. While eating traditional variety is more filling and we have feeling of adequacy after eating relatively less amount, they said. Fodder yield from traditional varieties is also more. So, what may appear at first glance to be somewhat lesser yield from traditional varieties may not actually be less, the people said. Soil fertility is much better maintained in the case of natural farming. Costs of cultivation are much lower.

Despite such experiences of farmers, agricultural departments and agricultural universities generally remain involved in propagating green-revolution type farming with its heavy agri-chemical inputs. There has not been much change in their attitude and instead of learning from sporadic success stories of natural farming or feeling enthused about this, or at least displaying unbiased curiosity, many of these officials remain cynical and discouraging towards natural farming. However, there are a few exceptions.

Andhra Pradesh is a state where community based natural farming has received more spread compared to other states, with government support as well as with important role of voluntary organizations, dedicated individuals (including scientists) and farmers organizations, but even here there is resistance from powerful persons placed in important positions in the agricultural officialdom, not to mention agribusiness interests. Efforts of organizations like Deccan Development Society for seed conservation have been widely appreciated.

Sikkim is another state which has made significant progress in natural/organic farming. In fact, this is the only state which has been declared to have 100% organic farming. Although overall farmland here is relatively less, still this effort covers about 66000 farmers covering about 76000 hectares. This shift to organic farming also started attracting more tourists. However, at grassroots level more efforts have to be made.

Interesting and encouraging efforts in the direction of natural farming by dedicated individuals can be found in almost all states, including green revolution leaders like Punjab. A heartening feature is the higher inclination of women farmers towards natural farming in several places.

The support given by the union government is very uncertain. Some publicized statements of support are followed by steps in the reverse direction. The lobbies for the introduction and spread of GM crops and big agribusiness interests are very powerful at the level of the union government. The schemes under which natural farming can be promoted often face budget cuts. There is increasing evidence that the overall tendency of the union government these days is strongly to push farming towards higher corporatization.

Hence the role of voluntary organizations, farmers practicing natural farming, farmers' organizations committed to this, independent scientists devoted to this is likely to be quite important. It is good that such farmers and their small organizations and dedicated scientists have been trying to get united although they are not a big force yet. Comparatively the big agribusiness interests, together with those colluding with them, are a much bigger force. This is a reality we have to face. One can only hope that with the emerging success of efforts of natural farming the spread of such farming will be more rapid and more sustained.

12: Neglected Aspects

12.1: Forest Food -- Important Source of Nutrition

" They had never in their short lives had nice things to eat . They were young and their palates were untrained, that is why they were eager to sample everything they could , particularly things that tasted sweet. They had never been able to afford to satisfy their craving for delicacies with cream and sugared curds. They were the children of a poor home, and like poor children everywhere they were driven to find their sweets on the jungle bushes; yet coarse and astringent though the simple fruits might be in a world which lives on luscious food , the kindly Goddesses of the forests had contrived to fill them with a honeyed nectar all their own."
---Bibhuti Bhushan Banerji in Pather Pancheli

In these memorable words a great writer has captured very well the great importance of forest food for the poorest households in a village of Bengal , a description which is true for many other parts of country as well. In fact, this great novel, on which the equally great and now even more famous film of Satyajit Ray is based, has many episodes in which the two children Apu and Durga, the two main characters of the story, derive much nutrition , taste and joy from the berries , other fruits and food they find on the trees and bushes, in the ponds and roots of forests. This novel also depicts the familiarity of these children, who are frequently underfed at home, with what is available as food in the forest near their home in various seasons.

When I was reporting on Chipko movement and other related movements in Uttarakhand, I often heard from my new friends in hills regarding the many seasonal delicacies based on raw material brought from forests in the form of vegetables, leaves etc, not to mention delicious, high nutrition fruits like kaafal and various berries which needed no cooking. I realized that in these Himalayan villages forests foods were not consumed just by the weaker sections; well-to-do households also looked forward to eating delicacies based on them. Senior activist of Chipko Movement Sunderlal Bahuguna often emphasized the very important role natural forests have to provide food directly to people. In fact, he saw a greater role for natural forests that for planted fruit orchards.

While covering a story based on a project to replace natural forests with plantations in Chhattisgarh , I came across official reports which described in some detail the numerous foods which the tribal communities in particular were obtaining free from forests and which had helped to maintain nutrition and health despite several adverse factors.

In Bundelkhand I realized that apart from obtaining numerous nutritious foods from forests for their own consumptions, Kol tribals also sold a part of some of these higher value foods like karaunji to traders to earn some income, although they did not generally get a fair price for this. An effort to get a higher price was much appreciated by people. Similar was the situation among Bhil's and other tribal communities in Rajasthan.

Before visiting Kalahandi region of Odisha, I had read several reports which necessarily linked consumption of forest food with great distress. However, after visiting some villages here I realized that this was not necessarily so and several communities found forest food to be a valuable source of nutritious whose usefulness increased further in lean times and drought years.

However, due to increasing commercial orientation of official thinking and practices relating to forestry, the role of natural forests as an important source of food and nutrition as well as related livelihoods has been increasingly neglected or ignored in recent times by the authorities. As a result, important decisions were taken to replace natural forests with plantation of commercial species, or to concentrate more on a few commercially useful species at the time of afforestation which very adversely affected the contribution that natural forests have traditionally made to food and nutrition, particularly to food and nutrition systems of tribal communities.

> *Another approach that groups have tried is the promotion of "open source" seeds, using licenses in a fashion similar to those using copyleft or creative commons for software, books or other works. The goal is to prevent the privatisation of seeds by declaring them not appropriable through labels, pledges or other conditionalities.*

To prevent this costly damage from accelerating further, it is important to establish a better and wider understanding of the important role of natural forests in protecting food and nutrition system of vulnerable communities. In this context a study titled 'Forests as Food Producing Habitats' has made an important contribution. This study was taken up by an Odisha based voluntary organization Living Farms on the basis of the conditions prevailing in Rayagada and Sundargarh districts with the help of three other organizations DISHA, ASHA and SHAKTI.

This study recorded 121 different kinds of uncultivated foods being harvested between the last week of July and December by the sample households. On an average, 4.56 kg of such foods were harvested per household, during each collection foray.

Participatory Rural Appraisal (PRA) exercises taken up with the communities studied showed the criticality of uncultivated foods in the perceptions of the Adivasi communities. The cultural linkages with forests and forest foods are clear and alive to this day. However, a variety of factors could potentially be playing a role in a general decline on dependence on forest foods, as reported by the Adivasi communities.

In terms of a nutritional analysis, it was found that the forest foods could be playing a vital role in terms of micro-nutrients. This study, as well as other surveys and inquiries undertaken by these organizations revealed that in times of stress it is the uncultivated foods which form a critical source of food and nutrition. If the natural forest is maintained well in all its diversity and if access is good, there is a year-long supply of such uncultivated foods . In the overall context of low incomes and inequalities, this is a food source that is not just affordable but completely free and accessible on basis of equality. If the resource is managed sustainability, it is also a source of income for the communities. The importance of forest food is likely to increase further in times of climate change, compared to cultivated species. Uncultivated foods provide an important fallback mechanism as these foods, which "do not require a household to incur costs, borrow money, depend on a government dole-out scheme or even seek the permission of others before accessing, lend communities as well as individual

households a sense of self-dependence, and therefore, dignity and pride, which are quite dear to Adivasi communities. In our interactions, the lack of reliability of state schemes was repeatedly brought up."

Another aspect to which this study draws attention is that there is an enormous wealth of biological knowledge associated with these foods with members of the community, including children. "Whether it is about where a particular species grows seasonality, characteristics, identification and appearance, or its nutritive and medicinal properties, properties related to processing or storing, cooking methods and quality, veterinary and livestock uses etc. are all valuable knowledge that community members possess." This important knowledge base should be protected. The protection of this food is closely connected with this knowledge base as selecting what to eat, knowing value and characteristics of selected food and also knowing what to avoid is extremely important.

This study has recommended that the Government should provide funds to research institutions to document the availability of uncultivated foods and their nutritional components so that conservation measures are taken up to ensure sustainable availability and collection processes in forest regions. Most uncultivated foods are highly nutritious, but some are not. It is recommended that the nutritional properties of these foods be fully documented and shared with the communities to help them, make better choices. The study has highlighted diverse conditions of availability of uncultivated foods , the lowest in one studied village being 21 varieties to a high of 69 in another village, both in Sundargarh district. The study has recommended that the conditions in which diversity of forest food continues to be available should be maintained by the Forest Department.

Further this study asserts that the implementation of the Forest Rights Act gives communities and the forest department a new opportunity to develop the commons in the service of community and to meet an important development goal of ensuring nutritional security to the most marginalized. Considering the extensive diversity and availability of uncultivated foods which can act as a buffer against hunger and malnutrition, it is recommended that organic agriculture is promoted in and around forest regions. Particularly, pesticide use must be banned to prevent negative impact on forest environment and pollution of water bodies or collapse of bee colonies or other harm to the flora and fauna.

12.2: Debjeet Sarangi's Important Contributions

Debjeet Sarangi, a leading development and environment activist based in Odisha, breathed his last recently at a Bhubaneswar hospital. He was only 53 at the time of his untimely death.

In a relatively short time, Debjeet had made very important contributions relating to justice, environment protection and evolving a new development paradigm. His contribution to looking at tribal communities living in remote areas from a perspective of appreciating and understanding their world view and learning from them has been particularly commendable, as many of those working with tribal communities do not go beyond well-intentioned but limited attitudes of help and patronage.

Debjeet grew up with a strong sense of justice which was cemented further when he came in contact with a village where most of male residents had died due to silicosis or tuberculosis after exposure to high levels of dust and other hazards at a stone mine. He also worked with the Narmada Bachao Andolan for some time before forming the Living Farms organization. The work of Living farms relating to organic and natural farming won a lot of praise from several quarters.

In the course of this work the production of healthy and safe food was emphasized and while links were forged with urban consumers also, the better availability of healthier and organically grown food for rural people themselves also got the due attention.

The least understood but very high nutrition potential of several foods collected from forests traditionally from natural forests was also emphasized and also highlighted by properly documented studies which contributed much to the knowledge of bio-diversity and nutrition.

This obviously had important implications, as the existing official policy had been displacing natural forests with commercially oriented monocultures in many places without realizing the great loss of medicinal and nutrition potential, particularly for local communities , apart from wider harm.

The work of Living Farms with the Kondh tribal community of Rayagada, Odisha, was also important from this context as this community was being threatened with displacement from highly unjustified and destructive projects and it was important to bring out the less understood importance and value of the traditional systems involving close, even sacred, links between natural forests and human beings which are of great value and on which the life systems and value systems of the Kondh community are based to a large extent .

Debjeet Sarangi had the vision needed for such understanding. He contributed to this understanding himself and helped to create the conditions in which other visionaries and learned people could have a better chance of such appreciation and learning.

I had the good opportunity of visiting some villages, urban settlements and schools in around Bhubaneswar where Living Farms had been working. I was greatly impressed with the great rapport which the activists of Living Farms had built with the teachers and students of some schools in a short time with the result that there was not only great appreciation for organic farming but in addition students were enthusiastically taking this up in vacant spaces in school and preparing to take up composting as well, relating to disposal of kitchen wastes generated from the cooking of mid-day meal. In a village I could see the quiet but deep commitment of women for organic farming and healthy food, and their great zeal to take this forward in very creative ways. In urban and rural areas very creative work relating to kitchen gardens was being spread.

Certainly, the work of Debjeet Sarangi was along very creative and visionary lines, and much that is very valuable has been lost very suddenly with his untimely death. His family, friends and colleagues will no doubt strive to carry forward the work of this visionary, and they should get all the help and encouragement in this effort.

12: New Threats to Important Crops and Traditional Seeds

13.1: Bt Cotton and Its Serious Problems

During recent years the experiences of over 7 million cotton growing farmers in India, the world's highest producer of cotton, has changed drastically as a diversity of cotton varieties have been replaced to the extent of perhaps over 90 per cent by genetically engineered Bt cotton varieties like Bollgard I and Bollgard II. This change, was widely promoted by very influential and resourceful private companies as varieties which will be less susceptible to pests, particularly the pink bollworm (PBW), reduce pesticide use and increase yields, a win-win situation of increasing earnings and reducing costs. However, the actual experience of farmers has been very different from this. This is a good time to look at the real situation as the debate over genetically engineered or genetically modified (GM) crops has again intensified recently and in this debate the question of Bt cotton often crops up as this was the first GM crop introduced in India.

A paper titled 'Long-term impacts of Bt cotton in India' by K.R. Kranthi and Glenn Davis Stone, published in Nature (13 March, 2020) has stated that cotton farmers today have to spend more on pesticides than before the introduction of Bt cotton. What is more, this paper predicts on the basis of the experiences so far, " the indications are that the situation will continue to deteriorate." The first mentioned author of this paper has been very closely involved with cotton research in India at very senior levels.

More recently another important paper has been published in Nature (February 7, 2022). This paper, written by Katharina Najork, Jonathan Friedrich and Markus Keck is titled, 'Bt cotton, pink bollworm and the political economy of sociobiological obsolescence: insights from Telangana, India'. This paper has stated, "After genetically engineered Bt cotton lost its effectiveness in central and southern Indian states, pink bollworm infestations have recently returned to farmers' fields and have substantially shifted their vulnerability context. We conceive Bt cotton as a neoliberal technology that is built to protect farmers only temporarily from Lepidopteran pests while ultimately driving the further concentration of capital.

"Based on data from a representative survey of three major cotton-producing districts of the state of Telangana, we find that pink bollworm pest infestations are a shock to farmers that lead to severe losses in yield and income. We argue that Bt cotton includes an inherent obsolescence that results in a systematic dispossession of resource-poor households while providing appropriation opportunities for other actors. Finally, reproduced hegemonic structures facilitate the accumulation of capital through a redistribution of assets from the bottom to the top of agricultural sector. Claims that considered Bt cotton as a pro-poor technology were thus flawed from the outset."

In a study of 15 villages this study found that 80% of farmers interviewed saw pink bollworm pest infestations in their Bt cotton crop during the last five years, and 96% of these farmers reported the first appearance of these pests within the last five years. The smaller farmers growing Bt cotton have been forced to take more loans and their debts have increased, endangering their survival as farmers.

While this study was more in the context of southern parts and partly central parts of the country, more recently this issue has become important in the context of northern parts too. Farmers across a vast cotton growing area of Punjab and some parts of neighbouring Haryana are today extremely bitter about the extensive damage caused by pink bollworm pest, while memories of other serious pest attacks also continue to trouble them. Neel Kamal reported in The Times of India (Chandigarh edition, 28 September, 2021), " The pink bollworm attack on cotton crop in Punjab has made farmers a worried lot, as memories of whitefly attack in

September 2015 are still fresh in their minds… the 2015 whitefly attack had caused over 60% damage to cotton crop." This report noted that pink bollworm attack is the highest this time in Punjab, although attacks were reported earlier in Gujarat and Maharashtra.

This report stated that this time the bollworm attack is more in Bathinda and Mansa districts, but other reports described the extensive damage in other districts as well. The Tribune reported on October 9 (Chandigarh edition, news titled Cotton in 85 Sangrur villages under bollworm attack)—" The cotton crop on 1500 acres in 85 villages of Sangrur district has come under the pink bollworm attack. In Barnala, the attack has caused panic among farmers. In many villages, the repeated sprays of insecticide have failed to prevent the spread of the attack…Department officials are organizing special camps at various villages, recommending sprays and making farmers aware against spurious ones."

Thus, unfortunately solutions are still being sought more and more in pesticides. As another report in The Times of India titled 'Channi checks damage to cotton by pink bollworm' stated—Chief Minister Charanjit Channi while visiting affected villages "asked the officers to pump in all the resources in terms of best available insecticides and pesticides to save the precious crops of the farmers."

In 2017-18 very widespread damage was reported to Bt cotton crop from pink bollworm in Maharashtra. A report in the Economic Times dated 21 January 2018 by G.Setthraman titled 'These Two Issues Could Put the Brakes on the Bt Cotton Story' quoted a senior agriculture official of Maharashtra as stating that 80% of the cotton growing area of the state had been affected in the current season. This report also stated that Bt cotton is the only commercialized GM (genetically modified) crop in India and it is due to the vast spread of this alone that India has the fifth highest area under GM crops in the world and Bt cotton seeds account for 40% of the Rs.14000 crore national seeds market. This report said—" the loss caused by the pink bollworm infestation has raised serious questions about the sustainability of GM cotton, which accounts for over 90% of all cotton grown in the country." This report documented the very rapid growth of Bt Cotton. Monsanto introduced its first generation Bt Cotton called Bollgard I (BG-I)in 2002 and Bollgard II (BG-II) in 2006. Over the last three years, this review said, reports have emerged of the pink bollworm becoming immune to Bollgard II In addition this review drew attention to illegal sale of herbicide tolerant (HT) variety of Bt Cotton, amounting to 3.5 million packets in 2017-18 alone. Keeping in view the high expenses of Bt cotton cultivation, this review concluded, its viability cannot be taken for granted anymore.

Here it needs to be pointed out that the claims of Bt Cotton relating to high yields have been refuted by several eminent experts from time to time. Dr. Jack A. Heinemann, of the School of Biological Sciences, University of Canterbury, Christchurch, New Zealand, has a long experience of reviewing safety information from companies on their genetically engineered crops. He writes, "the "Bt" trait does not increase yield, it just is becoming nearly impossible to source the best varieties without the Bt transgenes."

Why is this so? Dr. Heinemann answers, "The yield benefit (in Bt cotton) comes from the use of high yielding hybrids that are only available as GM varieties because genetic engineering companies like Monsanto control a large proportion of the seed supply and only offer them as GM cotton varieties."

This is confirmed by P V Satheesh, Convener of South Against Genetic Engineering, "The final nail in the coffin of non Bt cotton cultivation was hammered in 2006 when the industry - by forming a corporate seed cartel - successfully threw out all non Bt cotton seeds from the market firmly shutting out all options for farmers except the cultivation of Bt cotton."

Jack A. Heinemann asks, "Where is the data that these same high yield varieties lacking the Bt trait and grown using sustainable techniques such as integrated pest management and agroecology perform less than GM varieties," He answers, "There is none at all to my knowledge, while there is evidence that GM varieties undermine sustainable agriculture."

In some parts while yields of cotton increased significantly in the phase of spreading Bt varieties

for some years this was mainly due to the impact of good weather and improvements in irrigation, as also the government devoting more resources for this particular GM variety of cotton.

On the experience of the USA Dr. Heinemann writes, "The yields of Bt cotton in the US, for example, have not been consistently or sustainably higher than cotton produced using high yield varieties that were not genetically engineered, and GM varieties have contributed to financial losses for farmers. The high costs of genetically engineered seeds put farmers at financial risk."

Heinemann concludes, "Does India want to export control of its food? Then go with genetic engineering. If India wants to feed itself, then go with proven but so far neglected approaches that work, such as agro ecology."

In the very first year of Bt cotton's commercial cultivation in India (2002-03), the Andhra Pradesh dept. of agriculture concluded a study of 3709 farmers growing this Bt cotton. As many as 71% of these farmers reported low yields with Bt cotton.

In Madhya Pradesh the average yield of cotton between 1996-2002 (before the introduction of Bt cotton) was 612.7 kg/ha. However, in the six years after the introduction of Bt cotton average cotton yield was reduced to 518.3 kg/ha.

These realities specific to cotton should be seen together with other objections to all GM crops. Given the high hazards, risks and uncertainties associated with GM crops, these can never be sustainable. The more specific evidence against Bt cotton shows that its benefits have been frequently exaggerated by making wrong comparisons. Whatever the short-term gains, if any, these are quickly exhausted, leaving farmers burdened with more pests, more pesticides, higher costs of seeds and pesticides. These aspects come out more clearly in longer-term reviews which also bring out the collapse of several small farmers who cannot bear the high risks and losses, become indebted and may even lose their land, while some of the richest persons are able to benefit as agents of seeds and pesticides, as moneylenders and land-grabbers. What is more in cotton-growing villages the entirely system becomes very highly dependent on exploitative seed companies with almost monopolistic tendencies and control. This has happened in a country which used to have the most celebrated cotton textiles historically and this in turn was made possible by a very rich diversity of cotton varieties. This was ruined very quickly and this trend is continuing despite all the talk of Atma-Nirbharta or self-reliance. Big changes are needed in the future path of cotton sector development, including cotton cultivation, and very high importance should be given to the revival of the rich heritage of indigenous varieties of cotton.

13.2: Farmers' Rejection of GM Potatoes

On September 19 2024 nearly 100 civil society representatives, farmer organizations, scientists and academics of Nigeria issued a statement calling upon their government to discontinue plans to introduce GM potatoes and to reject all GM crops. These critics drew attention to similar plans to introduce GM potatoes elsewhere in Africa too and said that potato farmers would be devastated if these plans went ahead. This statement was made after some reports stated that GM potatoes may be introduced in Nigeria next year in 2025.

In view of this escalation of this controversy on GM potatoes, this may be a good time to recall an interview published by "Sustainable Pulse' news website (under the title 'The Creator of GMO Potatoes Reveals the Dangerous Truth') with the Ex-Director of J.R. Simplot and team leader at Monsanto, Caius Rommens, who himself revealed the hidden dangers of the GMO potatoes he created (he has taken up these issues in greater detail in his book 'Pandora's Potatoes: The Worst GMOs'). This interview also has a larger relevance beyond potatoes for what it tells regarding the way such research is often conducted.

Rommens has stated in this interview, "During my 26 years as a genetic engineer, I created hundreds of thousands of different GM potatoes at a direct cost of about $50 million. I started my work at universities in Amsterdam and Berkeley, continued at Monsanto, and then worked for many years at J. R. Simplot Company, which is one of the largest potato processors in the world. I had my potatoes tested in greenhouses or the field, but I rarely left the laboratory to visit the farms or experimental stations. Indeed, I believed that my theoretical knowledge about potatoes was sufficient to improve potatoes. This was one of my biggest mistakes." Further this senior scientist has stated, "It is amazing that the USDA and FDA approved the GM potatoes by only evaluating our own data. How can the regulatory agencies assume there is no bias? When I was at J.R. Simplot, I truly believed that my GM potatoes were perfect, just like a parent believes his or her children are perfect. I was biased and all genetic engineers are biased. It is not just an emotional bias. We need the GM crops to be approved. There is a tremendous amount of pressure to succeed, to justify our existence by developing modifications that create hundreds of millions of dollars in value. We test our GM crops to confirm their safety, not to question their safety."

In this interview Rommens revealed that he led a small team of 15 scientists at Monsanto, and directed the entire biotech R&D effort at Simplot (up to 50 scientists). He stated his initial focus was on disease control but "I eventually considered all traits with commercial value." He stated that he left J.R. Simplot when "my 'pro-biotech' filter was wearing thin and began to shatter; when I discovered the first mistakes. These first mistakes were minor but made me feel uncomfortable. I realized there had to be bigger mistakes still hidden from my view."

He added, "Looking back at myself and my colleagues, I believe now that we were all brainwashed; that we all brainwashed ourselves. We believed that the essence of life was a dead molecule, DNA, and that we could improve life by changing this molecule in the lab. We also assumed that theoretical knowledge was all we needed to succeed, and that a single genetic change would always have one intentional effect only.We were supposed to understand DNA and to make valuable modifications, but the fact of the matter was that we knew as little about DNA as the average American knows about the Sanskrit version of the Bhagavad Gita. We just knew enough to be dangerous, especially when combined with our bias and narrow-mindedness. We focused on short-term benefits (in the laboratory) without considering the long-term deficits (in the field). It was the same kind of thinking that produced DDT, PCBs, Agent Orange, recombinant bovine growth hormone, and so on. I believe that it is important for people to understand how little genetic engineers know, how biased they are, and how wrong they can be. My story is just an example."

Further Rommens stated, "I somehow managed to ignore the almost daily experience that GM potatoes were not as healthy as normal potatoes. They were often misshapen, stunted, chlorotic, necrotic, and sterile, and many GM plants often died quickly. One of the reasons for this genetic inferiority is that GM potatoes are derived from 'somatic' cells, which are meant to live for only

> *There should be a comprehensive campaign for protecting all pollinators with steps at several levels. Promotion of organic or natural mixed farming, banning all GM crops, protection of natural forests, avoiding any cruelty or capturing or harmful practices relating to leading pollinators.*

one season (to support a stem or leaf structure). These cells don't have the genetic integrity to create new plants (like pollen cells and egg cells). So, by transforming somatic cells, we created GM potatoes that contained hundreds of genetic mutations, and these mutations compromised yield. Additionally, the genetic modifications often have 'unintended' effects that negatively affect both the agronomic performance and nutritional quality of a crop."

The scientist added "I believed that the GM potatoes were bruise resistant but now understand I was wrong. The GM potatoes bruise just as easily as normal potatoes, but the bruises are concealed. They don't develop the dark colour that helps processors identify and trim them. I didn't understand that my potatoes were incapable of depositing melanin, a protective compound, when damaged or infected. More importantly, I didn't understand that the concealed bruises accumulate certain toxins that may compromise the nutritional quality of potato foods."

Rommens stated in this interview "My concern is that any attempt to promote the production of GM potatoes in humid regions (as vulnerable as Bangladesh and Indonesia) would actually increase rather than reduce disease issues."

Coming to wider issues he said, "The main problem about the current process for deregulation of GMO crops is that it is based on an evaluation of data provided by the developers of GMO crops. There is a conflict of interest. I propose that the safety of GMO crops is assessed by an independent group of scientists trained at identifying unintended effects."

These observations of a scientist most closely involved in the development of GM potatoes need to be widely known, particularly in those countries where farmers and consumers are deeply disturbed by the high-level efforts of GM lobbyists to introduce GM potatoes.

13.3: India Needs a Campaign for Protection of Traditional Oilseeds

Did we protest when the exotic, narrow genetic-base varieties of various crops displaced thousands of indigenous varieties?

Did we protest when many millet crops were being displaced?

In both these cases the lack of any sustained opposition by a significant number of people (leaving aside the opposition of a small number of scientists and farmers) proved very costly. Much later, when a lot of damage had already been done, some calls for correcting serious mistakes were made, and it remains to be seen how effective these calls really are in the middle of wider adverse changes that have been unleashed.

Now we are at a similar point in the context of the rich traditional oilseed's heritage of the country, and an attempt should be now before it is too late. Now is the time for action, tomorrow will be too late.

India has a very rich heritage of many diverse oilseed crops. The difficult situation now has appeared due to the predominance given to palm oil for meeting the edible oil demand in the country. Palm oil has been a cheaper source of obtaining edible oils, and so when domestic shortages appeared, the government and trading interests were one in opting for a solution in the form of increasing palm oil imports rapidly. Later

the government decided to accord much higher importance to increasing domestic production of palm oil as well, and if government programs succeed, then Indian market will be dominated soon by palm oil soon to a much higher extent in the form of domestic production while imports are also likely to continue because of the market conditions remaining favourable for this. This being much cheaper will prove to be a disincentive for traditional oilseeds including groundnut, mustard, sesame, coconut and others. With cheaper palm oil dominating the market, it will become even more difficult for farmers of traditional oilseeds to get a fair price for their produce. Hence within a few years, the share of imported and domestic palm oil will further increase to an even more dominant position while the share of traditional oilseeds will decrease further and over a period of time this will become a self-accentuating trend.

This will be very harmful as livelihoods of a very large number of farmers are based in oilseeds and they have very well-developed skills and knowledge for this. These traditional oilseeds are very well adapted to weather and agro-ecological conditions, mixed farming systems and rotations which are very well understood by farmers and are sustainable, whereas the prospects of newly introduced exotic palm oil are uncertain and risky.

Traditional oilseeds are rich sources of nutrition and their palatability and taste in terms of local preferences are well established. Most traditional oilseeds in their whole form (without extracting oil), are associated with the preparation of several nutritious and highly relished dishes, apart from being consumed in raw or very slightly processed form to provide high nutrition. Various by products of these crops and trees have many important uses. The oilcakes obtained after oil extraction are a very important source of farm and dairy animal nutrition. Many traditional oilseeds are a very important source of medicines in everyday life, and these medicinal uses are well understood by people. These traditional oilseeds being very familiar to preferred consumer tastes are more amenable to being used in wholesome forms with less processing, which gives high nutrition. Their local processing is possible in small units, hence the potential for large-scale rural employment still exists, and such local processing will facilitate supply of more, cheaper oilcakes to local dairy and farm animals.

Most of these benefits are denied in the case of exotic oilseeds including palm oil. Due to consumer resistance to unfamiliar taste, the possibility of use of hydrogenation and related technologies is more likely in their case, and this will increase health hazards while reducing nutrition.

The spread of palm oil trees will lead to disruption of local biodiversity systems in

ecological sensitive regions. As these require vast amounts of water for good yields, water scarcity and over-exploitation will be accentuated. As ripe palm oil fruit has to be rushed for quick processing in large-scale units (otherwise it will be spoilt from the point of view of getting edible oil), this will result in the need for very quickly raising a lot of additional infra-structure in ecologically sensitive areas.

In fact, it may be difficult to meet such excessive requirements and if this happens then palm oil tree cultivation with high yields may simply fail to take off. In fact, cases of farmers uprooting palm oil trees planted earlier in Karnataka and Tamil Nadu have already been reported as high enough yields to make them profitable in Indian conditions were not possible.

So, there are two possibilities. The one more likely is that fast spread of palm oil fruit trees in Indian conditions will not succeed. In this case several thousand crore rupees best used for promoting traditional oilseeds will be wasted on an undesirable exotic edible oil tree.

The second possibility is that somehow by concentrating all resources the government manages to increase domestic palm oil production in a big way as per its present stated plans. This increased domestic production will not lead to elimination of imports as once a cheaper product is established the imports will also continue. The higher domestic production and continuing imports will harm the traditional oilseeds the most.

Hence the government should change its policy and concentrate fully on traditional oilseeds. Secondly, the introduction of GM crops in the case of mustard should be stopped immediately. Thirdly, there should be a consumer campaign to consume healthy edible oils and avoid hydrogenated forms. This campaign should also inform people to avoid excessive consumption of edible oils as it is possible to cook in healthy and tasty ways with lesser quantities of edible oils. It has been often seen that people often tend to use higher than necessary quantities if edible oils, which is harmful for health.

Head Office:
Village and Post Kupra, District Banswara, Rajasthan, India - 327001
Ph. No: 9414082643
Email: vaagdhara@gmail.com

State Coordination Office:
37, Shiv Shakti Nagar, Gautam Marg, Near Kings Road, Nirman Nagar, Jaipur - 302019
Ph: +91 9829823424
Email: vaagdhara@gmail.com