Seed Sovereignty: Analysing the Debate on Hybrid Seeds and GMOs and Bringing About Sustainability in Agricultural Development

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Abstract: The paper further contributes to the debate on the use of hybrid and Genetically Modified Organisms (GMOs) in Nepal by bringing in the concept of seed sovereignty for sustainable agriculture and food security. Moreover, it argues that this debate needs to be looked at from the food system as a whole and at the corporate sector's interest to control the whole food system. The way the concept of 'food sovereignty' was developed to counter the control of the corporate sector on local agricultural production, the concept of 'seed sovereignty' can equally be deployed to save the local genotype, maintain agro-biodiversity and agro-ecology and produce healthy food in an ecologically and climate change-adaptive ways. As the seed is basic to the whole food system, the corporate agricultural sector is precisely hitting at the seed sovereignty of farmers so that they become dependent on them, eventually leading to their monopolistic control over the food system. Therefore, the paper argues that the major concern should be focused on farmers' seed sovereignty as the first step towards sustainable agriculture.

Key words: Seeds, agriculture, seed sovereignty, food sovereignty, genetically-modified seeds, corporate control.

INTRODUCTION

Debate on the use of hybrid seeds and genetically-modified seeds (or Genetically Modified Organisms [GMOs]) for enhancing farm productivity heightened in Nepal after the United States Agency for International Developments (USAID's) press release in September 2011, announcing partnership between the Government of Nepal's (GoN) Ministry of Agriculture and Cooperatives (MoAC) and United States of America's (USA) multinational company, Monsanto, on a pilot maize production project in Nepal. This pilot project was initiated to introduce hybrid maize seeds produced by Monsanto into Nepal. Under the project, Monsanto was to set up test plots to promote new seeds in Chitwan, Nawalparasi and Kavre districts, with training to 20,000 farmers in hybrid maize production methods and help in marketing the seeds. The potential benefits, as argued by USAID and Monsanto, were improvements in Nepal's food security and enhancement of income of Nepalese farmers. A newspaper reported the following statement of USAID Mission Director in Nepal, David C Atteberry: "Most maize farmers are unaware of the health and financial benefits that high-yielding hybrid seeds can provide. Improved seeds and targeted capacity building on crop management will allow maize producers in Nepal to reap the full benefit of their labour (Nepali Times 2011: 1). A further rationale for the project was given by USAID, saying that Nepal only grows half its current annual requirement of 270,000 tons of maize for human and animal consumption, and the rest is imported; the project will help to make Nepal self-sufficient and save Nepalese Rupees (NRs) 200 million in such imports.

After the release of the news of the above potential project, social and environmental activists and organic food producers expressed their worries about the potential harms of the involvement of a multinational company and introduction of hybrid seeds in the name of food security (Fuller 2011). Apprehensions were expressed about Monsanto's interest in genetically modified crops and that the company would use its test plots to propagate seeds that will contaminate the local gene pool, as well as make farmers dependent

on them for the seeds, agro-chemicals and other inputs that are required for growing these seeds.

In the later part of 2013 and early 2014, the controversy of this proposed project reached a climax when a big business house in Kathmandu, Chaudhary Group, announced its decision to introduce and distribute maize and vegetable hybrid seeds of Monsanto (The Himalayan 2013; Regmi 2013) through its subsidiary CG Seeds and Fertilizer - a local agent of Monsanto. At the same time, newspaper reports revealed that GMOs had already been tested in Nepal with Monsanto's involvement. There were debates in social media as well as in Nepali press about the benefits of hybrid seeds and genetically modified seeds. Social protests were also organized to oppose the project. Even though a large section of the public was against the proposal to introduce GMOs, government agencies were mostly supportive of the introduction of hybrid seeds and GMOs. They argued that hybrid maize had already been introduced into Nepal long ago and that there was no harm to the environment if chemicals were used in a balanced way with organic fertilizers. On the other hand, Nepalese government agencies were also aware of the fact that there existed some genetically-modified cotton and vegetables. Furthermore, they argued that Nepal would not be able to stop GMOs if India opted for GMO seeds as such seeds could easily infiltrate, as has been happening now, due to open border.

Despite popular protests against introduction of hybrid seeds and GMOs in Nepal, these seeds are entering Nepal. Currently, up to 30 foreign companies are supplying hybrid seeds in Nepal. Almost 90 per cent of imported vegetable seeds and 50 per cent of the vegetable seeds used in Nepal are hybrid (The Himalayan 2013: 1). Similarly, almost 20 per cent of corn seeds are imported and almost all of them are hybrid (*ibid*). A large amount of hybrid seeds is imported from India and China and a small fraction also comes from developed countries like Japan. From time to time, there have been cases of crop failure leading to desperate situations for farmers where such seeds were used. These events also led to debates on the benefits of these seeds.

In the emerging context, as discussed above, this paper critically looks at the role of seeds in sustainable farming or food production. It argues that the seed policy in Nepal should also be linked with the food sovereignty policy that the government is following. This calls for taking together the concepts of seed sovereignty and food sovereignty, whether in popular discourse or in policy and programme implementation. This will then put farmers in full control of their seeds and food production activities. This, however, does not mean that there should not be improvement in seeds, which farmers have been doing since they started domestication of crops and animals. The paper concludes that there should be continuous improvement of seeds through the collaboration of farmers and scientists, but such improvements should not undermine the rights and ability of farmers to control their seeds, which means their right to use, exchange and reproduce seeds freely.

This is a policy review paper which derives pertinent information from a variety of sources. Most of the information is collected from secondary sources: newspaper reports, opinion pieces, journal articles, government statistics, research studies already conducted and thorough analysis of other documents.

SEED SOVEREIGNTY AND FOOD SOVEREIGNTY

In Nepal's context, there has been a lot of debate on food security and food sovereignty. Even though Nepal's Interim Constitution (2007) states that 'food sovereignty' is the ultimate goal in agricultural development, this has not been brought into application. In practical

sense, still the focus is on 'food security'. This concept, popular with donor agencies and Non Governmental Organisations (NGOs), does not make much distinction on who produces food, where this is produced and how this is produced, but cares mainly on whether there is food available in the market and whether people have access to it. Therefore, the concept of food security does not correlate with sustainable food production, but rather it puts more focus on availability and access through trade and income generation for purchasing food. To enrich the quality of food, the concept of food security suggests supplementing nutritious elements in the food in order to provide nutrition or using genetically engineered food like 'golden' rice, which is believed to have more vitamin A.

The concept of 'food sovereignty' has been coined to provide food security through local sustainable production. 'Food sovereignty is the right of peoples, countries and state unions to define their agricultural and food policy without the dumping of agricultural commodities into foreign countries. Food sovereignty organizes food production and consumption according to the needs of local communities, giving priority to production for local consumption. Food sovereignty includes the right to protect and regulate national agricultural and livestock production and to shield the domestic market from the dumping of agricultural surpluses and low-price imports from other countries. Landless people, peasants and small farmers must get access to land, water and seed, as well as productive resources and adequate public services. Food sovereignty and sustainability are of higher priority areas and should not be left to be determined by trade' (Via Campesina 2014). The following are some basic features of food sovereignty, which also clearly talks about the seed issue (Adhikari 2009):

- Giving priority to local food systems in meeting food security.
- Guaranteeing access of all types of farmers to land, water, seeds and credit. This requires genuine, comprehensive land reforms, for open access to seeds, and for safeguarding water as a public good to be equitably and sustainably distributed.
- The right of family farmers and peasants to produce food.
- The right of consumers to be able to decide on what they consume, and how and by whom it is produced.
- The right of countries to protect themselves from low-priced agricultural and food imports.
- Agricultural prices must be linked to production costs with a profit margin required for a quality life and dignity of food producers. Countries should be entitled to impose taxes, quotas and bans on excessively cheap imports.
- The people should be able to take part in the formulation of agricultural policies.
- The recognition of women farmers' rights, who play a major role in agricultural production and in food.
- The recognition of indigenous people's rights to their resources.
- Abolishing all direct and indirect export supports.
- Phasing out domestic production subsidies that promote unsustainable agriculture.
- Developing local food economies based on local production and processing, and the development of local food outlets.
- Recognizing and enforcing communities' legal and customary rights to make decisions concerning their local, traditional resources, even where no legal rights have previously been allocated.
- Prohibit all forms of patenting of life or any of its components, and the appropriation

of knowledge associated with food and agriculture through intellectual property rights regimes; and

- Protecting farmers', indigenous peoples' and local community rights over plant genetic resources and associated knowledge, including farmers' rights to exchange and reproduce seeds.

'Seed sovereignty' can be defined the way food sovereignty has been defined. The seed is the first link in the food chain and seed sovereignty is the foundation of food sovereignty. If farmers do not have their own seeds or access to open pollinated varieties that they can save, improve and exchange, they have no seed sovereignty and consequently no food sovereignty. Seed sovereignty basically means farmers' control over the seeds (germplasm) they use and they have developed in addition to community and public provisioning of seeds in their diversity and quality to maintain the culturally, economically and ecologically sustainable farming system. Therefore, seed sovereignty is the availability, access to and control over seeds that farmers have been using in their fields. Here, control also means the right to reproduce seed. In sum, seed sovereignty includes the farmer's rights to save, breed and exchange seeds, to access diverse open source seeds which can be saved and which are not patented, genetically modified, owned or controlled by emerging seed giants. It is based on reclaiming seeds and biodiversity as a common and public good (Aljazeera 2012). This is also the view of The Campaign for Seed Sovereignty in Europe, which has put the following demands for seed sovereignty (CSS Europa 2014):

- Open access to fertile and diverse seeds free of any form of legal protection or patenting;
- The right of farmers and gardeners to obtain seeds from their harvest, to re-sow, distribute and sell them;
- A new model of agriculture based on local, small-scale food webs rather than monocultures requiring high inputs;
- New agricultural and trade policies promoting production for local needs and not global 'free' trade, dominated by transnational corporations; and
- Policies that favour the needs of farmers and consumers, health and the environment instead of profits for big businesses.

These demands clearly show that seed sovereignty requires more than just free access to seeds. It is also about the way of life of farming households and communities and emphasizes smallholder farming operated by many farmers supplying the local food requirements rather than large-scale trade. In a way, this concept is also applicable for Nepal as farming here is operated mainly by smallholders, and, in such a case, access to free seeds in open market and exchange system is essential. Moreover, it calls for health and safety issues in relation to food production and food products.

Like in the domain of food, there is also a debate on seed security versus seed sovereignty. In the domain of seed, there is not much discussion on seed security or seed sovereignty, even though the concept of seed security has started to creep into agricultural development field. For example, the United Nations' (UN) Food and Agricultural Organization (FAO) has started to use the concept of seed security in recent times. According to the FAO definition, 'seed security is defined as ready access by rural households, particularly farmers and farming communities, to adequate quantities of quality seed and planting materials of crop varieties, adapted to their agro-ecological conditions and socioeconomic needs, at planting time, under normal and abnormal weather conditions' (FAO 2014:1). This definition of seed security is akin to general definition of 'food security' in that proper attention is not focused on 'control', but on availability and access.

In recent times, the concept of seed security (availability, access and seed quality) has included other two main elements: varietal suitability and resilience. The resilience is to be gauged from six characteristics: productivity, stability, diversity, agency, equity and sustainability. Again, this concept is silent on farmers' control on seed and their capacity to regrow or reproduce the seed.

It is clear that the above definition or characterization/conceptualization of 'seed security' does not lead to sustainable agriculture. In such a conceptualization, the question comes as to who provides availability and access and how this affects farmers' ability to reproduce the seeds they use. It is interesting that 'seed security' is often employed in situations of seed scarcity created by adverse weather patterns like drought and disasters like tsunami and flooding. The basic rationale given for providing seed security under such circumstances is that, in emergency situations, farmer households which are displaced or their farms are destroyed due to disaster, lose their seeds and thus the capacity for food production. By supplying good quality seeds of appropriate variety, it is assumed that farmers can resume and increase agricultural production, thereby reducing or eliminating dependence on food aid following the next harvest. But again, this approach is silent on the right to reproduce the seed and whether the supplied seed can be propagated. Otherwise, like other development aid, including food aid, farmers become dependent on business companies to get the seed and this could lead to another disaster. In fact, as discussed below, such disasters have already started to happen. Therefore, 'seed sovereignty' should be basic in food aid or food security or agricultural production strategies.

GLOBAL AGRI-BUSINESS COMPANIES AND CONTROL OVER SEEDS

It is a common understanding that bigger and fewer number of companies are increasingly controlling the food system. The emergence of new technology of genetic engineering or bio-technology is helping them to achieve this, and they are forcing, through their governments or inter-governmental organizations like the World Trade Organization (WTO) or UN agencies, the governments to use these technologies (e.g. GMOs) by changing restrictive policies. These technologies and policy changes are pushing the biodiversity, especially genetic diversity, towards extension and food system into the grip of these companies because these technologies promote monoculture and chemical-based farming. The regulations (like WTO's agreement on agriculture) that impose patenting on life forms and control on right to reproduce seeds and privatization of public property in the form of common pool of genetic materials are all linked to empowering the corporate sector at the cost of the freedom and rights of farmers to access the genetic resources they have conserved through generations. The general institutional response to the rapid loss of agricultural biodiversity was limited to collecting seeds from farmers' fields and storing them away in gene banks. But then governments have control over these banks, and these governments generally succumb to the pressure of the corporate sector.

The overall result of all this is that the diversified and integrated farming systems that farmers have built through generations are threatened, weakening farmers' resilience, especially in the face of global warming. This is clearly seen in modern agriculture. Even in South Asian countries, the green revolution technology, which is anchored on a few 'high-yielding seeds of few crops and heavy inputs of fertilizer, water and pesticides', has led to rapid erosion of biodiversity. But still, as compared to chemical agriculture of developed countries, South Asia maintains a large pool of genotypes as a significant proportion of farmers have maintained their traditional farming system.

Over the last two decades, corporate control on seeds (and on food system generally) has increased

by leaps and bounds. The large corporations now have links to inter-governmental agencies like the UN system and with governments in the powerful countries. They also have the ability to change the perceptions of people and manage perceptions through philanthropy and media. Through perception management, corporate grip is further tightened. The corporate sector today sets global rules, with governments and public seed research centres following their lead. Such a control on seeds has led to expansion of monoculture crop production and undermining of farmers' seed systems, local food production and local food markets. The corporate control is making the smallholders and their communities hard to survive. In a few cases, this has compelled farmers to commit suicide. For example, in India, 17,638 farmers committed suicide in 2009 alone, that's one farmer every 30 minutes; it's estimated that more than 250,000 Indian farmers have committed suicide so far (Sainath 2010; Gucciardi 2012; Mercola 2012). A great number of those affected are cash crop farmers, mainly cotton farmers. As farmers shifted to cotton as cash crop cultivation, they were exposed to various vulnerabilities, which have arisen as this sector is dominated by foreign mega corporations that promote genetically modified seeds and exert increasing control over the entire agricultural industry. Most farmer suicides are a direct result of overwhelming indebtedness. But this problem is not limited to India as the suicide rate for farmers is higher worldwide than for the non-farming population. It is interesting to note that farmers' population is declining in general, but the number of suicides by farmers, especially in India, has been increasing. This shows the desperation of farmers.

Genetically engineered seeds (or GMOs) are considered as the main factor for the misery of farmers, as discussed above. Some of the reasons why GMOs and green revolution generally have brought such miseries are (Mercola 2012:1):

- Compared to traditional seeds, genetically engineered seeds are very expensive and have to be purchased in every planting season.
- Genetically engineered crops require much more water to grow, have much higher requirements for fertilizer and pesticide, and so require higher investment, forcing farmers to borrow loans. But the market for the products is volatile and generally not in favour of farmers, especially small farmers.
- The green revolution of the 1960s and 1970s had already made poor farmers poorer and wealthy farmers wealthier. Farmers became richer at the cost of smallholders and peasants.
- Rising prices for seeds, fertilizers, pesticides and other farm supplies, along with falling prices for farm commodities, are forcing farmers to take high interest loans from opportunistic money lenders.
- A trend from poly-culture farming (diverse crops) to monoculture has depleted soil fertility and increased crop damage by pests and diseases.
- Shortage of water supplies, periodic droughts, decreased monsoonal rainfall and poor access to irrigation.
- Dependence on dishonest and predatory salesmen because of lack of government support; and
- Grossly inadequate government relief programmes for farmers, including distress relief, medical support and the like.

The above are some of the reasons the concept of 'sovereignty' in food and agriculture is growing and has been demanded as a way to save farming, especially smallholder farming, as a way of life of farmers and to make agriculture sustainable and resilient in the face of climate and other crises.

In recent decades, especially past two decades, the concentration of power in a few agri-business

companies has been growing as smaller companies are slowly engulfed by the larger transnational companies (TNCs). There have been mergers of small companies with large companies (ETC Group 2011). Now, just ten corporations control half of the global market for commercial seeds. Most are pesticide producers focusing on the development of genetically modified (GM) crops that support chemical-intensive agriculture so that farmers are compelled to buy both chemicals and seeds.

GMO technology has been a weapon for the corporate sector to strengthen their grip on agriculture world over. It is seen that corporate control is high in the crops in which there are more GM seeds (like soyabean, oilseeds, canola, cotton and maize). In the USA, for instance, just one company, Monsanto, controls over 90 per cent of the seed market for soya (Patterson 2013). Corporate efforts to expand markets are thus focusing on opening more markets to GM crops, especially in developing countries. These have been done in two ways: buying smaller seed companies and then developing hybrid and/or GM varieties of crops such as rice, wheat and sugarcane, which have traditionally resisted private sector involvement because of the general practice among farmers of 'saving and exchanging' seeds. Attempts to introduce GM crops in Nepal also need to be seen in this light (Adhikari 2014).

In the past twenty years, there has been very rapid erosion of seed diversity and seed sovereignty all over the world and concentration of control over seeds by a very small number of giant corporations. In 1995, when the UN organised the Plant Genetic Resources Conference in Leipzig, it was reported that 75 per cent of all agricultural biodiversity had disappeared because of the introduction of 'modern' varieties, which are always cultivated as monocultures. Since then, erosion has accelerated (ETC Group 2011).

Besides displacing and destroying diversity, patented GMO seeds are also undermining seed sovereignty. Across the world, new seed laws, which enforce compulsory registration of seeds, are being introduced, thus making it impossible for small farmers to grow their own diversity and forcing them into dependency on giant seed corporations. Corporations are also patenting climate-resilient seeds evolved by farmers, thus robbing farmers of using their own seeds and knowledge of climate adaptation.

Privatization of the seed sector (and agriculture in general) research is a major outcome desired by the corporate sector. Accordingly, plant breeding has been pushed out of the public system. It is widely known that individual farmers have been practicing plant breeding for a long time, but they did it with public interest and the benefits of breeding were shared equally. Similarly, until two decades ago, government undertook plant breeding research and the output was shared equally and it was free access. In a few cases, public-private partnership has been emphasized, but again in this system, private sector takes the lead and reaps benefits through the 'copyright' system. Until the first half of the 20th century, seeds were overwhelmingly in the hands of farmers and public-sector plant breeders. In the decades since then, corporate sectors have used intellectual property laws to commodify[1] the world seed supply–a strategy that aims to control plant germplasm and maximize profits by eliminating farmers' rights (ETC Group 2008, 2011). Today, the proprietary seed market accounts for a staggering share of the world's commercial seed supply. According to a study, the proprietary seed market (that is, brand name seed that is subject to exclusive monopoly, i.e. intellectual property), now accounts for 82 per cent of the commercial seed market worldwide. The commercial seed market, of course, does not include farmer-saved seeds (ETC Group 2011: 22).

[1] Practice of giving economic value, usually for profit-making purpose, based on market prices undermining other values of a good or commodity like social, ecological, ritual and aesthetic values.

The top 10 seed companies now account for US$20,062 million, which is 73 per cent of the global proprietary seed market in 2009–up from 67 per cent in 2007. Therefore, corporate control on commercial seed market is growing (see also Table 1; ETC Group 2011: 22).

Table 1: The World's Top 10 Seed Companies

Company – 2009	Seed sales (US$ millions)	% of global proprietary seed market
Monsanto (USA)	7,297	27
DuPont (USA)	4,641	17
Syngenta (Switzerland)	2,564	9
Groupe Limagrain (France)	1,252	5
Land O' Lakes (USA)	1,100	4
KWS AG (Germany)	997	4
Bayer CropScience (Germany)	700	3
Dow AgroSciences (USA)	635	2
Sakata (Japan)	491	2
DLF-Trifolium (Denmark)	385	1
Top 10 Total	20,062	73% [of global proprietary seed market of 27,400 million]

Source: ETC Group 2011:22

As the monopoly in the 'seed sector' has increased, basically in the hands of the corporate sector, prices of their seeds have also increased. This was the exact strategy they have been following – increase the control and then raise the price. In this context, it leaves a dirty choice for farmers: either buy expensive seeds or quit farming. The expensive seeds may give good production with high dose of inputs, but in case of failure, farmers become indebted. In countries where farmers do not get any support from the government or insurance companies, they have no choice except to sell the farm and become landless farm workers or migrate to urban areas for work. For example, India, the home of cotton, has lost its cotton seed diversity and cotton seed sovereignty. With the introduction of GM cotton, some 95 per cent of the country's cotton seeds are now controlled by Monsanto, and the debt trap created by being forced to buy seed every year, with royalty payments, has pushed hundreds of thousands of farmers to commit suicide; of the 250,000 farmer suicides, the majority are in the cotton belt (Aljazeera 2012).

CONTINUED IMPORTANCE OF LOCAL SEEDS

Despite the claim that 'new' seeds, like hybrid and GMO, will save the world from hunger and malnutrition, traditional seeds are still very important. A perception that traditional seeds are not important has been generated as a way to increase the control of the corporate sector on seed. Until today, 50 per cent of the seed comes from the seeds saved by farmers and 20 per cent from other sources. The corporate sector contributes only 30 per cent (Via Campesina 2010:5; GRAIN 2014). Small farmers and local food system are dependent on farmer-saved seeds. But, the growing discrimination on farmer-saved seeds, for example, government's support in research and preservation of such seeds, is meant to encourage people to support new seeds like hybrid and GMO and then succumb to intellectual property rights leading to total corporate control on seed.

Farmer-saved seeds are still important to feed the world. Farm-saved seed supplies 67.5 per cent of the food and certified seed contributes only 32.5 per cent. In terms of producers, peasant farming feeds the half of the world's population, urban

gardening 8 per cent, hunting and gathering 13 per cent and 'industrial farming' 30 per cent (Via Campesina 2010:5; GRAIN 2014). But, public agencies' attention (like government, research institutions) is to support and expand industrial farming–the agenda backed by the corporate sector.

Farmer-saved seeds have several advantages; it has helped to maintain biodiversity, especially genetic diversity since generations, to produce a wide diversity of food, which is essential for proper nutrition, and is a live repository of germplasm for further seed development. As a result, this has been a sustainable system and, accordingly, farmers have been getting seeds since the domestication of crops and livestock without interruptions, and every generation of seed had developed capacity to adapt to the changing environment and thus become sustainable. Otherwise, the human civilizations would have ended a long time ago because of several disturbances to the system, but the diversity and continuity of seed supply helped to prevent crises. This lesson of the history is not given proper attention nowadays by the policymakers.

NEPAL'S CASE: LOCAL SEEDS AND THE DEBATE ON HYBRID SEEDS AND GMOs

The debate on seed in Nepal came to light with the USAID's plan to have collaboration between the MoAC and Monsanto Company to introduce GM maize in Nepal (Adhikari 2014). While, the US embassy in Kathmandu denied that it had any proposition of introducing GMO in Nepal through Monsanto Company (DeLisi 2011), there were reports in the media that GMOs were introduced in Nepal from time to time for experimentation, as well as through food products containing GMOs (IRIN 2012). The clarification given by the US Ambassador was that the USAID was interested in introducing or improving the hybrid seed production so that maize production would increase and food security would improve. The argument for supporting the use of hybrid maize seed and, hence, the production of hybrid seed was that farmers were already using these seeds from the informal market and that the government has been researching and producing hybrid seeds since 1986. While there is no specific data on the use of hybrid seeds in Nepal, it is reported by the US ambassador that approximately 75 per cent of tomatoes, cauliflower and many other vegetables in Nepal are grown from hybrid seeds (DeLisi 2011). The Nepal Agricultural Research Council (NARC) has also approved sixteen maize hybrids for sale in Nepal. Many of the approved varieties come from Monsanto, and four of them are being sold commercially here since 2004. Moreover, statistics like '80 per cent of maize produced in the Terai and 10 per cent of maize produced in the mid hills is grown from hybrid seed' (DeLisi 2011) are given to support the production and use of hybrid seeds. Moreover, it is argued that there is more demand for such hybrid seeds from farmers who are increasingly resorting to informal markets, which provide low quality hybrid seeds. The hybrid seeds have been extensively used in crops, especially vegetables, and most of these seeds come from India and some from China, Japan and other developed countries. The statistics on the use of various types of seeds in Nepal differ from one source to another. But, it is a fact that farmers are using hybrid seeds more in cash crops like vegetables. Demand for hybrid maize seeds, used primarily in the animal feed industry, has increased as animal feed has constituted a growing source of income for commercial farmers. While this would be the first time a donor, viz. USAID, subsidizes the cost of hybrid seeds on such a large scale in Nepal-targeting 20,000 farmers in three commercial maize - producing districts of Kavre, Chitwan and Nawalparasi along the southern lowland belt in the Terai region bordering India (Nepali Times

2011)—Monsanto has been exporting hybrid maize seed to Nepal since 2004, even though it was not widely known to people. Over the past decade commercial farmers in the lowlands have started using hybrid varieties, drawn by the potential of higher yields (IRIN 2012), and these come from informal markets in India. According to a report, the use of hybrid maize seeds has led to increase in the yield of the crop. For example, preliminary findings of a study done by the South Asia office of the International Center for Maize and Wheat Improvement (CIMMYT) in the lowland Nawalparasi and Palpa districts in 2011 suggest, there is almost double yields from hybrid seeds over openly-pollinated local varieties: from 0.8 to 1.5 tons per hectare (IRIN 2012).

On this issue of whether hybrid seeds lead to increase in production, there are debates, especially on what is meant by the yield and whether hybrid seeds are really efficient in the use of energy. Hybrid seeds also equally use more energy like pesticides, chemical fertilizers and water. In many contexts, use of improved local seeds with adequate management has produced more overall benefits for farmers. For example, in Andhra Pradesh, India, farmers became increasingly indebted when they switched to conventional farming, i.e. use of hybrid seeds, pesticides and chemical fertilizers and higher water use. But, when they adopted 'community managed sustainable agriculture (CMSA)', which emphasizes use of sustainable methods with local improved seeds and local organic fertilizers, they benefited in many respects, a World Bank Study in 2011 reports (Larson and Williams 2013). After CMSA, production costs were 33 per cent lower than in conventional agriculture (US$180 versus US$280 per acre). The savings translated directly to increased incomes for farmers. For crops raised without pesticides and fertilizer, farmers command a premium of 14–33 per cent (*ibid*). Even though CMSA produce is not yet certified organic, consumers, especially in urban retail markets, increasingly recognize the benefits of pesticide- and fertilizer-free food. Moreover, the switch to the CMSA did not lead to decline in the yield of paddy. The yield remained the same, but diversification in food production increased. Although CMSA brings higher labour costs, farmers are meeting this challenge by working together to manage pests and increase soil fertility. Demonstrations of multi-cropping and intercropping alternatives are helping more small-scale and marginalized farmers in Andhra Pradesh realize the benefits of diversification. The other benefits of CMSA were: communities obtained debt relief, families increased their investments in productive assets and sustainable land and water management, communities saw greater business innovation and new livelihood opportunities, food security improved, and human and environmental health benefited.

There is potentially another problem for the use of hybrid seeds as it could make farmers vulnerable in crisis situation. For example, farmers in Nepal using hybrid seeds have also experienced non-production of crops at all from time to time ruining their income as well as livelihood. In, 2008, there was a loss of around NRs 2 billion due to crop failure in Mahottari and Saptari districts owing to hybrid seed use in maize. Similarly, the same year, there was wheat hybrid seed failure in Kailali. In 2009/10, there was a failure of hybrid maize seeds provided by the Swiss Development Cooperation (SDC) in Bara, Rautahat, Sarlahi, Parsa and Nawalparasi districts. In 2010, there was failure of paddy crops in Far West districts due to defective hybrid seeds distributed by the World Food Programme (WFP). In 2012, there was severe crop loss in the Tarai districts due to the use of unregistered hybrid maize seeds smuggled from India (Shahi 2012). In 2013, farmers in Kavre alone had to bear a loss of NRs 20 million due to their choice of a Chinese hybrid rice seed (DY69). Similarly, use of Indian hybrid seed caused a loss of NRs 4.1 million (Guragain 2014). Given

all these experiences, there are questions about the benefits of hybrid seeds as well. Similarly, it clearly shows that there are clearly several viable alternatives within the rubric of 'sustainable agriculture' using local seeds and local inputs like organic manure and local labour.

Nepal, until recently, was able to maintain a wide range of seeds, and the traditional food system (from farming to consumption, waste disposal and daily religious and other cultural practices connected with food/seed) was so effective in preserving agro-biodiversity that there were as many as 2,000 landraces (varieties) of rice growing in areas from 60m to 3,050m altitude (Upadhaya and Gupta 2000). Another study reveals that, of the known 1,800 varieties of indigenous landraces of rice, including wild species in Nepal, only one variety is popularly cultivated in the Tarai, where rice is widely grown (Shrestha and Upadhyay 1999). Similarly, several indigenous varieties of vegetables are at the stage of extinction in Nepal. This evidence suggests that local species and landraces are disappearing. Modification of cropping pattern and expansion in the use of hybrid seeds and imported seeds of a few improved varieties are the main causes of this decline in agro-biodiversity (Bittman 2013).

There are also claims that there is political interest in promoting multinational companies like Monsanto in the development aid related to the seed sector. For example, USAID's support for the proposed hybrid/GM maize project comes through the 2009 US Global Food Security Act-a bill to authorize appropriations for fiscal years 2010 through 2014. This bill was aimed to provide assistance to foreign countries to promote food security, to stimulate rural economies, to improve emergency response to food crisis, to amend the Foreign Assistance Act of 1961 and for other purposes. The operational modality of this Act is through agribusiness companies. As US agribusiness is the only sector in which the USA has a positive trade balance; a wide range of government support is available for these companies. Under the US Global Food Security Act, Nepal signed an agreement with USAID and Monsanto. This led to massive protests across the country. In Nepal, farmer-managed informal seed system alone contributes more than 90 per cent to the total seed supply and use as of now. Recently, CG Seeds and Fertilizers, a Nepali company, came onto screen following its call for bulk buyers of Monsanto seeds on December 13, 2013. Taking lessons from the situations in 2010, the civil society protest has now heightened with a strong call to stop Monsanto in Nepal, and on January 8, 2014, the Supreme Court of Nepal issued an interim order banning the import of genetically modified seeds.

FOOD DEFICIT IN NEPAL AND USE OF HYBRID SEEDS AND GMOs

The rational for the promotion of hybrid seeds and GMOs has been given in the argument that we need to increase production. This has been so globalized, especially by the donor agencies like USAID and corporate giants like Monsanto, as well as governments and a section of scientists. The main argument is that population has been growing and will reach 9 billion by the turn of the century and that almost 1 billion population of the world are now malnourished, with 1 million chronically exposed to hunger and malnutrition (FAO 2013). But, it is also a fact that about 3 billion people are not eating well, if we count obese and overweight people alongside those with micronutrient deficiencies. Paradoxically, as increasing numbers of people can afford to eat well, food for the poor will become scarcer because demand for animal products will surge, and they require more resources like grain to produce. A global population growth of less than 30 per cent is projected to double the demand for animal products.

While the population is growing, there are also arguments that there is a lot of waste of food and overconsumption and gross unequal distribution of food. In a way, the problem at the world scale is not of food production. The world has long produced enough calories, around 2,700 per day per human, more than enough to meet the United Nations' projection of a population of 9 billion in 2050. There are hungry people not because food is lacking but because not all of those calories go to feed humans: a third goes to feed animals; nearly 5 per cent are used to produce biofuels, and as much as a third is wasted, all along the food chain (Bittman 2013).

Nepal's problem is not only 'eating well', it is also of less availability and less accessibility. For example, Nepal now produces only 80 per cent of food at absolutely basic level. Then, about half the children below five are malnourished (CBS 2013). Food production growth has not been commensurate with population growth rate. Nepal is becoming more and more dependent on other countries for food and the food imported from distant places obviously lacks quality. For example, Nepal imports almost NRs 1 billion worth of rice a month. Nepal's rice imports in fiscal year 2012/13 (July 16-July 15) increased to around 504,500 tons, up about 18 per cent from around 428,125 tons in the previous fiscal year. In terms of value, Nepal imported about NRs 14 billion worth of rice in FY 2012/13, up about 40 per cent from around NRs 10 billion; about 98 per cent of the rice is imported from India. In total, Nepal imported food stuff worth NRs 99.34 billion in 2012/13 - a significant increase from NRs 76 billion in 2011/12, vegetables worth NRs 51 billion, cereals and beverages worth NRs 26 billion, animal and vegetables worth NRs 18 billion, live animals and animal products worth NRs 3.5 billion (Prasain 2014).

One of the reasons for increasing rice imports is shortfall in rice production against growing demand. Per capita rice consumption in Nepal stands at around 122 kg per person per year, compared to 41 kg for maize and 17 kg for wheat (Oryza 2013). In addition, Nepal grows only half of the maize demanded by the animal feed industry and imports the shortfall of 135,000 tons annually, according to USAID (IRIN 2012).

It is certainly important to increase the overall production of all kinds of food that are nutritious. In this context, seed improvement is certainly required. Seed improvement can be done in various ways – by selection, by developing hybrid seeds and GMOs.

The basic question is the control of seeds. And, thus, any breeding method that leads to sustainable production of seeds, which farmers can save and reproduce, could be an alternative. In this context, hybrid seeds need to be produced locally if at all this possibility is to be followed. But, the available evidence show, as discussed above, there are possibilities to increase food production through improvement in farming system under the rubric of 'sustainable farming', using local seeds and local inputs.

WHAT NEEDS TO BE DONE FOR 'SEED SOVEREIGNTY'?

Various evidence and practices suggest that we need to maintain seed sovereignty for sustainable farming. Seed sovereignty is not about stopping innovations for improvement of seeds, which needs to be done remaining within the framework of seed sovereignty. So, continuous improvement with the participation of farmers and seed scientists is essential. The major thing here should be that farmers are able to save seeds and reproduce them without deteriorating their quality and diversity. So, in this context, some policymakers in Nepal have argued that even hybrid seeds are needed to increase production, but these should be produced within the country for selected crops and seeds should be made available free by the government in such a

case. Moreover, availability of opportunities to improve seeds in farmers' field is very important so that it remains within the control of farmers.

At policy level, the government needs to have a policy that stops the importation of hybrid seeds from outside and give subsidy to farmers using improved local seeds and imposing heavy tax on imported hybrid seeds. The current membership of the WTO does not restrict Nepal from undertaking such measures as there are spaces for such action.

The second way to maintain seed sovereignty is to change the farming practice. Seed sovereignty is lost in the 'industrial model of farming', which is generally undertaken by large companies using chemicals. It does not preserve the health and productivity of earth, and, thus, more and more chemicals and new seeds have to be used. It also does not produce diverse types of healthy food; rather, it produces disease-producing diets. Smallholders' farming is a blessing in disguise for Nepal, which needs to be preserved. This farming is ecologically more efficient than industrial farming, and it can produce food without using imported fertilizers and other chemicals. According to the ETC Group, the industrial food chain uses 70 per cent of agricultural resources to provide 30 per cent of the world's food, whereas what ETC calls 'the peasant food web' produces the remaining 70 per cent, using only 30 per cent of the resources (ETC Group 2011).

It is true that high-yielding varieties of any major commercial monoculture crop will produce more per acre of grain than the peasant-bred varieties of the same crop. Again, there are questions, as discussed above, about the yield and productivity and how to measure these. Sustainable farming, on the other hand, provides a range of benefits which are usually not accounted for in the narrow definition of yield. For example, diversifying crops, mixing plants and animals, planting trees (the traditional mixed, integrated and diversified farming system) provides not only fruit/grain but also shelter for birds, shade and fertility through nutrient recycling. Small landholders can produce more food, and more kinds of food, with sustainable farming techniques and with fewer resources and lower transportation costs (which means a lower carbon footprint), while providing greater food security, maintaining greater biodiversity and even better withstanding the effects of climate change. And all of this without the level of subsidies and other support that industrial agriculture has received in the last half century. Sustainable agriculture is the future and is a constituent element of 'seed sovereignty'. Therefore, any innovations in seeds need to be looked at through the perspective of 'food sovereignty'. In this regard, Vandana Shiva rightly says:

> The seed has become the site and symbol of freedom in an age of manipulation and monopoly of its diversity. It plays the role of Gandhi's spinning wheel in this period of recolonization through free trade. The charkha (spinning wheel) became an important symbol of freedom because it was small; it could come alive as a sign of resistance and creativity in the smallest of huts and poorest of families (Shiva 1997: 126).

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