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**SEED DIVERSITY IN
THE DRYLANDS:
WOMEN AND FARMING
IN SOUTH INDIA**

Carine Pionetti

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EXECUTIVE SUMMARY

Seeds are central to farming and food production. Saving, selecting, reproducing, storing and sowing those seeds is often dependent on women's knowledge and expertise. In the dryland farming systems of South India's Deccan Plateau, women's roles in maintaining seed and crop diversity enable rural families to cope with the region's many environmental demands. Here seeds and their management form an economy all of their own, whereby self-reliance in seed, crop diversity and nutrition are closely intertwined.

But increasingly, seeds are becoming the 'property' of the private sector and big business. The burgeoning seed industry undermines the scope for farmers to save their own seed through a mix of technological, legal and economic strategies. These include reducing the genetic variability of new crop varieties through pureline breeding methods or genetically engineered seed sterility; intellectual property rights regimes such as breeders' rights and patents which make it illegal for farmers to reuse seeds; variety registration and seed certification schemes backed by economic rules or subsidies; and gender-blind laws which provide no scope for enhancing women farmers' practices, choices and concerns in the realms of biodiversity and seed production.

This has serious implications for women as autonomous seed producers by:

1. degrading their knowledge systems and innovation capacity
2. destroying an activity that provides a living for marginal and landless farmers
3. undermining solidarity networks on which poor rural households critically rely
4. undermining women's status and intra-household bargaining power as their role in seed and grain management is eroded by market forces
5. destroying localised seed economies: seed regulations hamper farmer-to-farmer seed exchanges that have been shown to reinforce ecological sustainability and to secure livelihood and social capital in rural communities

The author argues that a radical re-orientation of public policies is needed to support autonomous seed production. Poverty alleviation and biodiversity conservation both directly depend on:

1. Strengthening diversity-based farming systems
2. Institutional support for decentralised seed systems
3. Shifting policy orientations so that technical and legal developments support, rather than undermine, autonomous seed production

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CARINE PIONETTI is an independent researcher with a particular interest in gender relations and biodiversity, autonomy as a key factor in sustainable rural livelihoods, indigenous environmental knowledge in relation to other forms of knowledge, participatory research methodology and action-research approaches that help to bring dissenting voices into the political arena. Email: cpionetti@yahoo.com

SEED DIVERSITY IN THE DRYLANDS: WOMEN AND FARMING IN SOUTH INDIA¹

Carine Pionetti

INTRODUCTION

The diversity of crops in existence today results from natural evolution coupled with the domestication practices of farmers across the globe. For millennia, farmers have developed farming practices adapted to local conditions, and maintained the adaptive and productive potential of their crops and their wild relatives. Agricultural biodiversity is extremely high for crops like rice, potato, wheat, barley and sorghum. It is estimated, for example, that over 50,000 varieties of rice were grown in India before the Green Revolution.

It is often women, through their intimate knowledge and micro-management of seeds, who have played a major role in shaping this diversity. Women's knowledge and use of plants not only concerns crops, but also uncultivated species that are gathered to meet food, fodder, fuel or health needs (Howard, 2003).

But over the last five decades, seeds have begun to slip through women's fingers as they increasingly become the prerogative of breeders, genetic engineers, commercial seed growers, registered seed dealers and bureaucrats in charge of seed market regulations. Commercial seeds are developed against a background of technological control, economic efficiency and rational management. The commercialisation and adoption of new crop varieties is undermining women's roles in the realms of seed and crop management, and has serious implications for the maintenance of agro-biodiversity, for food security and for women's role in the countryside and in the household.

In this paper I explore these threats in a case study of the farming system of the Deccan Plateau in South India. I look in particular at women's roles in agriculture

1. This paper is based on the author's book, *Sowing Autonomy: Gender and Seed Politics in semi-arid India*. IIED, 2005.

and especially the important part women play in saving and reproducing seed. This is set against the backdrop of the increasing commercialisation and centralisation of the seed sector and agriculture in general.

RESEARCH APPROACH

This study is based on participatory research I carried out over 15 months from 2000 to 2002 in eight villages from Medak and Adilabad districts in Andhra Pradesh. Both are dryland districts and farming is largely rainfed. These eight villages include a range of dryland farming systems, which allowed me to contrast two major types of seed systems: one largely run by farmers and based on local crop varieties adapted to dryland conditions, and the other driven by a commercial logic and based on hybrid seeds developed by the public and private seed industry.

This work draws on a number of disciplines and schools of thought:

1. Political ecology, to explore the linkages between environment, poverty and the problem of control and access to resources.
2. Gender studies, which provide methodological and theoretical tools for a study of gender relations in various cultural contexts.
3. Ivan Illich's frame of analysis (Illich, 1976; 1996 and see Box 1), to explore questions like what the shift from self-produced seeds to commercial seeds means for freedom, equity and gender relations; whether informal and formal seed

Box 1: The erosion of tradition and autonomous learning

Ivan Illich argues that owing to the 'industrialization of our world view', the fact that commodities produced by the industrial sector compete with individual capacities for autonomous production is often overlooked. The loss of capacity for autonomy and self-determination is a direct consequence of the expansion of the industrial model of development. An important mechanism in this process is what Ivan Illich has termed 'radical monopoly': 'the substitution of an industrial product or a professional service for a useful activity in which people engage or would like to engage', leading to the deterioration of autonomous systems and modes of production (Illich, 1996). Radical monopolies replace non-marketable use-values with commodities by reshaping the social and physical environment and by appropriating the components that enable people to cope on their own, thus undermining freedom and independence (Illich, 1976). Illich argues that 'the invasion of the underdeveloped countries by new instruments of production organized for financial efficiency rather than local effectiveness and for professional rather than lay control inevitably disqualifies tradition and autonomous learning'.

systems can co-exist; and how the development of a techno-structure (the seed industry and its research, marketing and regulatory apparatus) affects individual farmers' capacity to produce their own seeds.

SEEDS AND LIVELIHOODS ON THE DECCAN PLATEAU

The Deccan Plateau receives scanty rainfall, is regularly hit by drought, and is characterised by increasing out-migration – seasonal and permanent – in search of more secure livelihood opportunities. At the same time, this region is home to a rich rural agrarian culture, and still harbours a very significant diversity of crops and livestock (Satheesh, 2002).

Why do farmers save seed?

In India it is estimated that over two-thirds of farmers produce seeds from their own harvest (Sahai, 2000). This estimate is remarkably high if we compare it to the percentage of farmers who use farm-saved seeds in Europe, which varies between 10% and 50% depending on the crop and the country.

In the Deccan Plateau there are three types of seeds: farmers' seeds in the case of local varieties (sorghum, pigeonpea, safflower, mustard...); farm-saved seeds in the case of improved open-pollinated varieties (rice, blackgram, greengram...) and commercial seeds in the case of hybrids (cotton, maize, sorghum, chillies...).

When asked why seed-saving is essential, farmers invariably emphasise the interconnectedness between self-reliance in seed, crop diversity and nutrition. By extension, the realms of food culture and religious rituals (which entail the use of traditional crops) are also linked to seed autonomy. What is most significant about the intertwining of seed-saving, crop diversity and nutrition is that these three realms are largely under women's control. Being able to save their own seed means that women can ensure:

- diversity in crops and food, both now and in the future
- crop characteristics that meet their own specific needs
- the ability to sow at the optimal time
- the accumulation of seed capital
- self-reliance and bargaining power within the household

These motives emerged during a series of collective discussions and participatory enquiries. One exercise consisted of developing a matrix plotting various parameters

for seed-saving (identified by farmers) against farm size (Table 1).² The farmers' different categories (horizontal axis) were developed through a consultative group process.³ The category of 'marginal and landless farmers' includes people with access to tiny holdings 'of the size of an underwear' as Paramma, who owns only one-tenth of a hectare herself, put it. It was also the participants' decision to use five degrees of scoring (the higher the score, the more important the criterion) in order to show with great precision the differential weight carried by each motive behind seed-saving and how they related to landholding size.

Table 1. Small, medium and large farmers' rationales for saving seeds

Categories of farmers	Marginal and landless (0 to 0.4 ha)	Small (0.5 to 1 ha)	Small to medium (1.1 to 1.9 ha)	Medium (2 to 4 ha)	Large (above 4 ha)
Parameters					
Crop diversity on farm	-	•••••	•••••	••••	•••
Diversity in foodgrains	•••••	•••••	•••••	•••••	••••
Ability to sow fields in time	-	•••••	•••	•••	•••
Interest on seed loans	•••••	••••	•••	••	•
Seed lending as a livelihood	•••••	••	•	-	-
'Standing on our own feet'	-	••••	••••	•••	••
Independence from the market	-	••	•••	••••	•••••

1. Diversity in crops and food

Sources of stresses are numerous in the drylands (drought, insect attacks, diseases, high temperatures, off-season rains...) and one of the major ways farmers try to minimise risk is by growing a diversity of crops and crop varieties. 'If we sow ten or twelve crop varieties in our fields, we are sure to get a crop from at least four or five of them. This ensures that we harvest at least some grains to eat', say two farmers from Humnapur. Relying on various varieties of a single species is another risk-minimisation strategy. Ratnamma tries to increase her chances of getting a foxtail millet crop by growing three varieties instead of one, as these varieties respond differently to uncertain weather conditions, and especially to moisture stress.

2. This collective work took place in Shamshuddinpur in March 2001 with 23 farmers (16 women and 7 men). The rationales for saving one's own seeds were represented symbolically along the vertical axis, using locally available materials (stones, seeds, flowers, soil....).

3. During the discussion before we made the matrix, I asked whether the reasoning behind seed-saving may be a function of caste. Several women rejected this hypothesis, arguing that seed-saving motives were closely related to the size of farm, which was why this was a major parameter in the matrix.

While discussing the diversity of crops on their land, small women farmers frequently point out that growing such a wide range of crops would not be possible if they did not have the seeds ‘in their hands’. This concern is unequivocally expressed by Manemma when she asks: ‘Where would we get small amounts of seeds for our traditional crops if we did not save them ourselves?’. Small farmers need relatively *small amounts of seeds for a large number of crop varieties*: 100 g of sesame, 500 g of blackgram, 1 kg of finger millet, a handful of roselle seeds etc. Secondly, women farmers have very specific crops which they want to grow in addition to staple crops like sorghum or maize (in parts of Adilabad). There is no guarantee that outside seed agencies can provide them with seeds for all these crops. Therefore, the surest way – and perhaps the only way – of accessing these seeds is to save them from one’s own harvest. This logic is upheld not only by most small farmers, but also by many medium-scale farmers like Sushilamma. Thanks to their seed stocks, women farmers can maximise the number of crops grown on their land, and thus produce grains for a varied and nutritious diet.

2. Maintenance of local seed selection practices

By selecting their own seeds, farmers can ensure that crop characteristics meet their own specific needs. During collective discussions in Shamshuddinpur, Anjanna, a Golla farmer, asked: ‘How can we select the best seeds if we do not keep our own seeds?’, giving two examples to illustrate his point. Since *Malajonna*, a local sorghum variety, is susceptible to charcoal rut disease, it is important while selecting seed earheads to discard those affected by the disease. Likewise, in crops like pigeonpea and chickpea, farmers need to be able to select seeds from plants that are the most resistant to damaging pests.

Seed selection can also help farmers meet specific needs. For example, in certain varieties of pearl millet there is a small spikelet at the tip of each grain which makes it difficult for birds to nibble away at the earheads. A farmer growing pearl millet in an isolated location may try to select grains that have long spikelets to protect his crop from birds. In an area where everyone grows pearl millet, and where children regularly spend time in the fields to watch over the crop, earheads with long spikelets may not be so essential.

3. Sowing at the optimal time

Saving one’s own seeds is often the only way of ensuring that fields are sown on time. As Narsamma plainly puts it, ‘Once the time is gone, there is no more point in sowing’. Seed loans from other farmers are rarely availed of on time, as these

farmers only give seeds away once their own sowing is over. This makes the position of seed-borrowers somewhat precarious. Buying seeds depends on the monetary status of the household and on market dynamics (farmers often complain of late supplies and rising prices at the time of sowing). Late sowing has serious consequences. According to Bichappa, a 15-day delay in sowing invariably leads to a significant drop in yield for three reasons: the upsurge of pest attacks coinciding with crucial stages of plant growth, the greater vulnerability of plants to diseases and the concordance of the flowering stage (of pulses especially) with seasonal rains, causing damage to the flowers and leading to a decline in yields.

4. Building up seed capital

Seeds are a genuine asset in the hands of women farmers. A surplus of seeds can be given away as a loan that will be reimbursed in grain at the end of the season. Although all types of farmers exchange seeds (with some variation depending on landholding size, social belonging, etc...), small and medium farmers are the most involved in these transactions (both at the giving and the receiving ends). Amongst marginal farmers and landless households, some virtually turn seed-making into a skilled trade which they use to increase the meagre quantity of foodgrains they rely on for their subsistence. In this way, the act of lending seeds becomes an additional source of livelihood.

5. Autonomy

One of the strongest reasons for farmers to save their own seeds is undoubtedly the desire to be self-reliant. This eliminates the need to depend on other farmers or on the market for seeds. For a small farmer like Tuljamma, who farms a 0.4 ha plot, 'even buying a single *ser* [1.5 kg] of seeds is very difficult'. Hence, saving seeds is vital in order to keep her land productive. Moreover, seeds represent an asset that women have control over, unlike money: 'Money doesn't last, but seeds *do* remain with us' says Narsamma. Dalit women farmers find it especially important to 'stand on our own feet' by being self-sufficient in seeds, so as to be spared the trouble of having to ask upper caste farmers for seeds in case of shortage.

By controlling seeds, women farmers can influence and even steer cropping decisions in order to ensure household food self-sufficiency. Moreover, the diversification of crops and varieties is a strategy small women farmers use to increase their bargaining power with their husbands over the use of the crop (self-consumption vs. sale), as clearly exemplified by testimonies from Chilammamadi farmers (Box 2).

Box 2: Sowing autonomy

A small farmer from Chillammamadi explains that by sowing three varieties of chickpea instead of one, she obtains a harvest composed of three small volumes (25 to 30 kg) of black, red and brown chickpeas. This subdivided harvest does not make for a good market sale which gives her a good reason for dissuading her husband from selling the harvest to a grain merchant or a trader. If the harvest amounts to one quintal of a single chickpea variety, it is more difficult for her to convince her husband to store the grain instead of selling it. This compelling micro-economic logic shows that genetic diversity can help women fulfil their double agenda of ensuring household food security and of building up food stocks for lean agricultural periods.

In Pipri, in order to ensure a harvest of pulses and oilseeds, women farmers discreetly mix seeds of the 'minor' crops into the bulk of sorghum seeds before handing over the seed bag to the person who is in charge of sowing (husband, son, mother-in-law, brother-in-law...). Sowing is done by two people, often by a man and a woman, the man driving the plough and the woman dropping the seeds in the driller. Jangubai explains: 'If my husband and I go together for sowing, I prepare the seeds of all the varieties I want to grow and bundle them up in my *saree* while he is busy preparing the plough'. When her husband realises that what is being sowed is a mixed crop, 'he grumbles for a little while, but there is not much more he can do'.

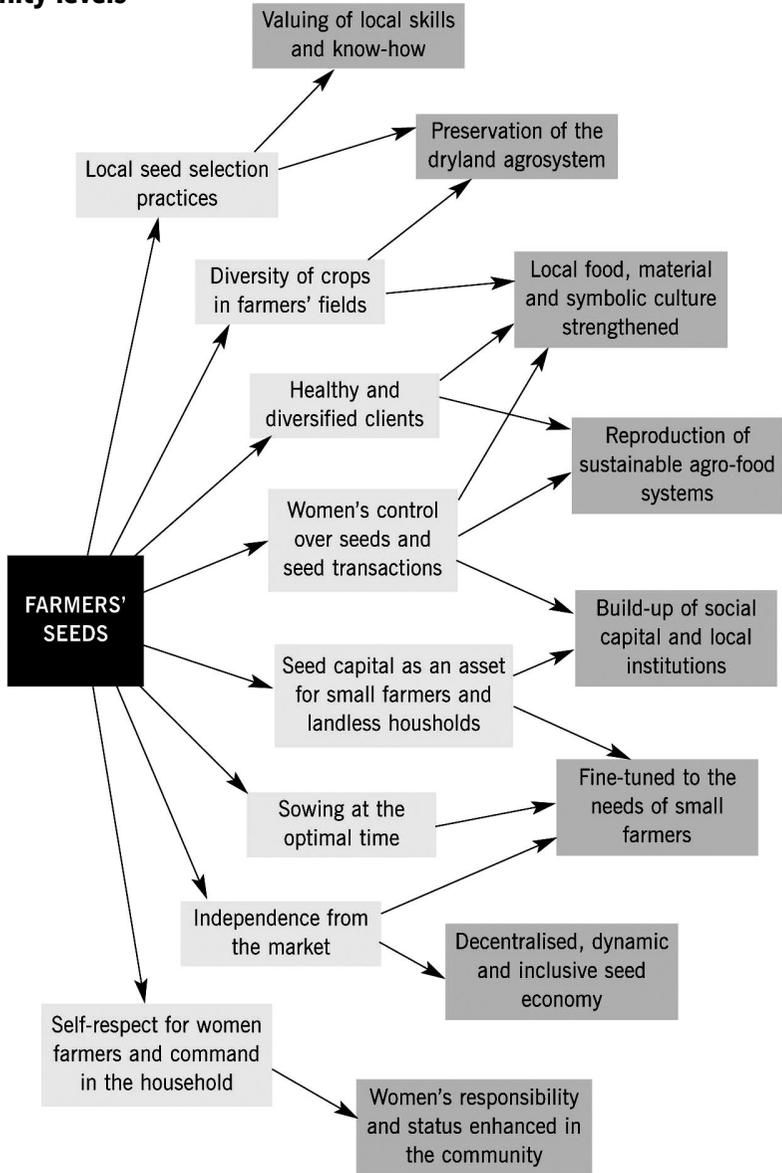
Women also clearly stress that having food stocks in their homes gives them command in the household and in their community. 'If I have sufficient grain in my house, I have command. I can give grain to people who come and ask for it without asking my husband', says Bichamma. Yet women farmers' bargaining capacity is extremely precarious, and even more so due to their lack of fall-back options such as individual landholdings (Agarwal, 1997). If men's cropping choices start prevailing because of endogenous or external factors, then conflicting interests arise within the household.

The value of a local seed economy

Individual women's seed work merges with practices of seed exchange at the community level to form a 'localised seed economy'. That farmers give and take seeds from each other, for dozens of crop varieties, without any money changing hands, is extremely significant for ecological, economic, social and cultural reasons (Figure 1).

The continuous exchange of seeds for local crop varieties circulates genetic resources from one field to another within a village territory and beyond. The dynamic management of genetic resources enhances the stability of traditional agrosystems, increases the adaptation potential of local crops to evolving environmental conditions and limits the risk of genetic erosion. Seed transactions also help ensure that land is not left fallow for lack of seeds, thus avoiding soil erosion and increasing the soil's organic matter content and water retention capacity.

Figure 1. The virtues of self-reliance in seeds at the household and community levels



Light grey box: Benefits of seed-saving practices at the household level

Dark grey box: Benefits of self-reliance in seeds at the community level

Furthermore, the local seed economy amounts to the most decentralised seed supply system that can be imagined. If a farmer faces a seed shortage, she or he is sure to find a source of local seeds within the community itself. Seed transfers also strengthen social ties in the village: farmers rely on each other for seeds. Inter-caste or inter-class seed transfers are very frequent. Thus, in spite of the significant social and economic disparities within rural society, for local seeds there are no pre-determined inequalities: the community as a whole is in control of the genetic variability contained in its seeds, and there is no scope for its appropriation by a single group.⁴

In parts of the Deccan Plateau where the traditional diversity-based cropping pattern still prevails, farmers estimate that at least 20% of all landless and small farmers derive some degree of livelihood from seed loans to other farmers. This means that local seed economies play a certain role in securing a livelihood for the poorest, and that, consequently, quite a significant number of families have a special stake in the persistence of the informal seed domain.

In fact, seed self-reliance at the community level may well be the *only* way for small women farmers to practise farming that provides sustenance and gives them some autonomy in the economic, cultural and, by extension, political spheres. This underlines the absolute necessity for local seed economies to continue to exist.

CHANGES IN CROPPING PATTERNS AND THE EMERGENCE OF NEW RISKS

Recent years have brought about a whole series of changes to the agriculture of the Deccan. The main influences are climate change, new agricultural policies, socio-economic transformations and institutional incentives for the expansion of cash crops. These are affecting cropping patterns and crop productivity, the role of livestock, soil nutrient balances, groundwater availability, sustainability, food security and the economic viability of small farms. Of particular concern to this paper is the impact of these influences on the local seed economy and women's seed-saving practices.

⁴. However, there is a risk of appropriation of crop genetic resources by external agencies through commercialisation or the imposition of intellectual property rights. Numerous such cases have been reported in several countries including India, and they are being addressed through various legal and institutional measures. These include the establishment of Community Biodiversity Registers (Andhra Pradesh Coalition in Defence of Biodiversity), the creation of a digital database on traditional knowledge (Council for Scientific and Industrial Research) and the development of agreements and laws that recognise and protect the rights of local communities over their own resources, like the Model Law of the Organisation for African Unity (2000).

The growth of the industrial seed and farming sectors

The moment farmers adopt one or several components of the agro-industrial system, they inevitably find themselves locked into a production chain where the choice of inputs and the use of the harvest are pre-determined by agro-chemical and food-processing firms. Thus, 'modern' farmers progressively lose their ability to make autonomous decisions about modes of production, crops, type and quantity of inputs and use of the produce. The transformation of farmers from independent producers to providers of raw material for industry also means that farmers become dependent on a network of technical information generated by specialists (agricultural scientists, chemists, genetic engineers, nutritionists...) and transferred to farming communities by agricultural extension workers or technicians.

For most actors in the commercial seed sector, the use of local varieties and farm-saved seeds by the vast majority of farmers across the developing world is nothing less than an aberration. The development of the seed industry is commonly seen as running parallel to the modernisation of agriculture. A clear connection is thus established between the seed industry's capacity to earn returns on its investment, farmers' access to improved germplasm and the development of agriculture (Yapa, 1996). This view sets the stage for fully-fledged institutional support for commercial seed models over farmer-centred seed systems, reputed to be inefficient and obsolete.

Like any other seed industry in the world, the Indian seed industry has a vested interest in increasing the seed replacement rate, i.e. the proportion of seeds purchased annually, for all major food and cash crops. In India, this rate averages around 30 to 35%, with relatively low rates (below 30%) in food crops like rice, wheat and millets and much higher rates (to the tune of 95%) in commercial crops like cotton or maize. The industry proposes raising the overall replacement rate to 65% in the coming decade. In other words, the aim is to create a seed market catering to 500 million farmers, at the very least. Another objective is to banish seed-saving practices on-farm, as these severely limit seed sales and therefore hinder the growth of the seed industry.

The public sector's approach to plant breeding and seed production has evolved over the years. Growing emphasis has been placed on the release of hybrid varieties and on the development of genetic engineering, with a growing neglect of open-pollinated varieties that can easily be reproduced by farmers.

Box 3: Like sowing in water: the problem with commercial seeds

The commercialisation of seeds and other agricultural inputs creates new forms of discrimination against small and marginal farmers. There is an alarming connection between illiteracy and poverty on the one hand, and access to quality inputs and information on the other. Given that in intensive chemical agriculture the capacity to access inputs largely determines crop yields, the potential of this 'new' agriculture is in reality extremely limited for small non-literate farmers.

'If we go to a shop wearing these [shabby] clothes, we are sure to get second rate seeds' remarks Poshamma, a small woman farmer from Bhoraj. Poor people have little bargaining power when buying inputs from dealers. First, they cannot afford to buy the 'high quality' branded seeds that large farmers buy, and which tend to give better results. Secondly, being largely illiterate, they are unable to read labels or identify seed packages and thus to discriminate between 'low quality' and 'good quality' seeds. Furthermore, they often lack information on how to use commercial inputs (including hybrid seeds that entail precise management practices). Thirdly, their low social status, often associated with a lack of self-confidence, hinders small farmers from demanding higher quality seeds and other inputs or stops them from protesting when shoddy products are sold to them. In fact, it is not uncommon for input dealers to take advantage of poor farmers' unawareness: 'I sell second rate pesticides to the illiterate people that I don't know', says a pesticide dealer from Warangal District.

'Sowing these seeds is like sowing in water. You can never be certain that the seeds will grow', says Gangamma, also from Bhoraj. Hybrid seeds do not come up well unless chemical inputs are regularly applied to the crop. Farmers often comment on the fact that the required levels of inputs increase from one cropping cycle to the next (this is true for both fertilisers as well as pesticides). Adivasi women farmers from Vaizhapur compare the local sorghum varieties they used to grow with hybrid sorghum: 'At that time, as long as you had the seed, you could get a good crop. You just had to sow Pedda Jonna and it would grow. Now we need to get seeds from middlemen. We have to buy fertilisers on credit and pay an interest on them. If you apply fertilisers, the crop grows. Otherwise it doesn't'.

When asked to compare the yield of hybrid sorghum with that of local varieties, most women farmers respond as follows: 'Nowadays, it depends on how much we spend! To grow [today's] crops, we need to spend rupees... by the thousand!'. Thus, with commercial seeds, there is no such thing as the 'intrinsic worth' of a seed. These added layers of dependency on purchased inputs increase the risk of a crop failing for lack of sufficient investment.

On a global scale, the seed industry undermines the scope for farmers to save their own seed through a mix of technological, legal and economic strategies. These include reducing the genetic variability of new crop varieties through pureline breeding methods or genetically engineered seed sterility; intellectual property rights regimes such as breeders' rights and patents which make it illegal for farmers to reuse seeds; variety registration and seed certification schemes backed by economic rules or subsidies; and gender-blind laws which provide no scope for enhancing women farmers' practices, choices and concerns in the realms of biodiversity and seed production.

The impact of commercial seeds on women and crop diversity

In most villages on the Deccan Plateau, localised seed systems co-exist with the formal commercial seed system. Farmers rely on the latter for high-yielding varieties of greengram, blackgram, pigeonpea and, more importantly, for hybrid varieties of cotton, sorghum, maize, chillies and a range of vegetables. However, the need to purchase these seeds imposes a whole series of constraints on cash-poor farmers and invariably leads to indebtedness (Box 3).

The growth of the commercial seed sector has had a profound impact on local seed exchange systems. In areas where commercial crops have almost completely displaced food crops, the practice of seed-saving itself is disappearing, with subsequent loss of local knowledge on maintaining agrodiversity, traditional breeding, seed selection, seed production and storage. By losing their prerogative over seeds, women have lost their main means of ensuring mixed cropping in their fields, with adverse consequences for the land and for plant diversity. As cropping systems lean towards commercialisation and away from dryland food crops, women's role in decision-making about cropping cycles and practices diminishes. Furthermore, with most cash crops women farmers have very little control over the harvest and its uses (Mehta, 1996).

Thus the processes of industrialisation and institutionalisation in the seed sector are undermining the very basis of autonomous seed production by:

- degrading farmers' knowledge systems and innovation capacity
- destroying an activity that provides a living for marginal and landless farmers, especially in female-headed households
- undermining solidarity networks on which poor rural households critically rely
- undermining women's status and intra-household bargaining power as their role in seed and grain management is eroded by market forces
- destroying localised seed economies: seed regulations hamper farmer-to-farmer seed exchanges that have been shown to reinforce ecological sustainability and to secure livelihood and social capital in rural communities

Why does it matter?

While this process has been occurring in agrarian societies for centuries, there are a number of reasons why it is of serious concern in the drylands:

- The erosion of agricultural diversity and women's role in maintaining it will

prevent such areas from adapting to environmental changes such as climate change

- Because of their role and responsibilities, women farmers have a different approach to risk, which may be more ‘conservative’ but also more sustainable in the long-run
- The increasing levels of indebtedness in rural areas point to the need for a better balance between high-input, high-cost and high-risk practices and the low-input, risk-proof alternatives that women tend to practise
- The increasing phenomenon of male migration to towns and cities means that women farmers have to play a greater role in dryland agriculture. Yet women’s ability to make independent decisions is hindered by their lack of legitimate control over land, credit, inputs, etc... This suggests that policymakers should focus on policies that meet women farmers’ needs in terms of access to and control of resources

CONCLUSIONS

Perhaps one of the greatest challenges facing world leaders today is to reverse the present trend of progressive elimination of the least productive and least competitive family farms which provide a livelihood for over a quarter of the world’s population. A corollary goal is to develop more sustainable and democratic agri-food systems (Pimbert *et al.*, 2001).

While a section of economists continues to see new technological developments in agriculture as the only way ahead, a growing number of agro-economists argues in favour of a prolonged, steady and significant rise in the price of basic agricultural commodities. The major impacts of this measure would be to substantially increase the revenues of small non-competitive farms and thus to limit the rural exodus (Mazoyer and Roudart, 1998). This approach would mean increasing research and policy support to the least productive farming systems. In other words, we need to reverse the current trend of channelling funds and increasingly sophisticated technologies into capitalist export-oriented agriculture, which happens to be the most immediately competitive.

Seed being central to farming strategies, it is essential to rethink the development of seed systems in accordance with these principles (Almekinders, Louwaars and De Bruijn, 1994). It would be illusory to think that the seed industry can be done away with. Private players in the seed industry are well-established and they are exerting more and more influence on the agenda of the public sector. The fact that most public research institutes now work on the development of genetically engi-

neered crops – despite the multiple layers of risks and dependencies associated with them – is a case in point.

What is possible, however, is to build synergies between the institutional sector and the informal sector as suggested by Ivan Illich.

The Indian seed industry is developing at a fast pace in a context of economic liberalisation and poses serious threats to the very existence of farmer-centred seed systems. Therefore, public policies need to be re-oriented towards a) providing support to the informal sector and b) building synergy with localised systems of innovation, production and exchange of seeds (Figure 2). The institutional system has to work on the development and sustainability of a seed system suited to the needs of small dryland farmers through the following activities:

1. Providing institutional support for decentralised seed systems

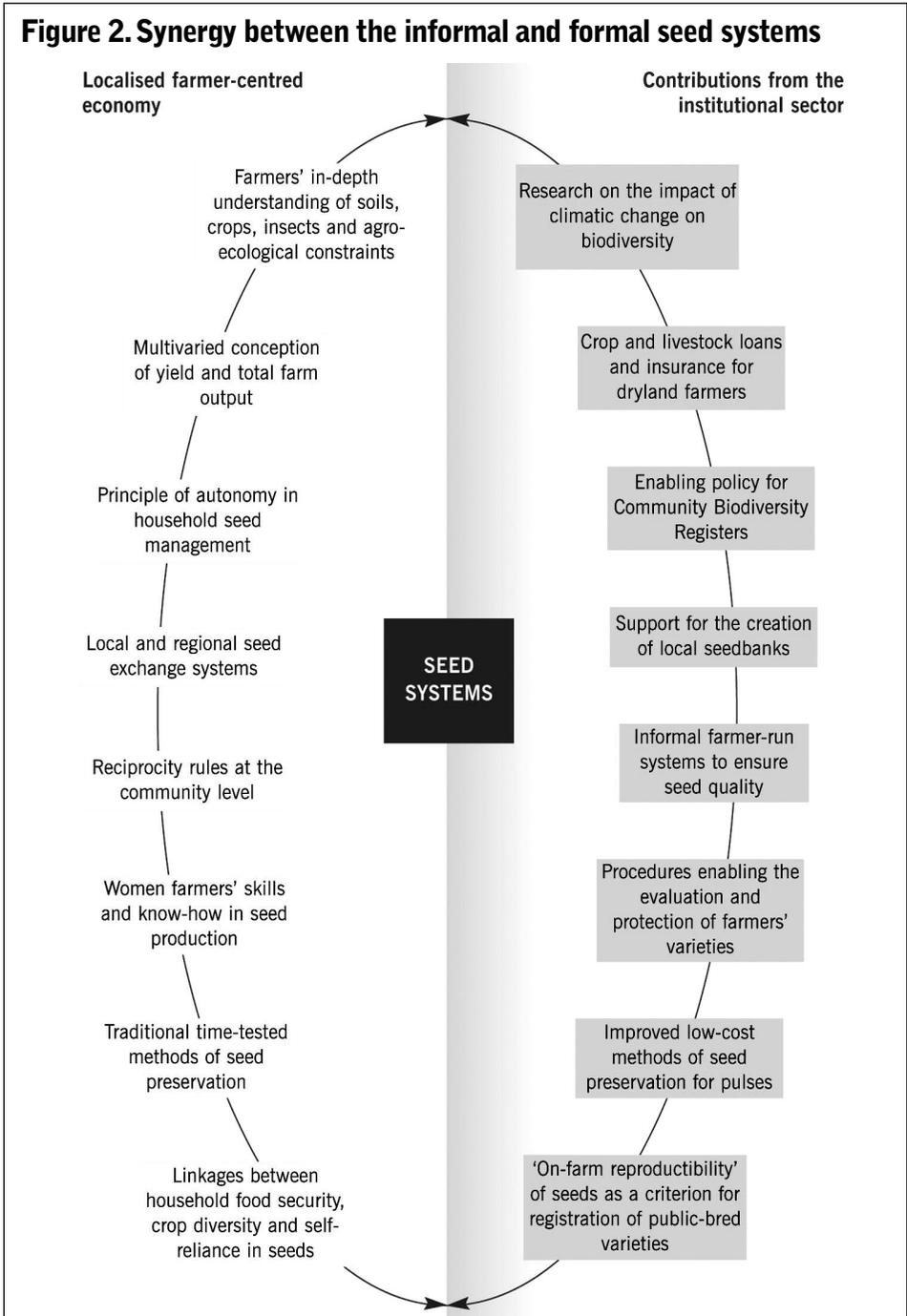
- Support farmer-led participatory breeding and selection in public research institutes and enjoin scientists to give priority to breeding criteria such as low-input requirements, yield stability, food and fodder quality
- Recognise and enhance women's role and expertise in the selection, production, storage and distribution of seeds in farming communities
- Support community gene banks which improve farmers' access to seed for local varieties, reduce small farmers' dependence on large farmers and act as seed insurance systems in the event of large-scale crop losses
- Encourage landless households (especially female-headed households) to take part in village seed production for local food crops but also for tree crops and medicinal plants
- Help farmers develop seed certification schemes based on local criteria to guarantee seed quality and to favour the circulation of farmers' seeds at the regional level

2. Strengthening diversity-based farming systems in the drylands

a) On the ecological front

- Ensure farmers have timely and appropriate access to livestock, organic inputs, biopesticides and seeds for dryland crops
- Document local practices which foster agrobiodiversity on farmlands
- Intensify people's involvement in watershed development and discourage costly and risk-prone irrigation based on the unsustainable use of groundwater

Figure 2. Synergy between the informal and formal seed systems



- Increase the resilience of dryland agro-ecosystems to environmental change through participatory studies on climate change and its impact on plant biodiversity
- b) On the economic and social fronts
- Increase the viability of organic and low-input farming practices through adequate price support mechanisms for dryland food crops and through a re-orientation of subsidies in favour of ecologically-sound agriculture
 - Provide low-cost methods for long-term grain storage as well as processing technologies for dryland crops
 - Develop alternative land-based livelihood activities for small and marginal farmers and for landless households
 - Democratise local institutions and introduce the goal of gender equity in regimes of access and control over productive resources
 - Protect small farms from the adverse impact of global trade agreements

3. Shifting policy orientations on technological and legal developments

- a) On new technologies and corporate practices
- Develop mechanisms for a systematic independent assessment of the ecological, socio-economic and gender impact of new technologies on small and marginal farmers and on farming communities
 - Introduce measures that limit the adoption of technologies known to generate indebtedness in farming communities (chemical pesticides, transgenic seeds)
 - Monitor and regulate the use of commercial arrangements (contracts, technology-user agreements...) that pose a threat to the informal seed sector
 - Make private corporations accountable for any damage caused to farmers
- b) On intellectual property rights
- Assess the seed industry's demands for more stringent intellectual property rights over seeds in the light of long-term economic, social and psychological impacts on farming communities
 - Refuse patenting of plant and animal life
 - Strengthen farmers' rights on local crop varieties and penalise Indian and foreign breeders violating these rights

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