Creation and Use of Micro-environments by Rainfed Farmers

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Robert Chambers
Administrative Staff College of India
Bellavista
Hyderabad 500 049

CREATION AND USE OF MICRO ENVIRONMENTS BY RAINFED FARMERS

The significance of the creation and use of micro environments by rainfed farmers can be understood against the background of five major changes in understanding of agricultural and rural development.

1. Sustainable livelihoods

Increasingly, thinking about agriculture puts people first. Concerns about the environment and about people have led to the concept of sustainable livelihoods. Given the large increases in rural populations which can be anticipated, a high priority, especially in rainfed areas, is to generate more livelihoods that are sustainable and adequate so that more people can be enabled to find their living in rural areas. Increasingly, also, sustainable livelihoods are recognised as often requiring a diversity of household activities and enterprises. A contrast can be drawn here between strategies which are "hedgehog" and "fox". This follows from the Greek proverb "the fox has many ideas but the hedgehog has one big idea". Rural peoples' livelihoods can be seen as either those of "hedgehogs" which have only one major source of support and those of "foxes" which are much more diversified, with different activities undertaken up by different members of the household at different times of the year and in different places. Opportunities for sustainable livelihoods may therefore be sought through diversifying environments and opportunities.

2. Who produces and who can command food

In the 1960s the main priority was seen as producing more foodgrains. The priority now is much more to enable those with inadequate livelihoods to produce more themselves or to gain incomes which enable them to buy adequate food. This has directed attention towards more difficult areas and problems than those of the earlier green revolution. The balance of priority in production has thus shifted in many countries, as in India, to rainfed areas.

3. From simple commodity approaches to complex systems

The earlier approaches of the green revolution tended towards mono cropping and uniformity. The trend now, especially with rainfed farming, is towards complicating farming systems in terms of the diversity of crops and the complexity of their biological inter-relations. This has pointed towards intercropping, serial cropping, agro forestry of various types, and the introduction of a wider variety of plant material including trees and crops other than the main foodgrains.

4. Regional specialisation

Comparative advantage in food production tends to lie mainly with green revolution areas. It is a reasonable working hypothesis that the future comparative advantage of many rainfed areas will lie with the production and marketing of other crops. Farmers will still wish to grow most of their food, but may also shift away from reliance on growing foodgrains to earn their cash income, and will instead rely on other enterprises, agricultural and non-agricultural for their cash incomes.

5. Rural people's knowledge and experiments

Increasingly, it has been recognised that farmers are experimenters. For many rainfed farmers each new season requires a new combination of activities. What is planted depends on when the rains come and on variable household and economic conditions. No two seasons are alike. In addition, farmers are often enthusiastic at trying out new genetic material on a small scale. Not only are they experimenters; they cannot afford not to experiment.

Three types of agriculture

The significance of these changes of view is sharpened by a classification of systems of agriculture into three: the industrial agriculture of the rich world and of plantation enclaves elsewhere; the green revolution agriculture of large irrigated areas in the deltas and plains of Asia and in some rainfed areas with adequate rainfall; and the "third" agriculture - of rainfed hinterlands, wetlands, hills, and other difficult or fragile areas including, for example, most of the Deccan plateau. The assumption to date has been that the approaches and methods of agricultural research and extension which have worked quite well for industrial and green revolution agriculture would also work for the third, largely rainfed, agriculture. However, it is now recognised that most of the technology generated by normal agricultural research is unsuitable for adoption by rainfed farmers. Their conditions are typically complex, diverse, and risk prone. They often try to reduce risk by diversifying and further complicating their farming systems and adding to the number of enterprises and sources of food and income. Whereas the traditional "transfer of technology" (TOT) approach generates a simple package to be transferred to a uniform and controlled environment, their CDR (complex, diverse, and risk prone) agriculture requires a different approach.

The Potential of CDR Agriculture

The working hypothesis is that industrial agriculture is producing far more than can be sustained in the long term, and that green revolution agriculture is close to its sustainable maximum production. In contrast, CDR agriculture is producing far less than its potential. The value of production per hectare in CDR agriculture is inevitably less than in industrial or green revolution agriculture. This has tended to obscure its high potential production compared with current production, and linked with this its potential for generating and sustaining many more livelihoods.

This potential paradoxically partly results from its current degraded condition, and from the lack of perennials where deforestation has taken place. Realising the potential can be approached through considering three sets of measures:

1. Alternate landuse systems

Some of these are described in the CRIDA monograph Alternate Landuse Systems for Drylands of India (Singh et al, 1987). They include alley cropping, ley farming, pasture management, tree farming in drylands, silvi-pastoral management system, and agro-horticultural system. It is notable that these incorporate grasses and trees in the farming systems, diversifying away from cereal crops, although those may be included.

2. The basket instead of package

The approach here is to present farmers with a wider range of choice of genetic material, both of crops which are already being grown, and especially of new plants. These may include multi-purpose trees, fodder grasses, vining plants, cover crops, vegetables, root crops, and various other "minor" crops. Farmers can then choose from the basket instead of having to adopt a package. This enhances their capacity to adapt to and exploit variable and unpredictable conditions. It also, through perennials, enables them to build up stable stocks of value, notably in trees, which can be cashed or otherwise used at bad times.

3. Reversals of normal views

Together, these three approaches reverse and change much of the normal model of transfer of technology. The term "Farmer First" has been used to describe the complementary model of agricultural research and extension which is implied. Some of the elements in these revers ls and shifts are as follows:

i. from simplifying and standardising to complicating and diversifying in order to achieve more sustainable livelihoods

ii. emphasising stocks of wealth, (animals, trees etc) as well as flows (of annual crops and food)

iii. from major emphasis on foodgrains to more emphasis on other crops

iv. from extension of a package of practices to a basket of choices

v. from soil and water conservation to soil, water and nutrient concentration in localised patches, as practiced by farmers

vi. from water harvesting in tanks to paying more attention to the micro level of very small catchments for individual plants or clumps of plants

vii. from irrigation to nala training and the use of rainfall runoff

viii. from the exploitation of natural flat planes and fields to the creation and exploitation of artificial micro environments

It is with this last that a surprising number of the opportunities indicated by farmers' current tendencies and practices appear to lie.

Micro environments

All farming can be seen as a modification of the environment in order to support livelihoods. In practice, many farmers progressively modify environments over quite long periods - through earth moving, through manuring, through planting perennials, through channelling water, through soil amendments, and so on. These progressive sequences contrast with the one-off nature of most government soil conservation works. Farmers with secure rights in practice often take a long view and gradually develop micro environments through successive interventions.

These micro environments take many different forms:

- many forms of agroforestry, which have been considered in this workshop-cum-seminar on Alternate Land Use Systems in Dryland Agriculture

- patches like old enclosures for livestock which have good nutrients, areas of internal drainage or flood recession, areas with locally deeper soil or better nutrients on which crops can be grown, places which are sheltered either from the sun or the wind or both, and areas where water and nutrients collect naturall, or can be made to collect

- strips, either riverine, or along the edges of nalas or road sides, hedges, and the like

- woods and other concentrations of perennials with multiple canopies, shade, and shelter

- home and kitchen gardens which typically contain a wide range of vegetables and other plants

These are examples of specialised physical and biological niches which occur naturally or which can be and are created. They complicate and diversify farming system, and often enhance the stability and sustainability of livelihoods by increasing production and reducing risk.

The themes of this paper can be illustrated by slides. The subjects covered by these include the following:

- the flat fields of ICRISAT, specially levelled and uniform to assist agricultural research of a conventional type, compared with the messiness of a pig wallow outside a village

- level fields in the form of regular planes chosen in a watershed for the demonstration of contour ploughing and the planting of khus grass

- small gullies on irregular undulating land where contour ploughing is difficult, and where attempts to plough across the contour channel water into the small gullies and aggravate erosion

- the erosion caused by such ploughing as a result of soil conservation interventions

- the contrast of indigenous technology which uses rocks at the low points of fields to trap silt and build up the field and fertility

- a roadway just off the contour used to take off excess rain water, as part of indigenous technology

- the experience of water harvesting technology at Yatenga in Burkina Faso in west Africa. This is an example where outside intervention to build earth bunds failed consistently, although farmers would make the bunds by hand if they were paid to do so. Eventually an indigenous technology using rocks and small pits dug for individual clumps of crop was adapted and further developed and then widely spread through the activities of a voluntary agency working with government. The lesson from this example is the importance of working with farmers on their own priorities to develop technologies which fit their needs, rather than trying to impose technologies from outside

- examples from Ethiopia where erosion in gullies is exploited by farmers who build up gully fields by making rock barriers which they raise year by year to trap more and more silt. Some of these gully fields are dug in at the side and grow sorghum, while others are left with the gully side standing to provide protected environments in which coffee, chat (a narcotic), papaya and other high value crops are grown, although the rainfall is of the order of 700 - 800 millimetres only

- complex multi tier systems of cultivation near Kodaikanal, Tamil Nadu, with jack fruit trees, a vining cucurbit, and coffee growing underneath

- protection through stone walling together with free seeding in Gulbarga District, Karnataka, (undertaken with the support of MYRADA, a voluntary agency) leading to rapid and diverse generation of species and vegetation

- nala training undertaken again in Gulbarga District, with the creation of paddy fields in nalas through trapping silt with rock walls. The rock walls and silt fields can be progressively built up over the years, as in the Ethiopian practice.

Concluding questions

The questions raised by this analysis and these examples include the following:

1. Have micro environments and their creation and exploitation tended to be overlooked by agricultural science and extension?

2. Are they more significant for sustainable livelihoods both currently and in potential than has been realised?

3. Are many of the normal technologies sought to be transferred to farmers in rainfed areas inappropriate because they do not fit or exploit their diverse conditions, especially their micro environmental niches?

4. Are many of the soil conservation measures of government inappropriate because they do not seek to develop micro environments or seek to do so in ways which farmers find difficult to maintain? (Why is it that government programmes so frequently introduce earth bunds, whereas rainfed farmers in different parts of the world appear normally to prefer to use rocks?)

5. If the potentials from the creation and use of micro environments are indeed considerable, what changes are required in agricultural research and extension? In particular, is it possible to shift from a transfer of technology approach in which packages are presented to farmers, to a Farmer First approach in which farmers' own analysis and demands lead to search by extension staff and scientists for genetic material and practices which farmers will find useful?

The implications of positive answers to these questions are major. Some of them have been discussed in the book Farmer First (Chambers et al 1989). Experience with farmer-first approaches has already been gained. It remains to be seen how widely these approaches can be spread and adopted within normal government bureaucracies. At present NGOs with their greater flexibility find it easier to act in this new mode. Often, though, they lack agricultural expertise. Perhaps one of the greatest challenges of the next few years is to evolve approaches in which NGOs and government work together, complementing one another with their respective strengths.

A final priority would appear to be further investigation of micro environments and a better understanding of conditions in which farmers develop them, and can be helped to develop them. Such investigation may point to security of tenure as a crucial precondition for farmers taking the long view and being prepared to invest their labour in processes with long gestation periods. Population density, and labour availability, may also be key variables. As in the Yatenga example, it may be only with a certain population density that farmers will undertake heavy physical work which has long term payoffs.

Investigating micro environments may not fit the normal preoccupations of any one discipline. For that reason it may continue to be neglected except by farmers themselves. The most appropriate support from the government agencies and NGOs may be to assist farmers' own analysis and experimentation, and the lateral transfer, farmer-to-farmer, of technology. Much of the solution must lie with the farmers, but outsiders do have key roles. They are those of catalysts and consultants, and of searchers for and suppliers of germplasm practices, principles and ideas which farmers can use, and of facilitators who help farmers learn for themselves and from each other.

References

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