Briefing

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Revitalising Rainfed Agriculture

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Policy pointers

India's rainfed agriculture systems were more climate-resilient when they worked with the inherent diversity of these systems, using locally adapted practices.

Agricultural policy and support systems have become rigid following the chemical-based and genetics-led green revolution; highly variable rainfed farming systems require alternative development logic.

Location-specific mixed cropping and integrated crop-livestock production systems are ideal for sustainable soil and water systems and suited to rainfed agriculture; they enable rural households to become food secure.

Rainfed agriculture needs decentralised integrated planning and implementation at the Block level; attempting to control its variability and diversity through vertical hierarchies results in unsustainable agriculture and food insecurity.

Reviving knowledge: India's rainfed farming, variability and diversity

More than two thirds of India's arable land is under rainfed farming. Local and national authorities, public sector agricultural research and extension, and commercial ventures are designed to supply 'one-size-fits-all' technologies, inputs and advice through uniform administrative apparatus or market protocols. This approach limits their capacity to work with the diversity and variability of rainfed agriculture. But with support that complements the variable nature of rainfed farming tracts, communities can improve farm productivity and sustainability. We present the case study of a farming community reclaiming its knowledge of variability through the revival of mixed cropping and millet production. We argue that decentralised support, with public investments appropriate to each agro-ecological system, is necessary for more communities to follow this lead.

What is rainfed agriculture?

Around 68 per cent of India's 142 million hectares of arable land is under rainfed agriculture, and accounts for a significant share of the area under major food and industrial crops — rice (42 %) pulses (77%) oilseeds (66%), cotton (65%) and coarse cereals (85%). This land also hosts the majority of India's cattle (78%), sheep (64%) and goats (75%). Added to this, stagnant yield growth from irrigated production systems makes productive and sustainable rainfed farming an issue of national importance.

Typically, rainfed production systems are characterised by undulating topography, soil types ranging from shallow red soils to deep black clays, large areas of common land and highly location-specific crops, crop varieties and livestock. What constitutes a rainfed production system in India is difficult to define; the definition itself has evolved.

The criteria of either exclusive dependence on rainfall or an area with assured irrigation are being replaced by typologies that include social, cultural, economic and agro-ecological features.

While evidence is available on the many roles of a rainfed system and its interaction with ecosystems, the articulation of production problems — and solutions — is biased towards individual crops and their isolated outputs. This leaves system components and relationships and overall system productivity ignored, with no relevant data collected, and hampers the wider understanding of rainfed agriculture.

Local expertise: more valuable than inputs

Agricultural practices designed for irrigated cereal production tracts include the adaptation and application of modern knowledge and

technologies, such as high yielding variety (HYV) seeds and chemical inputs.

The government also supplies external inputs to rainfed farming tracts through programmes and policy instruments that incentivise the adoption of production-boosting technologies. But rainfed agriculture is diverse and subject to variable intensity and frequency of rainfall, meaning there is little scope for the adoption of uniform technologies. And the increasing costs of inputs and rapidly worsening incremental capital output ratios mean rainfed farming communities can ill afford these unsuitable technologies — even if supplied with price support or subsidies.

The diversity in rainfed areas means that each system faces its own opportunities and challenges

Far more important for rainfed farming are location-specific knowledge, agronomic principles and choice of practices, time-dependent decisions, and the flow of skills and knowledge into the farming system to ensure effective production. Yet farmer 'practice' is the least acknowledged area; the domination of development policy, knowledge and technology (all designed for irrigated farming) over local farming systems and practices typifies the general approach to rainfed agriculture in India, and represents another barrier to helping this system reach its potential.

A core reason for the emphasis on inputs rather than farmer knowledge is that real understanding of local practices and focus on local needs demands decentralised investment in people and systems. This means investments in bio-physical rainfed farming as well as socio-economic and cultural systems that are more complex and harder to govern. Alongside this, agronomic knowledge or location-specific understanding of how natural resources, plants and humans interact, makes a case against uniform input (of it seeds, tubewells, diesel, pesticides, fertilisers or tractors). But mass-supply responses are easier and cheaper for corporate capital and public sector organisations, which are subsidised by the state to deliver.

It has not always been this way. Agricultural research on India's rainfed farming conducted in the early 20th century[1] and agricultural education (early colleges of agriculture with syllabi catering to local agro-climatic and soil features) paid specific attention to the diversity and inherent variability of farming systems. The immense opportunities that diversity offers for adaptation and shared learning at the village or community level were widely appreciated.[2] With the onset of chemical-based agriculture in the late 1950s and the 'green revolution' in the 1960s, agricultural knowledge turned towards genetics and chemical-based research. Since then, Indian agriculture — which had evolved in diverse agro-ecological terrains with economically specific production cultures (from spice producers to wetland rice producers) — saw its bio-physical and socio-economic balances disrupted by the uniform monocultures of HYVs, irrigation and chemicals. At the same time, agricultural administration moved from being area based and integrated towards single crop/commodity-based investments and approaches. The research that articulated and appreciated the diversity of rainfed agriculture has now largely been forgotten.

We do not argue that modern inputs or the government's role were wrong; we suggest the genetics-led green revolution became institutionalised as a supply-driven set of organisations and actors, which has become too rigid. The underlying agronomic, climatic and socio-economic diversities of agriculture are no longer given enough attention.

Rainfed farming in national planning

The problems of India's agricultural policy paralysis and the need for a more decentralised approach were highlighted in 2013 in a policy briefing on the country's rainfed agriculture by IIED and the Indira Gandhi Institute of Development Research.[3] It included a call to "build on the knowledge and experience of local understanding – knowledge that articulates in favour of an extensive method of integrated natural resource-crop-livestock production system, with in-built synergy and mutual dependence."

India's 12th Five Year Plan (the 'Plan') includes a National Programme on Rainfed Farming (NPRF). The NPRF is unusual: it proposes "an integrated, comprehensive and decentralized initiative which can help harness the high inclusive growth potential of rainfed production systems."[4] It contained a design for 100 pilots to be launched in Indian states with predominantly rainfed agriculture, aiming to scale-up integrated innovation capacities at the local ('Block')[5] level. But three years into the Plan period the NPRF is yet to be implemented. The reason given is that "the Ministry of Agriculture, or more specifically, the Department of Agriculture and Co-operation (DoAC), has no capacity to work at the Block level, especially in rainfed agriculture that is resource-poor, unpredictable and diverse."[6]

The government's inability to implement the NPRF pilots, and its uniform allocation of one Block in each of the 29 states, shows the contradiction inherent in efforts to plan and administer rainfed

agriculture. The focus on supply, which characterises national agricultural knowledge and policy, is convenient for administration and for the technology generation that caters to it.[7] By ignoring diversity and variability, it sets itself up to fail in rainfed production systems.

Decentralised planning and implementation at Block level has always been problematic in India. The need for contextual information and location-specific articulation of development concerns at Block-level is a sore point — especially so when it is clear that integration has to happen before national, state and district level plans are drawn up, and "the very ethos of decentralized development administration has to be different from that of current vertical hierarchies."[8] In the case of the NPRF, it is these very issues and the ethos of decentralised planning and administration of agriculture that pose the hurdles.

Additional spanners are thrown into the works, with increasing evidence of climate change, acceptance of the vulnerability of rainfed agriculture and, paradoxically, increasing evidence of growth rates of rainfed agriculture production and productivity.[9] In this context, with reports of farmer suicides, drying tubewells and land degradation appearing in the national dailies, we need an overhaul of the policy and support systems for rainfed agriculture, moving from the prevalent approach of uniform disbursement or supply, to one that acknowledges the value of variability and respects local agronomic principles and practices.

The good news for policymakers is that the principles, practices and capacities needed for planning and investing in rainfed, diverse and unpredictable environments can be drawn from existing local success stories. In Box 1 we offer a case study of the village of Mallapoor, which has used support from civil society organisations and some public sector agencies working at the local level to increase agricultural productivity and become both sustainable and nutritionally secure.

Building capacity for sustainable rainfed agriculture

The yields of rainfed agriculture are too important for policies supporting rainfed farming communities to remain ineffective: capacity must be built to revive the age-old agronomies of resilience. Appropriate public policy and scientific research must guide investments by the government and other stakeholders to strengthen community practices and knowledge of local soil, water and biodiversity. The case study of Mallapoor village (Box 1) shows how this can be supported in practice:

Public investments that open up options for farmers. The National Bank for Agriculture and Rural Development (NABARD) approach is to find the right partners, the best links in the field, the ideal communication strategies and awareness building, and the right investments for farmers to choose from a portfolio of options (developed in consultation with field partners and NABARD's lead bank or rural branch officers).

Box 1. Renewing local knowledge: a case study of nutritional security

"We understand our land; we have rules and norms that you may think unreasonable or harsh. But they are our rules that help us and our communities, our lands, water systems, our animals and the wildlife around us." — rainfed farmers, Mallapoor village

Today, all 82 households of Mallapoor village, in the semi-arid Adilabad district of Telangana State, are food and nutrition secure. But since the early 1990s this rainfed farming community was in crisis. Having given up their traditional food crops to almost exclusively grow cotton, farmers were facing poverty and debt at the hands of a cotton-trading middleman. Food security was compromised: on over 300 acres of arable land, the only food crop for household consumption was less than five acres of red gram.

In 1997 civil society organisation (CSO), DHAN Foundation (already working with the community on a microcredit and self-help group formation programme) was identified by NABARD to implement its watershed development programme. In 2011, working with the Village Watershed Committee in the Dharmasagar watershed, covering seven hamlets, DHAN Foundation and WASSAN — another CSO identified by NABARD — asked farmers to think about their previous agriculture and food systems. The farmers recalled "what we liked to eat, how we liked our food and our lands, and why we were so worried about our cotton crop. All of us said we were worried about … the right price for our cotton … But when WASSAN reminded us, we agreed that [our ancestors] never grew cotton as a mono-crop, it was always mixed with gram or millets — the very millets that were part of our food just thirty years ago." [10]

Armed with a better understanding of their vulnerability, the farmers worked to restore balance: "The potential conflict with the cotton trader was as expected … Over the past three years, the area under cotton has reduced by 25 per cent [but] productivity of cotton has increased almost by that proportion … now we have 220 acres of cotton mixed with jowar, red gram, black gram, and millets like bajra, foxtail millet and little millet as inter crops, and bengal gram, wheat, soya, maize and tomato and other vegetables."

The farmers credit the higher cotton yield — up by around a third even in tough years — to mixed cropping and new agronomic practices, also recognising that "… some of these are very much our old practices". And as they embraced and grew their knowledge, cultivation costs declined: chemical fertiliser and pesticide application were halved; use of farmyard manure increased by 50 per cent. Crop loss to pests and diseases dropped significantly.

WASSAN and the DHAN Foundation continued to work with Mallapoor's villagers. They helped reintroduce livestock and practices that conserved soil moisture through soil biomass application, better livestock management and the application of manure; as well as water-saving local staples to reduce households' dependence on cash purchases of food.

Box 1 (continued). Renewing local knowledge

The two CSOs enabled crop diversification and revival of millets in high-risk rainfed cotton tracts, demonstrating the importance of using decentralised knowledge and management systems that work with the diversity and variability of rainfed agriculture. The intervention saw the cattle population rise five-fold between 2008 and 2014. Information and lessons on better livestock management and the application of manure, better land and soil management techniques (conserving soil moisture), fodder production, veterinary care investments, market linkages, and energy and employment norms became accepted practices in the village.

The village's food secure status was proven in the poor and erratic monsoon season of 2013–14. Farmers in three surrounding mandals (a sub-division of the Block) faced massive crop loss; but fields in Mallapoor faced only a minor yield decline and the farmers made a good profit because the regional crop loss and inflation pushed up the price of their cotton, soya, millets, vegetables and milk.

The farmers noted that the recently introduced changes in practice had taken them back to traditional ways of managing risk. Their wellbeing, marketing strategies (decided by Village Development Committee and the farmers), and mixed crops for higher and more sustainable yields are all elements of a system that understands and works with local diversity. Their success demonstrates the importance of using location-specific decentralised knowledge and practices (not merely inputs supplied through the government's department or available on a shop shelf).

Strong community-level capacities for problem diagnosis and decision-making are the key: the integration of diverse components within the farm, and between the farm, the household and the community, would have been inconceivable if implemented as a scheme for crop diversification through conventional input-disbursing extension systems. The farmers' decisions to not sell their manure, to adopt crop diversification, and to sow a winter crop were incentivised by the higher production and productivity of their farming systems, collective pest management and market negotiations. They worked because the Village Development Committee in each hamlet was trained by the CSOs to manage their own records, conduct monitoring and evaluation. The village has adopted its own rules, one of which is to forbid cutting of trees to ensure soil biomass availability and application, as the basis of soil moisture management.

Enabling crop–livestock integration. The Watershed Support Services and Activities Network (WASSAN) and Development of Humane Action (DHAN) Foundation worked with the agro-ecological features of the region, reintroducing the principles of crop–livestock systems, bringing livestock and farm yard manure to complement soil biomass application and soil moisture management in the village. This enabled the revival of hardy nutritious millets that the villagers used to grow and consume.

Linking knowledge, policy and practice. Location-specific practices (soil biomass application, mixed crop layout) and policies (forbidding tree felling and sale of farm yard manure) — when used at the farm level, across farms in the village, and between the farmers, CSOs and public agencies like NABARD — deliver maximum production potential, resilience and nutrition security in rainfed agriculture. They draw upon the substantive knowledge of the sustainability and inherent variability and diversity of rainfed agriculture.

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Notes

[1] Bombay Scheme of Research on Dry Farming, 1926 / [2] Voelcker, 1893, Report on the Improvement of Indian Agriculture, Eyre and Spottiswoode for Her Majesty's Government, London (Reprinted in 1986 by Agricole Reprints Corporation, New Delhi) / [3] Srijit Mishra, A Ravindra, Ced Hesse (2013) Rainfed agriculture for an inclusive, sustainable and food secure India. IIED, London. http://pubs.iied.org/10041IIED.html / [4] Planning Commission (2013) *Twelfth Five Year Plan (2012-17) – Economic Sectors, Volume II*, Planning Commission, Government of India. SAGE, New Delhi. 46–47. / [5] A 'Block' is a district sub-division, representing a compact area. for which development programmes are implemented directly by the Block Development Office, specific line departments (like Agriculture or Education) and through Village Panchayats. / [6] Interview and meetings in 2013, R B Sinha, Joint Secretary, DoAC, and J.P. Misra, Advisor - Agriculture, Planning Commission, Government of India. / [7] R S Raina (2014) Beyond Supply Driven Science, Seminar, No 654. 69–74. / [8] M L Dantwala (1980) Block Level Planning Revisited, *EPW*, 15 (30): 1279-1281 / [9] Ministry of Finance (2014) *The Economic Survey, Government of India: New Delhi* / [10] Bhim Rao, J Joseph, Kova Hanumanthudu and M Shankar are the farmers in Mallapoor quoted here, interviews and conversations during field work from 22–25 January 2015.

Knowledge Products

The International Institute for Environment and Development (IIED) promotes sustainable development, linking local priorities to global challenges. We support some of the world's most vulnerable people to strengthen their voice in decision making.

Revitalization of Rainfed Agriculture Network is striving to create enabling and relevant policies and programs for strengthening rain-fed agriculture in India. About 300 members are part of this network including WASSAN, Samaj Pragati Sahyog and several reputed institutions.

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