



“Cotton is our major crop; it grows well here. Our ancestors have grown cotton over hundreds of years. As the “white gold” became more valuable – brought more money, we also fell for the temptation and by the early 1990s there was only cotton here. 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. That became our answer; we wanted to eat millets again. We wanted to grow our own millets in our own fields. The potential conflict with the cotton trader was as expected. We used to get many forms of support, especially cash and agricultural inputs when needed, from him. The trader did not see merit in our move to reduce the cotton area and increase the area sown to millets, maize, vegetables and grams. Overall, the productivity per acre is higher in each field, though 25 % of the land has gone to other crops. Cotton yield used to be 5-6 quintals per acre. Now, with the mixed crop stance and new agronomic practices (some of these are very much our old practices), the yield is 8 qtls per acre (even during a tough year like 2013-14). During a good year (like 2012-13) the yield now is about 9-10 quintals; it would not have gone above 7 quintals if we had followed the earlier mono-crop cotton.”

Farmers in Mallapoor village, India - interviewed in January 2015.



“There have been people from the Department of Agriculture telling us that the Bt cotton stumps are good enough to feed cattle. But somehow we have this fear, because we know the leaves contain the poison that can kill worms. What guarantee is there that this will not destroy the guts of our animals? Now that we have brought mixed cropping and millets back into the centre of our cropping pattern, we have fodder and feed material for our cattle.”

Bhim Rao, farmer, Mallapoor village.

Left: Wheat and sorghum (in January) sown after cotton harvest, with the red gram border crop bearing pods.

Right: Local maize (dual-purpose varieties).

Case study

Rainfed farming in India – Reviving mixed cropping and millet production⁵⁵

Almost a century ago there was considerable awareness of variability within Indian agriculture, including: the immense opportunities that diversity offered for enhancing productivity; adaptation and learning at the village level; and need for integration of various scientific and local practices.⁵⁶ The Famine Commission of 1881 had also demanded that ‘the Government should first get thoroughly acquainted with Indian agriculture before deciding how to improve it using modern scientific methods and maxims.’⁵⁷

The XII Five Year Plan of the Government of India proposed a National Programme of Rainfed Farming (NPRF).⁵⁸ It was meant to harness high inclusive growth potential by enhancing ‘untapped agronomic and management innovations’. But the capacities to implement the NPRF are missing in the current highly centralized and supply driven formal Science & Technology and administration of agriculture.⁵⁹ Yet, there are some cases that demonstrate capacities for agronomic and management innovations. One such case is the revival of agronomic knowledge and millets based mixed cropping systems in Mallapoor village in Uthnoor mandal, Adilabad District in Telangana.

By the early 1990s, Mallapoor village had shifted crop stance completely to cotton (‘white gold’), plus some soya and red gram, having given up traditional crops and cropping systems. Increasing destitution and indebtedness at the hands of the middlemen handling the cotton output had become major issues. Recognising that agronomic and natural resource based knowledge is necessary to build secure bridges between agriculture, nutrition and the environment;⁶⁰ WASSAN and the DHAN Foundation began working with farmers in Mallapoor.

After much painful churning between farmers, NGOs, private traders, rural banks, and public sector extension services, in 2010–11 Mallapoor overhauled its focus on cotton, set to work on improving soil moisture retention, and devoted 25% of its arable land for millet-based mixed cropping systems. Today, the village of 7 hamlets, 82 families in all, has now 7 dug wells, one tube well and revived a tank (the Dharmasagar watershed under the Indo-German Watershed Development Programme) with NABARD support. As farmyard manure and biomass application has increased, the number of cattle has also increased, from about 20 in 2008 to 100 bullocks and cows in 2014. Previously the village sold 10–12 cartloads of cow dung, but now the village uses all of it on its own land. Labour sharing and seed saving norms have also been introduced.

Today, every household in Mallapoor village is food and nutrition secure: a reflection of the wellbeing of their fields, their lands, water and livestock. The cost of cultivation has declined, with chemical fertilizer and pesticide application each reduced by 50% and manure increased by 50%. Mixed cropping of millets, pulses, vegetables and tree crops, alongside the production of cotton, has yielded more cotton, food, and fodder. The new resilience was demonstrated in 2013–14 when the poor and erratic monsoon caused only a marginal decline in yield, whilst farmers in the three surrounding mandals faced massive crop loss. Translating and transferring these community-based innovations to the mandal, district, and state levels, however, remains a daunting task.



The Maldhari community came to the state of Maharashtra in Western India from Gujarat during the drought of 1972. Distinct from other pastoralist groups, the Maldharis are recognised by their colourful turbans, jewellery and clothes; but like other herders, they do not figure in village records or national censuses, and their economic contribution to GDP remains unrecognised. Unnoticed within the vast hidden economy of India, the Maldharis do not actively seek the help of the state to keep them and their animals alive during drought years, but instead use strategies skilfully built into their production systems to optimally use the variable resources of the drylands.



The relationship that the Maldharis enter into with sugarcane farmers and sugar-crushing factories differs from district to district. In some they purchase sugar cane, and in others farmers exchange sugar cane for dung. Some Gir farmers have negotiated contracts with sugar cane factories whereby they are allowed access to sugar cane tops and fodder in exchange for the men working in the factory for a few hours everyday. Similar negotiations are also entered into for camping sites and the use of water.



Case study

Sugar cane, popcorn and sweets: integration strategies of Maldhari pastoralists in India⁷²

Since their arrival in the State of Maharashtra, the Maldharis have integrated with the landscape, built up relationships, learnt new languages and adapted to the local conditions.

The main production strategy of the Maldharis is mobility to access discontinuous resources – periodically moving their Gir cattle, their entire family, and their belongings – but it is a strategy that is closely integrated with crop production. In the drier parts of the state they camp on fallow lands and open fields close to river banks in order to access sugar cane residue – the cash crop that has changed the face of semi arid Maharashtra, and which uses 75% of the state's irrigation. During the monsoon months from June to September, the Maldharis graze their animals on the open fields and uncultivated open lands; but in the winter months from October to February they cut a deal with sugar cane farmers for sugar cane tops and other residue. The herds will also help out farmers with other crops – cereals, pulses and cotton – cleaning their land of stubble after harvesting and fertilising the fields with dung and urine.

An important aspect of the Maldhari production system is their use of resources that would otherwise be considered 'waste' (eg failed crops and crop residues), as well as fallow land and land that is considered barren or unproductive by crop farmers. They also make use of waste from factories, including the popcorn factory in Pune district: Here they feed their animals the corn culms after the corn is removed, and effectively recycle 'waste' into useful products for human consumption including milk. Their focus on accessing unused resources also extends to water sources; sometimes camping where there is a leak in a pipeline and quenching the thirst of their animals

with the water being wasted. As crops change, farming practices change and farms themselves change hands, the Maldharis have had to undertake new negotiations and explore new options. In Ahmednagar and Beed districts, where the sugar cane factories have closed, the Maldharis have had to move on to new areas.

The main products from the Maldhari production system are milk, manure and calves. Milk is sold as raw milk as well as ghee, and sometimes as reduced/condensed milk. Milk brings daily cash into the household, whilst manure is sold every fortnight. Of the total daily milk produced by the herd, about half is sold to households near the camping site, a little less than half to milk and sweet shop vendors, and a relatively small portion – about 2–3 litres of the total produced – is kept at home for consumption. When sold to dairies the price of milk is determined by the fat percentage. As this varies across the lactation cycle, and dairy cooperatives also offer fairly low prices, many Maldharis prefer selling their milk to sweet shops, which use it to make sweets that are very popular in India with tea. Dairy cooperatives do not pay everyday, while sweet shops do. Milk is condensed to the solid popularly called khoya in India (also mawa or khawa), which keeps longer than fresh milk. The price is fixed depending on the quantity of khoya obtained from a litre of milk. In some areas their milk is bought at higher prices, the premium from being produced by an indigenous cow.



The Raika shepherds from the Godwar area in south-central Rajasthan make strategic use of all available biomass in order to produce meat for the market, organic fertilizer for farmers, and milk for home consumption and sale. The shepherds make the best use of what is already available – finding feed resources in harvested fields, forests and from common property resources such as revenue land and village grazing grounds. The Raika specialise in niche utilisation, making use of what otherwise would be wasted. For security purposes and mutual support, Raika families organise themselves into herding groups of 8–15 families that together are called a dera and who are led by a patel. A dera may contain around 3–4,000 sheep. The patel is elected every year based on his experience, his contacts and impartiality in decisions on when and where to move, and his skills at liaising with landowners or authorities. Individual family units in the dera are called dolri – the dolri being the ‘charpoy’ (string bed) on which the possessions of the family are stacked (bedding, cooking utensils, supplies). The dolris are set up in a wide circle in the same position to each other in every encampment. The sheep are kept within the circle at night.



At the end of the rainy season in October, the sheep of the Raika become restless and indicate their desire to start moving – shepherds having to actively stop them from going on migration on their own. With the crops still standing, farmers are often not welcoming to the shepherds, but by the start of the hot season in mid March the crops have been harvested and it is the best and the easiest time of the year for the shepherds. Neither sheep nor shepherds have problems coping with the heat. The lambs are gradually sold off and milk is sold to teashops and private customers. In July when the first clouds suggest rain is in the air, the sheep indicate that they want to return back home.

“When the rains start, then the animals march very fast back home, about 20 kms per day.”

Nagaram Raika (patel)

Case study

Highly productive risk takers – The Raika shepherds of Godwar Rajasthan, India⁸⁹

India is the largest exporter of sheep and goat meat worldwide, amounting to 22,608 MT and valued at almost 7 billion rupees in 2013-2014. The vast majority are raised in drylands in extensive pastoralist systems. In the Godwar area of south-central Rajasthan highly professional sheep rearers are organised in large groups that fan out across Rajasthan and into adjoining states – including Punjab, Haryana, Madhya Pradesh and Gujarat⁹⁰ – to systematically utilise crop aftermath and biomass from common property resources (CPR). Grazing CPRs is a response to the structural unpredictability of the eco-system where rainfall fluctuates from year to year, whilst grazing crop residues is a dynamic solution responding to variable resource availability. The specialized sheep-rearing communities – including the Raika, Rajputs, Sindhi Muslims, Gairi, and Gujjar – undertake long distance migratory systems for eight to nine months of the year, producing meat for the international market, organic fertilizer for local farmers and milk for home consumption and sale.

The Raika move distances of between 150 and 400km from their home villages in Marwar to their summer grazing grounds. The destination depends on the knowledge of the patel (group leader) and his collaborative relationships with farmers.⁹¹ It is a continuous process of scouting for new grazing opportunities, and also of avoiding competition and conflict. The sheep pastoral system is intricately integrated with crop cultivation, dependent on farmers providing access to their fields and on remunerating the shepherds with grain, tea, sugar and sometimes cash. The sheep graze on the aftermath of wheat, jowar, soya beans, tur, masoor, channa, maize, groundnut, fenugreek, mustard, as well as various medicinal plants. The cultivation of soya beans has

increased in recent years and provides excellent nutrition for sheep, which search out the residual beans, to the extent that a new ‘soya bean route’ has been carved out. Whilst fifty years ago there was little irrigation and the cropland was fallow for nine months of the dry season, the establishment of tubewells has led to year-round cultivation and has removed this fallow. New opportunities open up, however, as crop cycles change and as groundwater resources are depleted and people return to rain-fed farming.

Based on a total sheep population of Rajasthan of around 9 million head, at least two million ram lambs are produced and sold each year by the pastoralist sheep rearers. Calculating an average live weight of 11 kg per lamb, this would translate into 22 million kg.⁹² Buyers actively seek out these lambs by following the Raika on their migration and coming to their villages during the rainy season. But not everyone is willing to pay for the sheep. The Raika face considerable threats from sheep theft: teams of two on a motorbike, one driving and the other grabbing a sheep, do most of the stealing. The Raika also talk of gangs of 20-30 men wearing black clothing and driving up at night in pick-up trucks. Thefts are particularly common while driving the sheep along highways, when flocks are on their own with a single herder, or when drinking at ponds. Loss of fallow land through agricultural intensification, as well as expansion of built up areas and highways, creates further risk. Despite their overall value to the state in terms of live weight of meat, milk and manure, the police rarely investigate the theft of their property.

The government knows very well about our problems, but it does not do anything. We can only reach the low level officials. We can't get the attention of Modi-ji.

Hinduram from Ghanerao