Farmers' varieties mitigate and adapt to climate change in South India

By TJ James, Hubby Mathew & Stebin Sebastian*

Farmer Innovator Bore Gowda with his paddy variety Siddasanna

Credit: St Thomas Mission Society

Climate change is having a devastating impact on the agrarian economy. It has upset the entire rhythm of farming for smallholders (with about 0.5–1 ha of land) in South India. Agriculture has become even less predictable and reliable. Many people, especially youths, are leaving farming as a major source of livelihood and are seeking alternatives. Yet, despite these adversities, some farmers are developing innovative strategies to mitigate, minimise and adapt to the impacts of climate change. Partners in Prolinnova–South India, a multistakeholder platform for promoting farmer innovation, are documenting such strategies and innovative practices in South India.

Over the decades, farmers and their communities have identified, selected and propagated site-appropriate crop varieties and developed suitable cultivation practices for them. In this process, the farmers give attention not only to yield but also to other criteria such as site adaptability; capacity to survive floods or drought; disease and pest resistance; plant vigour; and meeting needs not only for food but also for fodder, fuel, and other domestic uses.

However, with the advent of the 'Green Revolution', research institutes released and propagated hybrid varieties aimed at enhancing yield alone. As a result, local and indigenous varieties were neglected by many farmers and scientists. However, the hybrid varieties do not perform well in areas of high environmental risks. Especially in recent years, some farmers have observed that, under changing climatic conditions, these varieties did not survive or adapt well. The farmers realised the importance of local and farmer-bred varieties and started giving preference to these over varieties released by research institutes.

Farmer-bred varieties of highland pepper

Pepper is an important crop in the highlands of Kerala, Tamil Nadu, and Karnataka States. *Panniyur-1* is one of the most popular varieties released by research stations, and it dominates in large areas of pepper cultivation in Kerala State. High productivity is the main reason why farmers shifted to this variety. In well-irrigated and -managed farms, it performs very well.

Kerala State faced a major flood in 2018. Farmers report that, thereafter, the climate changed drastically. Delayed and prolonged monsoon, high-intensity rains, waterlogging and floods have become common. Farmers observed that the change in climate affected the flowering of pepper, and the productivity of the introduced 'high yielding' varieties declined drastically, especially in the highlands. Many farmers lost 30–40% of their pepper crop.

Partners in Prolinnova–South India have documented the work of several innovative farmers who recognised this impact of climate change and are promoting local and farmer-bred varieties. These farmers noted that the local varieties could better withstand the adverse effects of climate change. Some of the farmer-bred varieties that perform well under the more extreme climatic conditions are *Zion Mundi, Kumbukkal, Aswati* and *Suvarna*. They are drought-resistant and tolerate foot rot caused by the fungus phytophthora, which is favoured by wet conditions. Farmers also started giving attention to and reviving the cultivation of traditional varieties such as *Karimunda and Uthrankotta*.

The pepper variety *Zion Mundi* was developed by the late PG George in the early 1990s. In 1985, there was an outbreak of foot rot, to which he lost most of his pepper plants. He found that two local varieties, *Thotta Mundi* and *Neelamundi*, survived and were resistant to foot rot. *Thotta Mundi* was known among farmers for disease resistance and *Neelamundi* for good productivity. He allowed the two varieties to cross-pollinate, after which he collected the seeds, cultivated them separately, observed them closely and – through a selection process – identified the foot-rot-resistant *Zion Mundi* variety. Many farmers now prefer this, as it performs well under today's harsher climatic conditions.

Kumbukal, another popular local variety of pepper, was identified and

propagated by the farmer innovator Kumbukkal Thomas Varghese. It is known for its resistance to quick wilt disease. In the early 1990s, the farmer's entire pepper crop (mainly the hybrid Panniyur variety) was affected by quick wilt, but he found one plant that survived. He propagated it using vegetative methods. He was convinced of its superiority in the Kerala highlands and decided to promote it, giving it his family name Kumbukkal. This variety has a highly developed root system and can resist foot rot.

Peermade Development Society, the host organisation of Prolinnova–South India, documented this local innovation and helped the farmer start a nursery of Kumbukkal pepper and promote it more widely. This variety is now one of the most preferred pepper varieties among farmers in Kerala State.

The Aswati and Suvarna pepper varieties were developed by farmer, A Balakrishnan. He learned about cross-hybridisation from a radio programme and developed these varieties by cross-fertilising two local types: Karimunda and Uthrankotta. His varieties show vigorous growth at high altitudes (800–1400m above sea level), are resistant to quick wilt and are suitable for the Wayanad region of Kerala State.

Creativiti Council, a partner organisation in Prolinnova–South India, helped the farmer set up a nursery for these varieties and diffuse them widely.

Farmer-bred varieties of cardamom and other crops

Cardamom is another highly climate-sensitive crop. It is native to hilly regions of South India and usually performs well at high elevations (800–1300 metres above sea level [masl]). Prolinnova–South India documented several farmer-bred varieties of cardamom that perform well at different altitudes, including *Njallani* (1100–1200 masl), *Pannikulangara* (1200–1400 masl), *Wonder Cardamom* (900–100 masl) and *Thiruthali* (1100–1200 masl in mist conditions).

The strategy used by these innovators consisted of keen observation of the natural selection process, studying the performance of the selected varieties under local conditions, and propagating them vegetatively. The market is growing for these varieties. Many of the innovators have started nurseries for propagation, some of which are managed by women entrepreneurs. All these innovations have been recognised and given awards by the National Innovation Foundation; the Government agency responsible for promoting grassroots innovation.

Prolinnova–South India has observed the same strategy used by local innovators with other crops. Farmers are reviving local varieties of cassava, yams and cowpea and cultivating them along with the hybrid varieties in order to minimise the risks of climate fluctuation. They are experimenting with different varieties – not only a single variety – on the same farm to cope better with climate change.

Local varieties for organic farming

Promotion of organic farming has special significance in the context of climate change. Organic farming enriches the soil organic matter content and helps retain water and nutrients. Innovative farmers are identifying and propagating varieties suitable for organic farming. The St Thomas Mission Society, a Prolinnova–South India partner in Karnataka State, has documented a unique paddy rice variety, *Siddasanna,* developed by the expert organic farmer and seed saver Bore Gowda in Sivalli village in Mandya District.

The variety responds to organic farming very well, is resistant to pests and diseases, and can be cultivated in both the *kharif* (wet) season from June to October and the *rabi* (winter) season from November to March. The paddy stalks grow over one metre tall and provide fodder for livestock, saving money and time that otherwise would have to be spent for feed.

Bore Gowda initiated local paddy conservation efforts in Mandya District in 2007, thereby inspiring hundreds of farmers to shift from the introduced varieties to indigenous ones. Later, he came into contact with pioneering farmer plant breeders and learnt the basics of plant breeding.

In 2008, while walking through his *Gandhasale* (paddy variety) field, he observed a distinct ear of paddy that reminded him of *Sona Masuri,* an introduced high-yielding variety.

"Then, *Sona Masuri* was the most sought-after variety for its fine grains, and there was no local variety that could compete with it", he recalled.

Farmer Innovator Bore Gowda with his Siddasanna paddy variety

Credit: St Thomas Mission Society

He collected the grains from that ear and cultivated them in a separate patch in the next season. For the next four years, he continued the experiment through seed selection and separate cultivation. He kept aside the entire harvest for seed and distributed it among other interested farmers. Through the 'Save our Rice' campaign (initiated by Thanal, a Kerala-based voluntary group), his variety reached farmers across Karnataka State. Pioneering organic paddy growers elsewhere in the State started propagating this variety regularly. Together, all these growers now sell over 10,000 kg of *Siddasanna* seed per year.

Because *Siddasanna* is easy to cultivate, resistant to pests and diseases, and suitable for both growing seasons, it quickly became popular among farmers. The tasty, superfine grains also attracted the consumers. It grew in popularity also because of its good response to organic farming and the high quality of the rice. The number of *Siddasanna* growers increased steadily and in 2022, despite extreme rainfall variability, over 500 farmers grew *Siddasanna* paddy.

Conclusion

To address the challenges of climate change, it is important to apply methodologies that include the participation of smallholders in the research and development process, promotion of their own innovation and strengthening their capacity to experiment so that they can meet their site-specific needs. The strategies of innovative farmers to address the issues of climate change – not only with respect to identifying and developing locally appropriate seed for organic farming – need to be recognised, studied, and supported.

***Author profiles**

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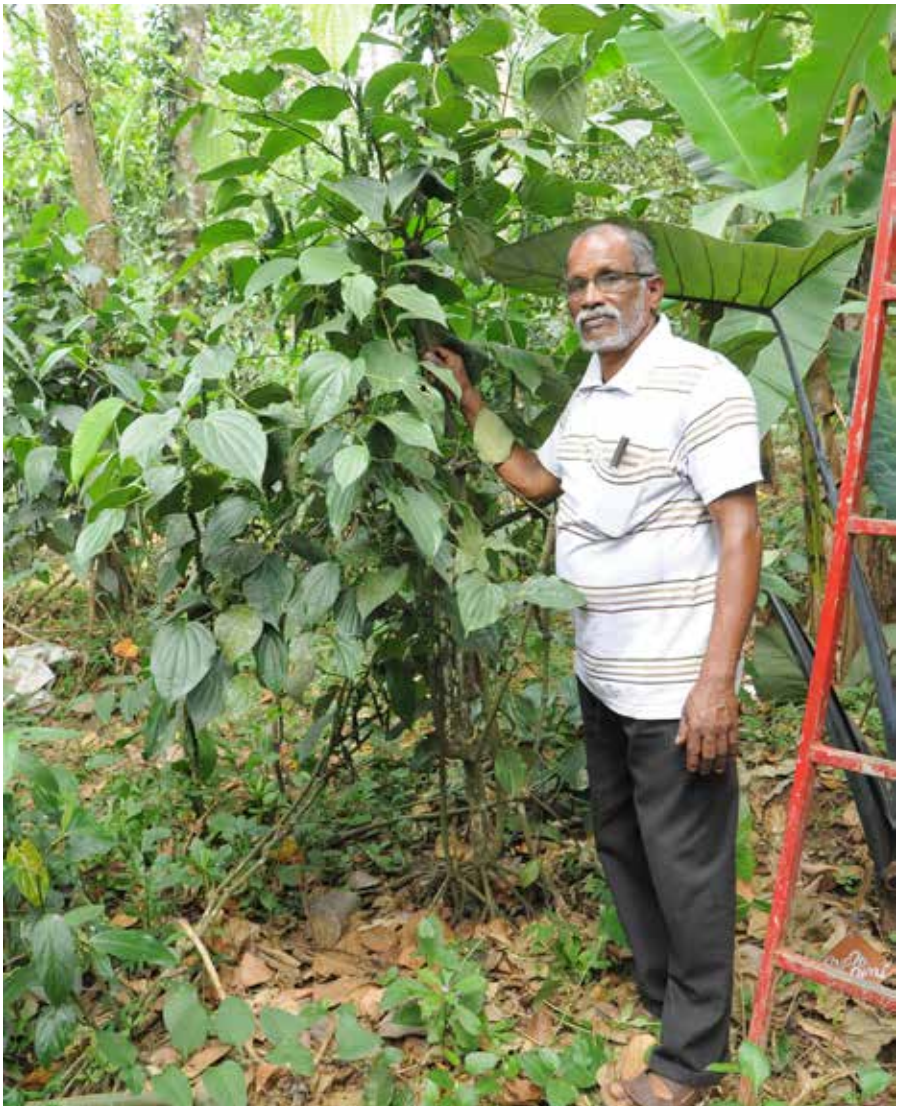

Farmer Innovator late PG George with his Zion Mundi pepper variety

Credit: Stebin Sebastian

Zion Mundi pepper variety

Credit: Stebin Sebastian