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ICAR Research Complex for NEH @50:

Advancing agriculture and empowering the northeast

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The north eastern region of India consists of eight states: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura covering an area of 262,179 km^2 and are home to more than 45.58 million people according to the 2011 Census, which is about 3.77 percent of the total population of India. The region is unique in its social, cultural and political diversity. More than 200 major tribes and numerous sub-tribes live across the region, each with their distinct traditions, customs and ways of life. This article highlights the various interventions done by ICAR Research Complex for NEH, its regional centres and KVK's in the northeast India.

Keywords: Agricultural interventions, Cultural diversity, Tribal farming

AGRICULTURE is the backbone of the north eastern economy, supporting livelihood of majority of the population, more than eighty percent of whom live in rural areas. Jhum, or shifting cultivation, remains the dominant land use system in these hilly areas. At the same time, the region is blessed with extraordinary natural resources. It is one of the world's recognized biodiversity hotspots, containing species-rich tropical rainforests that support a wide variety of plants and animals. The region is also considered centre of origin for several important crops, including citrus fruits, cereals and orchids. Its water resources are equally significant. About one-third of India's total surface runoff originates here through the mighty Brahmaputra and the Barak river systems. The northeast alone accounts for about 34 percent of the country's water wealth and nearly 40 percent of its hydropower potential. Floods and soil erosion frequently damage land and livelihoods, while groundwater resources remain largely untapped.

In addition, forests dominate the landscape of the region, covering almost 65.6 percent of its total geographical area, which is far higher than the national average of just 21.34 percent. However, forest cover has been under pressure. The India State of Forest Report of 2015 recorded a decrease of about 628 km^2 in forest cover across the northeast, mainly because of shifting cultivation and other human pressures. The soils, climate and biodiversity of the region are well suited for a wide range of crops, livestock, fisheries and forestry-based activities.

Thus, Indian Council of Agricultural Research established the ICAR-Research Complex for North Eastern Hill Region in 1975 with an objective to provide scientific and technological support for agricultural development tailored to the unique challenges and opportunities for the north eastern region. Over the years, it has grown into a multidisciplinary research centre covering a wide range of fields, including natural

ICAR-Research Complex for NEH Region, Headquarter at Umiam, Meghalaya

Rice variety: NICRA Aerobic Dhan-1

Turmeric cultivar: Megha Turmeric-1

Production of gerbera under open condition

Production of lilium and gerbera under low-cost polyhouses

resource management, crop sciences, horticulture, animal husbandry, fisheries and agricultural engineering.

The institute is committed to developing location-specific technologies that are sustainable, climate-resilient and culturally compatible with the tribal societies of the region. Its headquarter is located at Umiam, Barapani in Meghalaya. Four divisions operate at the headquarters, supported by six regional centres located at Basar in Arunachal Pradesh, Lamphelpat in Manipur, Kolasib in Mizoram, Jharnapani in Nagaland, Tadong in Sikkim and Lembucherra in Tripura. In addition, the institute coordinates twenty Krishi Vigyan Kendras distributed across all eight states of the region, which serve as vital links for transferring technologies from research stations to farmers' fields.

The institute has been playing a leading role in promoting agricultural development and improving tribal livelihoods in the region. It provides customized livelihood options in agriculture and allied fields, supports skill development and builds rural social capital. It is also active in human resource development, providing teaching and research opportunities for postgraduate and doctoral students in agricultural and allied sciences in collaboration with universities from across the country. Being hub of agricultural research in the northeast, the institute has implemented numerous competitive projects supported by national and international agencies. The institute has built strong linkages with other ICAR institutes, universities and international organizations while also working closely with NGOs, farmers' organizations and cooperatives for outreach programmes. It continuously provides technical advice, consultancy and modern technologies to stakeholders across the region. Its contributions cover many aspects of agriculture, natural resource management and rural development.

One of the greatest challenges to agriculture in the north eastern hills is soil acidity. About twenty-one million hectares in the region are affected by acidic soils, and around sixteen million hectares suffer from high levels of acidity with pH below 5.5. In such soils, essential nutrients such as phosphorus, calcium, magnesium, zinc, boron and molybdenum are deficient, while toxic elements like aluminium, iron and manganese occur in harmful concentrations. Traditional liming practices require 2–10 tonnes of lime per hectare, which is far too costly for resource-poor farmers. To overcome this problem, institute developed an alternative technique of furrow application of lime at much lower rates of 2–4 q/ha, making the practice affordable and effective.

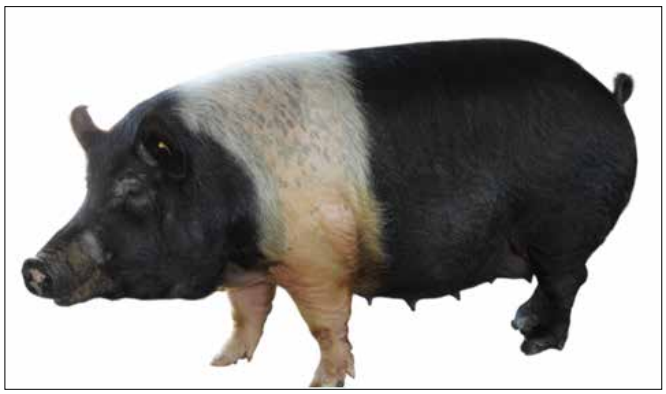
The institute has also standardized organic production technologies for about fifty crops, including cereals, pulses, oilseeds and vegetables, under a cropping system approach for hill states. It has standardized technologies for year-round production of high value crops under naturally ventilated polyhouses/rain shelter and developed package of practices for management of the citrus decline in Khasi mandarin. It has developed integrated farming system models that combine crops, livestock, fisheries and other components to ensure year-round food, income and employment security for farmers. Integrated farming system and integrated organic farming system have been widely adopted and are helping to reduce dependence on shifting cultivation. They have enhanced productivity of crops by 20–40 percent, livestock by 20–30 percent and fish by 30–50 percent. The institute's work on integrated organic farming was recognized at the global level during the United Nations Climate Change Conference in 2021. Besides, the integration of mushroom cultivation, bee keeping, fish farming and farmers' friendly tools into these systems has improved soil conservation and significantly enhanced the economic conditions of tribal farmers.

Further, water scarcity during the dry season, especially from November to March, remains a major

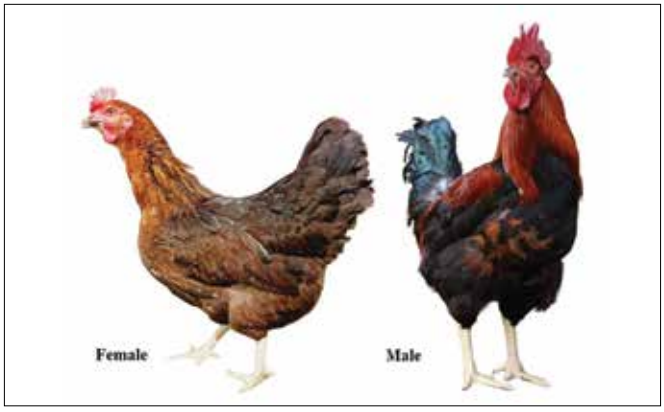
Ginger and turmeric washer and slicer

problem in the hills despite abundant rainfall in the monsoon. To address this, the institute developed Jalkund, a low-cost rainwater harvesting structure for storing rainwater. Jalkund has enabled farmers to irrigate crops during dry periods, raising cropping intensity from 100 percent to 200 percent and generating additional income. In crop improvement, NICRA Aerobic Dhan 1, a rice variety that requires 60 percent less water than traditional; puddled rice and emits up to 85 percent less methane, has been developed. Another significant development is Megha Turmeric 1, which is valued for its high curcumin content. Its adoption has increased production, created employment opportunities and encouraged entrepreneurship among tribal farmers.

In horticulture, the institute has developed 4 varieties of guava (Megha Wonder, Megha Supreme, Megha Magenta, and Megha Seedless) that are in high demand among farmers. It has also developed improved cultivars of papaya, pineapple, tomato, brinjal, French bean, taro, yam, gerbera and other crops suited to the region. There is a huge demand of the ornamental crops, for that institute has developed package of practices for the production of the gerbera, lilium and anthurium for open as well as under protected conditions.



Lumsniang: An improved breed of pig



Tokbari: An improved breed of poultry

Farm mechanization is a major challenge in the hill agriculture; the institute has developed several tools and farm tools and implements suitable for the marginal and small farmers of the region. Among them, the recently developed ginger and turmeric washer, slicer and drier are most popular among the farming communities.

In animal husbandry, the institute developed the Lumsniang pig variety, which is well adapted to the hill ecosystem and preferred by consumers for its growth rate and meat quality.The breed reaches body weights of 90–100 kg in twelve months and has higher litter sizes compared to local pigs. Artificial insemination in pigs, developed and standardized by the institute, has been widely adopted and has produced about fifty thousand piglets in Nagaland alone in recent years. The institute has also developed the Tokbari chicken, a dual-purpose bird with better scavenging ability and egg production rates 133 percent higher than native birds. To address animal health issues, the institute has created affordable diagnostic kits. A simple Mastitis Detection Card has been developed to help dairy farmers identify mastitis early and reduce economic losses. For pig farmers, an indigenous ELISA kit for Classical Swine Fever (CSF) virus has been developed using a freeze-dried antigen. This is the first indigenous kit for detecting CSF antibodies in India and provides a cost-effective alternative to imports.

Looking to the future, the institute emphasizes that food grain productivity in the region must increase from the present level of about 1.9 t/ha to nearly 4 t/ha, while cropping intensity must rise from 135 percent to 240 percent. This will require improvements in every aspect of crop production, including seeds, soil fertility management, irrigation, pest and disease management and mechanization. In the meat sector, piggery and poultry will continue to be priority areas. Efforts will focus on improving local breeds, developing suitable crossbreeds and reducing the high cost of feed by utilizing locally available materials. In animal health, the institute aims to develop next-generation vaccines, including edible and DIVA vaccines, as well as companion diagnostic tests for major livestock diseases.

SUMMARY

Through these diverse initiatives in the last 50 years of its journey, the institute has transformed agriculture and allied sectors of the region significantly and continues to play a vital role in supporting sustainable agricultural growth, improving rural livelihoods and ensuring nutritional security in one of the unique and resource-rich regions of India.

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