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CLIMATE CHANGE AND RURAL COMMUNITIES: STORIES OF IMPACT AND RESILIENCE

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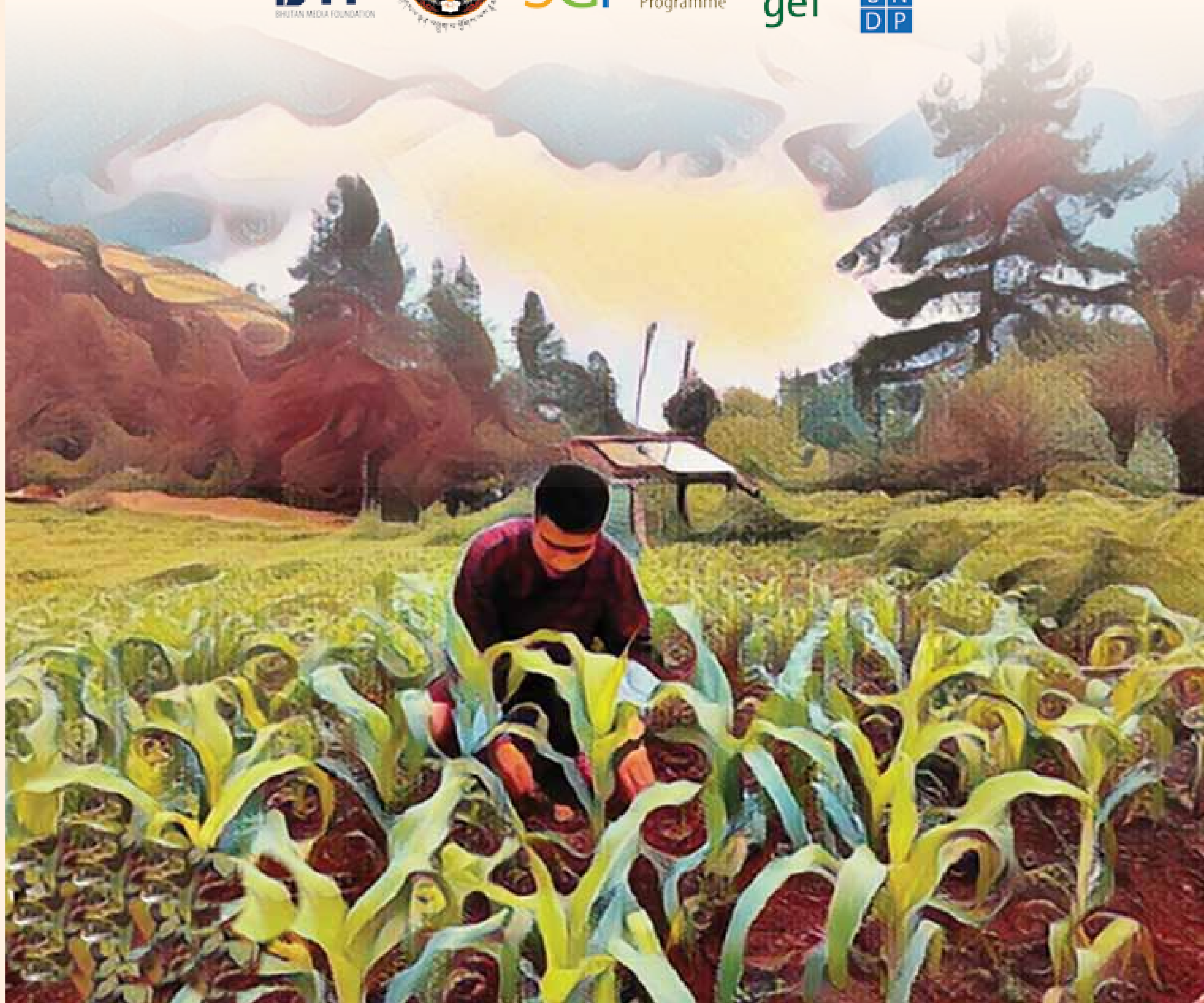

Climate Change and Rural Communities:

STORIES OF IMPACT AND RESILIENCE

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Looking for mountain gold amidst changing climate

Choki Wangmo

Gumna, Laya—It is late in the afternoon, when hours after descending a steep and dangerous cairn, glistening with layers of snow, the majestic Masangang came into view. A crisp mountain air cut through the silent vast land as the strong breeze gracefully encircled the towering peaks. A lone woman with a child strapped on her back, trudges towards the campsite, a stark figure amidst the snow-white landscape.

Chimi Dema, with her 9-month-old grandson, Tandin Sonam is returning to the campsite with their day's harvest of cordyceps. "It is just a single piece," she said with a frown. Early that morning, the duo left their campsite at Gumna, the base of the Masangang range to look for yartsa guenbup which has become extremely rare in recent years.

Chimi's daughter, Sonam Wangmo, along with more than 20 highlanders from Lungo in Laya left for the higher peaks with high hopes of a better harvest. Since its legalisation in 2004, for a month every year, people in the mountains of 15 gewogs in Bhutan make a tortuous and cumbersome journey, scaling above 4,000 and 5,000 metres looking for the "Himalayan Gold".

Once in the uncertain alpine mountains, they spend most of their time crawling on the ground, trying to collect cordyceps among other grasses. The conditions are harsh— treacherous routes, freezing winds, rain, bloodshot eyes, strong ultraviolet rays, low oxygen, migraines, and altitude sickness. There are no guarantees that they will find anything at the end of a month after braving such hardships in the mountains.

The risk of death and brawls among other collectors hangs heavy. People had died for the internationally sought-after aphrodisiac, Ophiocordyceps sinensis. The most recent incident in Tsharijathang in 2021 is still fresh in their memories.

Pem Zam from Lungo is still haunted by the memories of her 10 friends who were buried under a landslide in 2021 at Tsharijathang as she watched in horror. She camps below a glacial lake; her nights are disturbed by thoughts of dying in an outburst flood or snow avalanches.

But in the evening, she sits by the fire in her wobbly tarpaulin tent. The silent fall of the snow is loud as the eerie night sets in. She digs into her pockets and starts counting her day's harvest. She got 10 pieces. As she put cordyceps into a plastic jar, she smiled, "It is my lucky day."

Her friends, who climbed higher than Masangang, returned with a few pieces of cordyceps, and a throbbing migraine.

Three decades ago, Pem Zam's 62-year-old father Rinchen Tashi collected a bag full of cordyceps in one sitting. As the fungus did not have any commercial value, they would collect only a few for self-consumption. As the four members of his family return with a mere harvest after a month in the mountains, he is in disbelief. This year, the harvest will be poorer, he said. Untimely snowfall is an indication, the village astrologer said.

Records show that Laya has experienced a decline in the abundance and quality of cordyceps in recent years. The amount auctioned at the forest range within the Jigme Dorji National Park showed a decreasing trend—from 55.93kg in 2020 to 38.06kg in 2021.

Climate change, characterised by fluctuating temperatures and unpredictable weather patterns, is believed to have disrupted the growth and development of cordyceps. As mountain areas are expected to experience a further increased temperature rise, their main source of livelihood is in jeopardy.

A conservation biologist, Lhendup Tharchen, says that such extreme weather conditions due to a changing climate will have an adverse impact on the highland communities. Climate change, he said, will

impact the growth of cordyceps. "Cordyceps is a caterpillar fungus, and the humidity and the moisture availability will certainly favour the growth. An increase in temperature will have a huge impact on cordyceps as both the host fungi growth and the life cycle of the moth will be affected."

This has become a rampant phenomenon across the Himalayan communities in India, Nepal, and China. A research study conducted by Stanford University reported a significant decline in cordyceps collected— in Nepal, the production per person significantly dropped from 212-261 pieces in 2006 to 97-126 in 2010, while China experienced a substantial 70 percent decline in yield from 1978 to 2001.

Unsustainable collection, ecosystem disturbance, and climate change, the research says, had caused the rapid decline.

The snowfall in May this year was heavy in Laya. This had affected the cordyceps growth, as most of the fungus were left to rot in the deep snows. If Laya receives heavy snowfall in February, a "normal snowfall time", the harvest, it is said, would be good. Due to erratic weather conditions—heavy rain and snow—Pem Zam and her friends stay in tents for most of the days during the collection period. They occasionally go outside to check the weather.

The cordyceps collection, which was once a masculine task has become a lucrative job for everyone in the household. A household can get three permits issued by the gewog administration. But there are many who leave behind their children and elderly parents in the villages as they leave for the mountains in hopes of even obtaining a piece of the highly-priced fungus.

Pem Lhaden, 50, had been collecting cordyceps for the past 15 years. This year, she walked half a day to Gumna from Lungo with her husband and the youngest son to collect the cordyceps. Her three other children and their families had spread across various collecting areas in Laya Gewog. Her five-year-old granddaughter is left in the care of the early childhood care and development centre in Laya.

"We used to collect 500 pieces a day two decades ago," Pem Lhaden recalls. Now the highest amount one can collect in a day is 50, that too, when the harvest is good, which is every four years. Last year, it was a lucky year for them. The harvest was good, with a record price of Nu 2.85 million for a kg at the auction yards.

"It is like a gamble; it depends on luck. The times are difficult now, snowfall has decreased too," the mother of four said, as she pointed at a receding snowline along the Raena-gu Mountain range. "The snow used to reach till the base. Now it is just rocks."

The mountain gold has helped attract many dropout youths in the highlands. Tshering Yangden, a

middle school dropout climbs as high as 5,000 metres to collect cordyceps. She takes noodle seasonings and sweets to counter mountain sickness. She is planning to head to Lunana, about a three day's hike away from Lungo. It is located at a higher altitude but the group of young people wants a better harvest.

While her mother goes to collect the cordyceps, Karma Yuden,8, tends to her two-year-old brother in the tent. She had to drop out of school after completing class I when her parents separated years ago.

Pem Zam left behind her ageing parents and 84-year-old mother-in-law with dementia in Lungo. Her two children are in boarding schools in Gasa. Occasionally for an hour, she climbs a pass with a cellular network to ask after them.

Times are difficult for women. Maintaining hygiene in such cold weather is almost impossible. Days are hard with monthly periods and premenstrual symptoms.

Tshewang Lhamo, a Gender and Inclusion Analyst with the United Nations Development Programme, said that caregiving and domestic

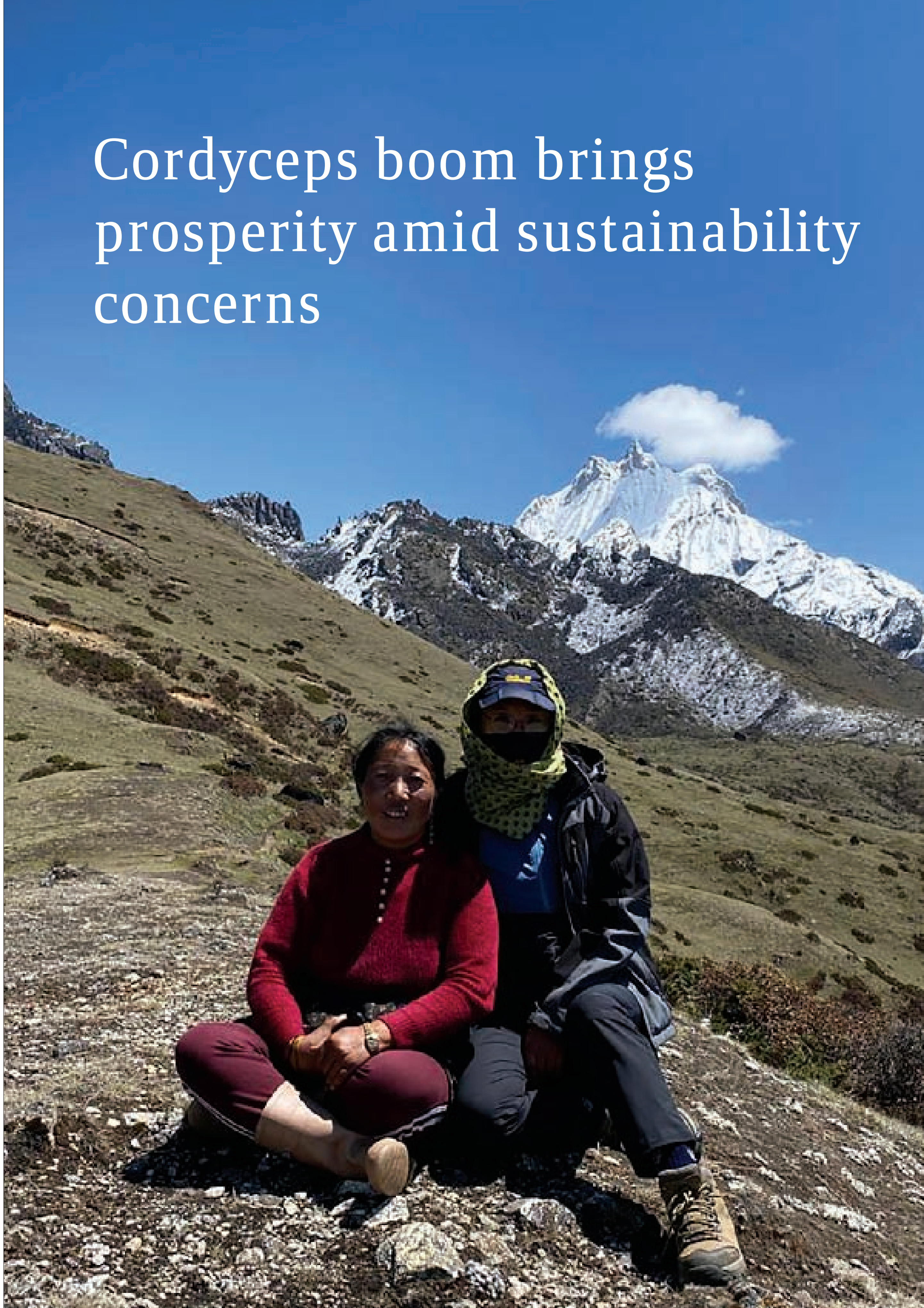
“*The impact of these stresses is more for women cordyceps collectors due to harsh climatic and geographical conditions.*”

responsibilities will have a huge bearing on women's health and wellbeing. As they don't have time for leisure to take care of the physical and mental stress, they are vulnerable to disaster and climate change impacts. “The impact of these stresses is more for women cordyceps collectors due to harsh climatic and geographical conditions.”

After three days at Gumna, Chimi Dema returned home to Lungo with her grandson and her youngest daughter. Her sick daughter was suffering from frequent asthma attacks.

“People say mountain people are rich from cordyceps business, but only if they know a portion of what we go through, no one will dare say it again!” the 38-year-old said, with a look of defeat on her weather-beaten face.

Cordyceps boom brings prosperity amid sustainability concerns



Choki Wangmo

Laya— In the aftermath of a devastating housefire that reduced her newly-built two-storey residence to ashes, Pem Zam, a resident of Lungo, was left heartbroken. However, her resilience shone through as she swiftly reconstructed a new house, thanks to the substantial earnings of Nu 2 million from the sale of cordyceps.

Over the past two decades since its legalisation in 2004, the rare fungus has emerged as the main source of income for many herding families. Each year, three members of Pem Zam's family spend a month scouring the alpine meadows for fungus, a species that is gradually becoming scarcer due to shifting climate patterns.

Previously, the residents of the 15 cordyceps-collecting gewogs primarily relied on yaks and cattle, but this traditional practice is fading in the high mountains.

Among the 400 species of cordyceps, Ophiocordyceps sinensis, found above 3,800 metres, is the most widely collected species in Bhutan, India, Nepal, Tibet, and several Chinese provinces.

Numerous studies conducted in Bhutan show that the income generated from a month-long cordyceps collection significantly surpasses the earnings from a full year of yak farming. This transition has brought about transformative changes in herding communities, altering their lifestyles and economic dynamics.

One study revealed that until 2009, each household had earned an average of Nu 0.14 million since the start of cordyceps collection in 2004. Collectively, the collectors had accumulated Nu 57 million between 2004 and 2009.

In this year's cordyceps auction in Wangdue, collectors fetched Nu 5.2 million per kilogram, equivalent to USD 62,650.

The driving force behind the cordyceps market is the demand

from Chinese consumers, leading to a staggering 900 percent increase in value from 1997 to 2008. For more than two millennia, this fungus has been recognised as a valuable medicinal product in China, playing a crucial role in traditional Tibetan and Chinese medicine. Consequently, this growth has created a distinct rural fungal economy in the Himalayan plateau.

The cordyceps boom has attracted many to the mountainous regions. For example, in Sephu, the number of households rose from 265 in 2004 to 314 in 2005, reaching 319 by 2018.

The Laya gewog has also experienced a significant surge in households, as numerous young school dropouts embrace the cordyceps business. "They eschew opportunities outside the gewog due to the lucrative nature of the cordyceps industry," said Namgay from Lungo.

The gewog now boasts more than 100 young people seeking their fortunes.

The increasing population in these villages has contributed to the development of improved facilities and amenities in the region.

In Lungo, Laya, the number of registered households continues to rise annually. With 60 households, the small village is bustling with activity as new homes sprout up within a few years. Moreover, they offer construction work opportunities to individuals from the eastern regions.

Within Pem Zam's house, one room is brimming with grocery items, while her kitchen shelves are adorned with utensils she purchased for Nu 80,000 from Punakha. As a mother of two, she plans to invest in her children's education. When cordyceps yields are poor, she still manages to earn Nu 65,000 per kilogram. The record price reached as high as Nu 2.83 million per kilogram last year.

Tshewang, 41, earns a minimum of Nu 1 million from cordyceps sales. He invested in a building in Punakha, which serves as a winter home for his family for three months. Content with his newfound prosperity, Tshewang has no intention of leaving Lungo. Additionally, he derives rental income from his property. A significant portion of his earnings is allocated to his children's education, with both attending private school

and university. "Life is more comfortable now," he says.

Tshewang finds the task of yak rearing arduous with little financial return. "We were barely self-sufficient," he says.

In Punakha, Tshewang notes that Lunaps and Layaps own the majority of the buildings. Lunana Gup Kaka reveals that 10 percent of collectors from the gewog have invested in properties in other parts of the dzongkhag, predominantly Punakha and Wangdue.

However, Kaka admits that the earnings are just enough to meet annual needs. With no road connectivity, residents often rely on pony services to transport food, with each trip costing over Nu 100,000. They make three annual trips to Punakha to purchase essential items.

"Once the goods reach Lunana, people have to pay exorbitant rates," says Kaka.

For instance, a 25-kilogram bag of rice costs Nu 3,000 in Lunana.

Among those who left the village, four Lungops have ventured into the

cordyceps export business. In a year, a Lungo exporter can earn Nu 10 million from cordyceps export.

Sephu Gup Dawa Tshering highlights that for many harvesters in the gewog, between 80 to 100 percent of their income is solely derived from fungus sales.

"With limited agricultural land holdings, our livelihoods used to depend on yaks, but the cordyceps business has significantly improved our living standards," he says.

Farmers, he adds, utilise their earnings to repay loans.

Research findings indicate a notable increase in household incomes in Sephu. Prior to the cordyceps business, 80.2 percent of households earned below Nu 100,000, but after entering the fungi industry, their incomes soared to over Nu 300,000. As a result, the population and number of households in the Sephu gewog have seen substantial growth, accompanied by numerous new constructions.

Nevertheless, the sustainability of this thriving industry faces significant

> *"We pray that we don't run out of this fungus, as we currently lack alternative sources of income, Namgay voices anxiously."*

challenges. Unsustainable collection practices, disturbances to the ecosystem, and the impacts of climate change are causing a rapid decline in cordyceps. In regions like Yaktsa and Nubri in Tsento gewog of Paro, the fungus can no longer sustain the livelihoods of residents.

Gup Chencho Gyeltshen says, "It has become an alternative source of income alongside yak rearing."

Collectors express deep concerns about the decreasing yield of cordyceps.

"We pray that we don't run out of this fungus, as we currently lack alternative sources of income," Namgay voices anxiously.

Without substantial investments, the mountainous regions may face challenging circumstances once again.

A journey of joy: warm temperatures enable maize cultivation at higher altitudes

Nidup Lhamo

Amidst the ever-changing tapestry of climate change, a heartwarming tale of resilience and delight has been unfolding in the higher altitude regions. Against the backdrop of shifting weather patterns and uncertain agricultural futures, a group of dedicated farmers has discovered a secret to both adapting to changing climate and finding pure joy: cultivating maize at higher altitudes. With every sun-kissed field and every radiant smile, they have transformed the challenges of climate change into flourishing opportunities, fostering a remarkable journey of passion and abundance.

It has been more than six years since the people of Togtogom began reaping corn harvest. Customarily, Togtogom was a summer residence, and Togtowom was a winter residence of this present community. Togtogom is a small village under Bongo Gewog, Chukha located about 2,700 meters above sea level. They dwelled permanently at Togtogom, a

few years back abandoning the winter-summer migratory practice.

In the small village nestled in the embrace of towering peaks, a community of sixteen households once believed maize cultivation to be an elusive dream. Only wheat was cultivated in their summer residence.

However, since 2011, a group of visionary farmers, led by the indomitable Ap Changchala, 65, dared to sow the seeds of maize as a trial. Their pioneering efforts bore fruit, as the maize crops thrived and ripened. "Encouraged by this success, the farmers expanded their cultivation to larger fields, paving the way for a maize revolution in the village," 68-year-old Karma shared.

About two acres of land were used by the farmers of Togtogom for growing maize, along with other cash crops such as potatoes and peas. They mostly practice mixed cropping.

However, they can harvest corn only once a year. Karma said, "It is gratifying to see the production of maize increase year by year, and we are set to trial if we could grow it twice a year." He added that they are willing to cultivate maize even twice a year.

The maize grown there is an indigenous variety. The seeds have been used for a long period of time. Tashi, 33, said, the hybrid seeds provided by the government are not adaptable to the higher altitude. Therefore, the farmers prefer to use their own ancient maize species.

The farmers usually sow maize in March and harvest it in October. Tashi said, "Though we can only grow it once a year, all the farmers genuinely take an interest in growing maize and most of the households cultivate maize along with other cash crops."

According to the villagers, maize production in their village has been increasing every year. Today, the communities cultivate maize primarily for self-consumption, mainly as staples and snacks, and some of it is used as seed and fodder for livestock.

Tashi shared, "It was a blessing in disguise, as in the olden days, we had to go to other villages to collect maize grains, but now we can grow it ourselves, and it's great for us."

According to the annual statistical yearbook of Bhutan 2022, Bongo gewog produces 42,713 kilograms of maize.

Another young farmer, Sonam Dawa, a 25-year-old high school graduate, shared the joy of growing maize in his village. He said, "For generations, wheat had been the lifeline of the village, and most people would usually use this village as a summer residence. But after maize offered a promising alternative to their once wheat-dominated fields, many villagers showed interest, and now we are fully engaged in maize cultivation."

Moreover, the absence of pests and diseases in high-altitude regions provides a natural advantage to farmers. Sonam shared, "The maize we grow here is never infested by pests. Even if we keep it in open areas for two or three years, it hardly gets attacked by any pests."

Phub Dem, a 32-year-old farmer, exudes excitement for maize cultivation. She says,

"The annual growth of maize, a once-a-year event, brings me immense pleasure and fuels my dedication to work harder." She added that with improved transportation, they can also sell maize and reap profits, igniting the passion for agriculture.

The community of Togtogom has claimed that they believe the establishment of the Chukha Hydropower project has led to a noticeable increase in temperature. However, they are not thankless; the people of Togtogom have electricity, new farm roads, and mobile network in their senile rural life otherwise.

Though no major climate change-related issues have arisen, Karma shared his observations. "Earlier, we used to receive rainfall lightly, but now it comes suddenly and intensely, sometimes even more heavily." Furthermore, the villagers shared that they haven't received a snowfall last year, marking a significant change in their weather patterns.

The Chief District Agriculture Officer (DAO), Dhodo said that a region like Togtogom is favorable for dry-land farming. Their main crops are potato, wheat, barley, and buckwheat. Despite maize farming is not insisted on, the community cultivates maize too according to the Chief DAO.

This is very clear from the Intergovernmental Panel on Climate Change (IPCC), 6th assessment, and their studies too found that temperature is gradually rising in the Hindu- Kusk-Himalyan region. This rise in mountains is comparatively higher than in other regions. "We call it altitude-dependent temperature rise," Dr Abid Hussain said.

"Due to this altitude-dependent rise, low-altitude crops are gradually moving up. And very high altitude pasture lands are getting favorable for some selected crops like potato, peas, buckwheat etc," Dr Abid Hussain added.

Nonetheless, where dreams have taken root from the legacy of wheat to the golden maize fields, it paints a picture of climate change. Climate change necessarily may not bring negative impact. The people of Togtogom now bask in the beauty of their journey; their eyes alight with the promise of a future where hope and abundance flourish.

"

The maize we grow here is never infested by pests. Even if we keep it in open areas for two or three years, it hardly gets attacked by any pests.

"

Production of maize in Togtogom village is not serendipitous. Though the people in this village may not understand much about global climate change, they are not so mundane to observe uncommon weather patterns of today. Drilling activities of Chukha hydropower had vibrated till Togtogom and the older people there say "The power plant is the factor of temperature rise."

However, the managing director (MD) of DGPC, Chewang Rinzin denied the claim and said it would be a result of global warming. "There are no direct or indirect thermal effects associated with hydropower projects that could influence local climatic conditions," MD said adding that unlike thermal and nuclear power plants where stream is used to drive the turbine to generate power, hydropower plants use gravitational force of water to drive turbine to generate hydro-power.

MD said that energy from hydropower is considered one of the cleanest amongst energy sources and it fits in well with sustainable development goals. "Countries are opting for hydropower development to mitigate the climate change with hydropower mitigating GHG emission."

According to MD, noise and dust pollution may occur during construction, and mitigation measures must be considered. Once commissioned, hydropower projects have cooling effects due to small reservoirs and rising water tables, making eco-systems more livable. "The Kurichhu dam and Gyelpozhing Township are examples of green and vibrant cities." MD said adding that climate change is a global phenomenon, and Bumthang now grows maize, chili, and rice.

Embracing the lessons of climate change

Nidup Lhamo

As the world grapples with the impact of climate change, high-altitude farming communities in Togtogom, Bhutan, are not standing idle. They are rising to the challenge, demonstrating resilience, and crafting innovative solutions to combat the changing climate.

Across the picturesque landscapes of Togtogom under Chukha dzongkhag (district), farmers are witnessing shifts in weather patterns, including higher temperatures and altered precipitation. While concrete data on climate and rainfall remains limited, farmers are noticing new possibilities. With the rise in temperature, they are finding success in cultivating low-altitude crops at higher elevations, introducing a ray of hope amidst climate uncertainties.

The expansion of maize and other low-altitude crops to higher altitudes is a clear indication of the climate's transformation. The agriculture officer at ARDC Wengkher said that changes in climate patterns, including variations in temperature and precipitation, can impact traditional maize-growing regions. She added that in response to these shifts, farmers may be forced to move their cultivation to higher altitudes that offer more favorable climate conditions.

While the effects of climate change are evident, data to substantiate local claims remains limited. The absence of weather stations in some areas hampers the accurate recording of climate and rainfall patterns, making scientific analysis challenging including the Togtogom village.

However, the data from the National Centre for Hydrology and Meteorology (NCHM) has observed a clear trend in the Bongo region. The maximum temperature reached 30°C in 2019, soaring to 31°C in 2020.

Globally, the Hindu Kush Himalayan (HKH) region faces rapid warming, according to a report by the International Centre for Integrated Mountain Development (ICIMOD). Even if the world manages to limit global temperature rise to 1.5°C, the HKHs are predicted to experience an increase of 0.3°C to 0.7°C above this threshold, posing threats to both mountain communities and their fragile ecosystems.

Additionally, according to research by APN Science Bulletin in the HKH regions, it shows that the future projection of some parts of Pakistan shows a 1.40c -3.7oc increase in the mean temperature by 2026 (Higher than the expected global average).

In the case of Bhutan it says, "Over the last few years, the country experienced rapid change in temperatures, precipitations pattern and the arrival of late summer monsoon causing flood and landslide resulting in massive loss of farming."

The research also shows that most of the farmers in Bhutan experienced a change in cropping practices such as alternative crops. New varieties have also been reportedly experienced at higher altitudes.

However, there is no research on the expansion of growth to higher elevations. An officer at ARDC Wengkhar, said, "Our farmers have been growing maize in high elevation, but we haven't done any maize-related activities." She added that they are trying to explore it in the 13th Five Year Plan (FYP).

"We will explore some good germ-plasm (High yielding varieties) for high elevation which can help our farmers in high elevation to have more varietal choice as well as to enhance their production," an officer added.

The increased cultivation of maize in the high zone presents an important opportunity to improve maize production and overall food security for that of Togtogom. Nevertheless, the expansion of maize to higher altitudes might affect the cultivation of the cold-tolerant crops traditionally grown there and there are chances of expanding even high up what is known as brushland or forest.

However, report from the science bulletin on the climate change risk perceptions, vulnerability and adaptation in high-altitude farming regions of HKH shows that due to limited research on high-altitude farming regions regarding climatic changes makes it difficult to understand the exact picture.

Similarly, in Bhutan too, there is a shortage of research or data and correspondingly in-depth news on the expansion of any low- altitudes species in the higher elevation.

The Dzongkhag Agriculture Officer (DoA) of Chukha, Dhodo also shared that the growth of maize in Togtogom is in the initial stage, and that they have no concrete recorded data for the production of maize and other figures.

"We have transformed Togtogom into a center for asparagus commercial farming, and now every household is engaged in upland paddy cultivation. Previously, people were unable to grow paddy here, but now they are successfully doing it," added the DoA.

In the face of escalating climate change impacts, communities in high-altitude regions are also taking proactive steps to adapt and safeguard their livelihoods. Sonam Dawa, a 25-year-old farmer, has observed the changing climate through the growth of new crop varieties that were previously unsuitable for the region. To support people's livelihoods, he shared the need for the government to provide seeds suitable for the changing conditions. Furthermore, he urged concerned agencies to advocate for climate change awareness and conduct in-depth research to better understand the evolving climate patterns.

Another resident, Karma, a 68-year-old shared the impacts of climate change. However, he expressed concerns about potential future risks, particularly the threat of flooding. "As a precautionary measure, we are advising children not to litter and advocate against cutting trees, particularly around water sources."

Lham, a 58-year-old also shared the observed rise in temperature, leading to the successful growth of low-altitude species like chilies, maize, and cucumbers in her village. However, she expressed concern about potential new diseases that could emerge with the changing climate. "To address this issue, we the communities are actively seeking solutions to mitigate such risks and protect their agricultural practices."

As the sun sets on Togtogom, its residents stand united in their efforts to adapt to a changing world. Through a harmonious blend of tradition and innovation, they forge a path toward resilience in the face of an uncertain climate. Embracing the lessons of the past and the potential of the future, these communities inspire the world with their unwavering spirit and determination to safeguard their cherished lands and livelihoods.

Dying water sources ravaged paddy cultivation in Pemagatshel

Sonam Penjor

Consuming only kharang (maize grain) had always not been a soft staple for the people of Dungsam Dosum. Many opt for buying rice, and rice consumers were considered a standard family. The people of Khar, Pemagatshel, started planting paddy, but their dreams are shattered.

With the objective of achieving food self-sufficiency, both the government and the villagers in Khar made significant investments to build a 5.5 km irrigation canal in 1988.

About 9.743 acres of land were used for paddy cultivation, and the farmers of Khar could reap the harvest. Cheten Chedar, 42, from Khar village, said that the farmers benefited from the irrigation channel. The water from the channel was also used for domestic purposes.

However, after five years, paddy farming couldn't be practiced. The irrigation canal was damaged by a landslide. It couldn't be restored and today it lies ruined. The farmers had no option but to switch to growing other crops.

Once-cherished dreams of lush paddy fields and bumper harvests for Khar farmers are shattered forever. Prolonging droughts and shifting weather patterns have made it harder for farmers to continue paddy cultivation.

With the impossibility of restoring the canal and distance being factors, farmers were demotivated from pad-

dy cultivation and mostly opted for cash crop plantations. Neither, there are perennial water sources nearby the village. The villagers, rather now import the rice.

Cheten Chedar said, "I have been forced to rely on imported rice to meet our basic food needs," which is actually a huge financial burden.

Water woes in the locality have been intensifying for more than a decade.

Cheten Namgay, 53, stated that as a result of climate change, water sources dried up and agricultural lands were left fallow. Farmers observed that crop production is impacted, which would pose a risk to livelihoods with no food security.

Dawa Dema, 75, stated that climate change and forest degradation are the main causes of the drying up of water sources. "This phenomenon will threaten not only the agricultural industry but also other industries like hydropower," she said.

She said there is a need to increase investment in water resource conservation, particularly in smaller water sources, such as springs, streams, lakes, ponds, and marshes.

Nima Gyeltshen, 60, said that dry land farming predominates in his village, followed by orchard farming. Furthermore, farmers' reliance on their livestock has always been a necessary source of income.

He claimed that as the water problem worsens, villagers are compelled to look for alternative sources of income. "Many people have moved away from their homes in pursuit of employment, abandoning the formerly prosperous agricultural fields."

As small-scale farming is carried out by women, Yeshi, 44, felt that water scarceness has limited the economic empowerment of women.

The Gup of Khar, Jamtsho, shared that there were incidences of brawls between the villagers in earlier days due to water scarcity for farming.

It is noticed that many farmers' ways of life have

changed drastically in Pemagatshel, and an immediate solution to the water crisis has become urgent.

Nonetheless, farming is part of their lives, and farmers are exploring other crops that require less water, according to the Gup, mostly cash crops. For their livelihood, the farmers grow maize, vegetables, and cardamom.

The Gup shared that if given liberty, farmers would wish to convert their wet land (Chhuzhing) into dry land, adding that the Jetsamri canal cannot be repaired.

Tshering Dorji, Assistant Dzongkhag Agriculture Officer (ADAO), stated that the majority of the villages are situated on steep slopes. Water shortages with settlement topography are bound, and obviously, irrigational practices would be harsh.

Despite the fact that the government always encourages domestic rice production, the ADAO said that farmers opt for dry-land farming due to a lack of water for irrigation.

The Dzongkhag administration is urging locals to engage in climate-smart farming practices, such as raising upland paddy and plantations of water-resistant crops like pineapple, cardamom, avocado, mango, and dragon fruits, among other water-resistant types.

> “*This phenomenon will threaten not only the agricultural industry but also other industries like hydropower*”

The matter is the same with Shumar Gewog. Paddy cultivation is long gone, and the gewog faces an acute shortage of drinking water, according to the Gup, Sonam Dendup.

The gup said that water shortages are effects of climate change, gypsum mining, and the expansion of water user groups like businesses, schools, and other institutions.

Yet for food production diversification, the farmers of Shumar grow more cash crops, such as mango and avocado, among others, to improve food security in the gewog.

The gewog is fostering the expansion of climate-smart agriculture, providing greenhouses to the farmers, which help in income generation.

Similarly, the paddy fields in Decheling Gewog are also left barren.

Meanwhile, drinking water sources alone make up approximately 95.4 percent of the Dzongkhag's total water sources, with irrigation accounting for 1.5 percent, according to the Assessment and Mapping of Water Sources in Bhutan, December 2021, released by the Department of Forests and Park Services Watershed Management Section.

The assessment found that six probable untapped water sources were identified throughout the investigation as potential sources of water supply in the future.

According to the Assessment and Mapping of Water Sources in Bhutan, Pemagatshel Dzongkhag reported 263 water sources, of which 217 are still in the status of no change and 45 are in a state of drying up.

The assessment states that of the 263 water sources in the Dzongkhag, about 76 percent are springs, 19 percent are streams, and the remaining sources include ponds, marshes, rivers, and lakes.

According to the National Statistics Bureau's 2022 Agriculture Spatial Information for Paddy Cultivation (2022 ASI4PC), Punakha Dzongkhag had the largest cultivable paddy area holding with 6,291.23 acres, followed by Samtse Dzongkhag with 5,301.40 acres and Wangduephodrang with 4,772.61 acres.

The lowest cultivated paddy area was recorded for Pemagatshel Dzongkhag with 19.34 acres, Haa with 99.7 acres, and Gasa with 175.91 acres.

Except for Nanong and Norboogang gewog in Pemagatshel, none of the other gewogs in the Dzongkhag cultivate paddy.

Meanwhile, the Khar Gewog Water Project, constructed at a cost of Nu 3.84 million in 2021 under the water flagship program by the Royal Government of Bhutan-De-suung partnership, is benefiting about 63 households.

Finding solution for drying water sources

Planting trees, fencing and recharging water sources….

Sonam Penjor

Climate change is creating more extreme events, probably the most common driver we see for landslides worldwide is rainfall. A 5.5-kilometer irrigation canal that was built in 1988 in Khar village of Pemagatshel was washed away by a landslide after five years. Since then, the farmers couldn't continue paddy farming. It couldn't be restored and was ruined. Water sources keep drying. This calls for urgent action to conserve water sources for farming and livelihoods.

The people of Khar used about 9.743 acres of land for paddy cultivation in the past. But now the farmers have no option but to switch to growing other crops. Prolonging droughts and shifting weather patterns have made it harder for farmers to continue paddy cultivation.

The landslide is caused by heavy rainfall, a factor that is due to climate change. Rain is why landslide researchers are warning that climate change may make landslides more likely and that we are not prepared for this growing risk. This has led farmers to abandon rice cultivation and import rice.

Dawa Dema, 75, from Khar, said that climate change and forest degradation are the main causes of the drying up of water sources. She said that heavy rainfall caused by climate change affects nature, ultimately affecting humans through disasters like landslides.

She said there is a need to increase investment in water resource conservation, particularly in smaller water sources such as springs, streams, lakes, ponds, and marshes.

53-year-old Cheten Namgay claimed that the effects of climate change resulted in the drying up of water sources and the abandonment of agricultural lands. Farmers have seen that agricultural output is affected due to water scarcity. He said that something should be done to protect water sources.

There is no other alternative than to protect the water sources by planting trees, building a river protection wall, and advocating for proper use of water, said Shumar Gup, Sonam Dendup.

He said the gewog maintains a water system that is climate resilient to ensure a steady supply of water for agricultural needs through the formation of a water user group.

The Water Research Bhutan claimed that, due to changes in rainfall patterns, climate change can alter recharge catchment patterns. "A catchment would be a preferable place to store a moderate amount of summertime rainfall."

The group suggested that "Water source protection should be based on catchment scale, and you can't just fence a water source." Instead, the researchers recommended locating potential water recharge zones and starting to keep them as natural as possible without adding any new plant species.

In order to decrease leakage loss, it was also suggested that the infrastructure for distributing water be improved. It was also suggested that reservoir development be looked into as a means of damming and storing water.

According to the Policy in Brief Report of the Department of Water, Ministry of Energy and Natural Resources, Bhutan is already experiencing the impacts of climate change with observed decreases in snow cover, increasing incidences of declining water availability, flash floods, and windstorms.

"Adaptation is needed to address current vulnerabilities and also reduce the risks from future impacts. Ambitious mitigation measures will reduce the magnitude of climate change while bringing local benefits, and early mitigation action will be

cheaper than delayed action," added the Policy in Brief Report.

In response to the dying of water sources due to climate change, the Assistant Dzongkhag Agriculture Officer (ADAO) for Pemagatshel Dzongkhag, Tshering Dorji said that the Dzongkhag has initiated fencing off the water sources and planting trees in and around the water sources.

He said that the Dzongkhag is taking the initiative to exchange the

land next to the water sources and put rainwater harvesting technologies into practice with Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP) project funds in order to maintain the home, kitchen garden, and domestic animal use.

In addition to collecting rainwater, the Dzongkhag, according to him, has plans to resurrect dried lakes that will be used for agriculture purposes.

The Minister for Agriculture and Livestock, Lyonpo Yeshey Penjor, said that with lots of water resources drying and pests and diseases coming in, crop productivity and the source of water will be impacted, leading to food security.

In landlocked and mountainous countries like Bhutan, Lyonpo said that with a rise in temperature, there can be migration of crop patterns and faster soil evaporation, leading to the drying of our perennial streams, which are the main source of water for irrigation.

However, Lyonpo said, "Bhutan cannot do anything on mitigation as we are not an emitter of greenhouse gases (GHG)." Lyonpo said, "The only way we can mitigate climate change is to reduce GHG emissions." Bhutan is a carbon-negative country."

"There is nothing we can do on mitigation; we can only avail ourselves of resources from the international community to adapt ourselves to climate change," said Lyonpo.

Although Bhutan is not a climate change maker, Lyonpo added that Bhutan definitely suffers from climate change. "So, we should prepare ourselves to build better for adaptation, and an adaptation fund has to be mobilized from global climate funding agencies."

Lyonpo added that thinning out trees allows more sunlight to reach the forest floor, which reduces the density of vegetation and leaf litter. This, in turn, allows rainwater to penetrate the soil more easily instead of being intercepted by dense vegetation. "When the rainwater infiltrates the soil, it can eventually reach the groundwater reservoirs."

Dense forests with a high tree density have a significant amount of transpiration, which leads to the loss of water from the ecosystem. Thinning out trees reduces transpiration rates, allowing more water to stay within the soil and potentially con-

tributing to groundwater recharge, added Lyonpo.

In the meantime, Assessment and Mapping of Water Sources in Bhutan, December 2021, released by the Department of Forests and Park Services (DoFPS) Watershed Management Section, found out that the impact of climate change causes 36.5 percent of the country's water sources to dry up, with deforestation and forest degradation as the second-leading causes with 28 percent.

In addition to that, road construction, forest fires, excessive grazing, changes in land use and land cover, the building of transmission lines and other infrastructure projects, and unstable geology, among others, are other factors that people believe are contributing to the drying up of water sources globally.

The assessment states that water supplies are also drying up in some parts of the nation for reasons that people are unaware of.

According to the Recharge Area Mapping of Drying Water Sources, Spring Shed Assessment at Yagyur and Khengzor in Pemagatshel, carried out by the Tarayana Foundation, it has been noted by villagers in Khar Gewog that spring water flow is decreasing annually, hindering domestic work and sanitation, especially during the lean season.

The assessment recommended that recharging drying water sources will ensure the sustainability of critical water sources and therefore reduce the drying up of water sources.

According to a validation assessment report released by the Watershed Management Division, DoFPS, 2021, Pemagatshel alone has 263 water sources, 45 of which are in the process of drying up. Among the 11 gewogs in the Dzongkhag, Khar Gewog has the highest number of water sources that are drying up.

Fencing structures are currently used as a protection measure for water sources, but they do not achieve conservation and will not prevent springs from drying up in the future, as the Spring Shed Assessment at Yagyur and Khengzor in Pemagatshel states.

གཙང་པོ་གཡུས་ཚན་ནང་ གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལས་འགུལ་འགོ་བཙུགས་ཡོདཔ།

བདེ་སྐྱིད་ཆོས་སྒྲོན།

བཀྲིས་སྒང་རྫོང་ཁག་ ཁྲིམས་ཤིང་དྲུང་ཁག་འོག་གི་ གཙང་པོ་གཡུས་ཚན་ནང་ གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལས་འགུལ་འགོ་བཙུགས་ཡོདཔ་ཨིན་མས། དེ་ཡང་ འཛམ་གླིང་སྤྱི་འགྱུར་དང་ རྒྱལ་ཁབ་ནང་ དཔལ་འབྱོར་གོང་འཕེལ་གྱི་གནས་སྟངས་ དེ་ལས་ གནམ་གཤིས་འགྱུར་བགྲོད་ཀྱི་དཀའ་ངལ་འཐོན་ཡོདཔ་བཞིན་དུ་ དེ་དང་མཐུན་འགྱུར་སྒྲི་ལྷ་འབད་ནིའི་དོན་ལུ་ ཡུ་ཨེན་ཌི་པི་གི་ལས་འགུལ་ཆུང་བའི་གྲོགས་རམ་མ་དངུལ་དང་ འབྲུག་གཞུང་མཉམ་འབྲེལ་ཐོག་ལས་ གཡུས་ཚན་ནང་ གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལས་ཅིག་འགོ་བཙུགས་ནུག།

གཡུས་ཚན་འདི་ མཐའ་ཟུར་ཅིག་ཨིནམ་ད་ གཡུས་ཚན་གྱི་མི་སེར་ཚུ་ འཚོ་བ་གཙོ་བོ་ ཀ་བ་དང་གེ་ཟ་ལུ་བརྟེན་སྡོད་དོ་ཡོདཔ་ཨིན་རུང་ སོ་ནམ་ཞིང་ལམ་དང་ གློག་མེ་ བརྒྱུད་འཕྲིན་ཞབས་ཏོག་དང་ གཞན་གཞི་རྟེན་མཁོ་ཆས་ག་ར་ ཐོབ་ཡོདཔ་ལས་ གཡུས་ཚན་དེ་ ཡར་རྒྱས་མདུམ་དུ་སྤྱོ་བའི་བསྒང་ཨིན་པས།

འབྲུག་རྒྱལ་ཁབ་ཀྱི་གཡུས་ཚན་མང་ཤོས་ཅིག་ནང་ འཚོ་བའི་གནས་སྟངས་ཡར་དྲག་སོང་རུང་ གནོད་ལེན་སྙོམ་ཤོས་ར་ རི་དྭགས་སེམས་ཅན་གྱིས་ ལོ་ཐོག་ལུ་ གནོད་སྐྱོན་རྐྱབ་མི་དང་ ན་གཞོན་ཚུ་གིས་ སོ་ནམ་གྱི་ལཱ་ལུ་ སྤྲོ་བ་ལེན་མ་བཏུབ་པའི་ དཀའ་ངལ་ཚུ་ཐོནམ་བཞིན་དུ་འདུག།

གནམ་གཤིས་འགྱུར་བགྲོད་དང་མཐུན་འགྱུར་འབད་དགོཔ་གལ་གནད་ཅན་ཨིནམ་བཞིན་དུ་ གཙང་པོའི་མི་སེར་ཚུ་གིས་ གནམ་གཤིས་འགྱུར་བགྲོད་ཀྱི་ གནོད་ལེན་ལུ་ གྲ་སྒྲིག་འབད་དེ་ ཐབས་ལམ་སྣ་ཚོགས་སྟོན་པའི་བསྒང་ཨིན་པས། དེ་ཡང་ གཙང་པོ་གཡུས་ཚན་ སྤྲིབ་ལ་ཟེར་ས་ལུ་ ས་གཞི་བཟའ་སྤྱོད་མ་འབད་བར་ལོ་ ༣༥ དེམ་ཅིག་ལུས་ཡོད་མི་དེ་ སྤྱི་ལོ་ ༢༠༢༡ ལུ་ གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལུ་ ལེགས་བཅོས་འབད་ཡོདཔ་ཨིན་པས།

དེ་ཡང་ མི་སེར་ཚུ་གིས་ གནམ་གཤིས་འགྱུར་བགྲོད་ལུ་ གནོད་ལེན་དང་ མཐུན་འགྱུར་འབད་ནིའི་དོན་ལུ་ གློག་མེ་རྭ

བཙུགས་ རང་མགོ་རང་འདྲོངས་བཟོ་ཐབས་ལུ་ ས་གཞི་ཉམས་བཅོས་འབད་ གནམ་གཤིས་འགྱུར་བ་དང་བསྟུན་སྐྱེ་བཏུབ་པའི་ཧ་ཟམ་ཤིང་དང་ཚོད་བསྲེ་ཚུ་ བཙུགས་ཡོདཔ་ཨིན་པས།

གཡུས་ཚན་ནང་ས་གཞི་ཡོངས་བསྡོམས་ ཨེ་ཀར་ ༦༢ དེམ་ཅིག་གུ་ གློག་མེ་རཝ་བཙུགས་ཡོདཔ་ད་ ཀི་ལོ་མི་ཊར་ ༨.༥ འབདམི་ གློག་མེ་རཝ་དེ་འགྲིབ་རཝ་ ༣༠༠༠ དེམ་ཅིག་ལག་ལེན་འཐབ་ཡོདཔ་ཨིན་པས།

ལས་འགུལ་གྱི་ཁྲི་འཛིན་ སྐྱེས་ལོ་ ༥༨ འབདམི་ ཨཔ་བསྐལ་བཟང་ཚེ་རིང་གིས་བཤདམི་ནང་ ལས་འགུལ་གྱི་སྡེ་ཚན་ནང་འཐུས་མི་བསྡོམས་ ༨༩ དེམ་ཅིག་ཡོད་རུང་ ད་ལྟོ་ ཧ་ཟམ་ཤིང་བཙུགས་མི་ ༢༧ རྐྱངམ་གཅིག་ཡོདཔ་མི་འདི་ ལས་འགུལ་གྱི་འཐུས་མི་ ཞི་གཡོགཔ་འབདམི་ཚུ་ ལྷ་འབདབར་ལྷོདམ་ཚུགས་ནི་དེ་གི་ཨིན་པས། ཨིན་རུང་ ཁོང་ཆ་ཁྱབ་ཀྱིས་ གློག་མེ་རཝ་ནང་འཁོད་ཚུད་མི་ས་གཞི་ཚུ་ སྟོངམ་སྦེ་བཀོ་མ་བཞག་པར་ ཆརོགས་འབད་ནི་ཟེར་བཤདཔ་ཨིན་པས།

ད་ལྟོ་ཚུན་ གློག་མེ་རཝ་གུ་ སྐྱོན་ཞུགས་ག་ནི་མེདཔ་ད་ འགོ་ཐོག་གློག་ཐག་ ༨ སྦྱིང་ཡོད་རུང་ ཤཝ་གི་གནོདཔ་བཀག་མི་ལུ་བརྟེན་ གློག་ཐག་ ༡༡ གུ་ ཡར་སེང་འབད་ཡོདཔ་ད་ ད་རུང་ཧེང་སྐལ་སྦྱིང་ནི་འབདཝ་ཐ་ད་ རཝ་གི་བདའ་མ་ཟུན་པར་ ལུས་ཡི་ཟེར་ ཨཔ་བསྐལ་བཟང་ཚེ་རིང་གིས་བཤདཔ་ཨིན་པས།

ལས་འགུལ་གྱི་ས་གནས་སྒྲིབ་ལ་ཚུན་ ཀི་ལོ་མི་ཊར་ ༡.༨ འབདམི་ སོ་ནམ་ཞིང་ལམ་སྟོན་ཡོདཔ་ད་ ས་གཞི་ཨེ་ཀར་ ༣༡ དེམ་ཅིག་ནང་ ཧ་ཟམ་ཤིང་ ༦༨༠༠ དེམ་ཅིག་བཙུགས་ཡོདཔ་ཨིན་པས།

དེ་ལས་ ཨེ་ཀར་ ༣ ནང་ སྤུར་ལས་བཙུགས་མི་ལོ་ཐོག་ ཀར་དང་ནག་ ཞིམ་རྩི་ཚུ་བཙུགས་ཡོདཔ་ད་ ཤུལ་ལས་ ཨེ་མ་ཡང་ བཙུགས་ནུག།

སྤྱི་ལོ་ ༢༠༢༢ སྤྱི་ཟླ་ ༧ པའི་ནང་ སོ་ནམ་ཞིང་ལམ་འདི་ འཕྲུག་འཐབ་སྟེ་ ཟླཝ་ ༡༡ ལྷབ་ཅིག་འགྱོ་རུང་ ད་ལྟོ་བར་ན་ཡང་ སེལ་མ་ཚུགས་པར་ཡོདཔ་ལས་ རྐེད་འོག་བདག་སྐྱོང་ལུ་ ཞུ་བ་ག་དེམ་ཅིག་ཕུལ་རུང་ སེལ་མ་ཚུགས་པར་ཡོདཔ་ཨིན་པས།

ས་གཞི་ ཚོད་བསྲེ་དེ་དང་དེ་བཙུགས་དགོ་ཟེར་མེདཔ་ད་ ཨཔ་བསྐལ་བཟང་ཚེ་རིང་གིས་འབད་བ་ཅིན་ ཧ་ཟམ་ཤིང་དང་གཅིག་ཁར་ ཨ་ལྷུན་ཅི་བཙུགས་ཡི་ཟེར་བཤདཔ་ཨིན་པས། ཧེ་མ་ ས་གཞི་དེ་ཁར་ ཀ་དང་གེ་ཟའི་ཐོན་སྐྱེད་ལེགས་རུང་ མི་སེར་ཚུ་གི་བཟའ་སྤྱོདམ་འབདཝ་བར་ ནགས་ཚལ་གུ་འགྱུར་ཡི་ཟེར་ཨིན་པས།

དེ་ལས་ འབྲུག་མཐུན་འབྲེལ་ཚོགས་པའི་ སྲིད་འཛིན་འོག་མ་ ཊོག་ཊར་བཙོ་ལྷ་ཚེ་རིང་ གདངས་རི་ཧ་ཟམ་ལས་སྡེ་གི་ མདོ་ཆེན་སྣེ་ཕྲུག་ཞུ་བའི་སྐབས་ ཡུ་ཨེན་ཌི་པི་ལུ་མ་དངུལ་རྒྱབ་སྐྱོར་གནང་དགོ་པའི་ཞུ་བ་ཕུལཝ་བཞིན་དུ་ གྲོས་འཆར་ཡང་འགྲུབ་ནུག

དེ་ཡང་ ཡུ་ཨེན་ཌི་པི་གི་ མ་དངུལ་འབུམ་ ༢༧ དེམ་ཅིག་གནང་མི་འདི་གི་ འབུམ་ ༦ དེམ་ཅིག་ སོ་ནམ་ཞིང་ལམ་སྟོན་ནི་དོན་ལུ་ ལག་ལེན་ཐབས་ཡོདཔ་ད་ ད་ལྟོ་ སོ་ནམ་ཞིང་ལམ་འདི་ རྐེད་འོག་ལུ་རྩིས་སྤྲོད་ཡོདཔ་ཨིན་པས།

ཨཔ་བསྐལ་བཟང་ཚེ་རིང་གིས་བཤདམི་ནང་ གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལས་འགུལ་འགོ་བཙུགས་པའི་སྐབས་ མི་སེར་ཚུ་ གློག་མེ་རཝ་དང་རྩི་ས་ ཆུ་ལ་སོགས་པ་འཐབ་སྟེ་ གནམ་མེད་ས་མེད་དཀའ་ངལ་སྤྱད་ཡི་ཟེར་ཨིནམ་ད་ ལོ་ལྔ་གི་ཤུལ་ལས་ གྲུབ་འབྲས་ལེགས་ཤོམ་ཐོན་པའི་ རེ་བ་བསྐྱེད་དོ་ཟེར་ཨིན་པས།

གནམ་གཤིས་འགྱུར་བགྲོད་རིག་པའི་སོ་ནམ་ལས་འགུལ་དེ་ ཁྲིམས་ཤིང་གཡུས་ཚན་ལས་ གུང་པ་ ༩ དང་ གཙང་པོ་ལས་ ༢༣ ཡོངས་བསྡོམས་ གུང་པ་ ༢༧ གྱིས་འགོ་བཙུགས་ཡོདཔ་ད་ བརྒྱ་ཆ་ ༦༧ དེམ་ཅིག་ ཨམ་སྲུ་ཡོདཔ་ཨིན་པའི་གནས་ཚུལ།

གནས་ཚུལ་འདི་ ཨུ་ཨེན་ཌི་པི་ལས་འགུལ་ཆུང་བའི་གྲོགས་རམ་མ་དངུལ་དང་ འབྲུག་གཞུང་མཉམ་འབྲེལ་ཐོག་ལས་ འབྲུག་བརྡ་བརྒྱུད་གཞི་ཚོགས་ཀྱིས་ རྒྱབ་སྐྱོར་འབད་ཡོདཔ་ཨིན།

Transforming degraded fallow lands into climate-smart agriculture expanses

Deki Choden

In the face of climate change impacting Bhutan, a concept of climate smart agriculture has been introduced in

Tsangpo to contribute to the mitigation and sequestration of carbon emissions. The project is under GEF-Small Grants Programme UNDP, implemented in partnership with the Royal Government of Bhutan.

Tsangpo is a remote village under Thrimshing Drungkhag in Trashigang Dzongkhag but it's connected with a farm road, electricity, mobile network and other basic amenities. Communities' mainly depend on cash crops like potatoes and maize and they are now in the verge of graduating from the 'least developed' status.

Bhutan's development is highly dependent on climate sensitive sectors and one among them is the agriculture. Although the lifestyles in most of the villages in Bhutan has improved, the wildlife and youth's unwillingness to work in agriculture sector are the common challenges faced by the communities.

The need for climate change adaptation action is paramount and there appear to be a limited number of adaption projects ongoing in Bhutan. However, the people of Tsangpo have come up with climate smart agriculture which is an integrated approach to climate change and the project was initiated in the year 2021.

In order to mitigate and adapt to climate change, the community reverted degraded fallow land, installed electric fencing and cultivated climate smart crops and fruits. In a total area of 62 acres, they installed 8.5 km electric fencing using 3,000 plastic up-cycled poles to prevent the crops from wildlife predation.Kelzang Tshering, 52, the community project member head, said that a total of 84 household members were initially registered but only 27 of them were able to plant hazelnut saplings because most of them were civil servants and resided in urban areas. However, other members who reside in village helped them to plant the hazelnut saplings in plots that fell within the electric fencing range.

He added that initially they installed 8 electric wires in a pole and later, due to the threat from deer, they increased it to11 electric wires. They wanted to further increase the number of electric wires in the poles however they had to drop the idea due to lack of space.

The location of the climate smart agriculture project is in Dripla which is under Tsangpo village and their main aim of the project is to yield a hazel-nut production within or after 5 years. The villagers constructed over 1.8 km access farm road with co-financing of Nu 300,000 from Gewog administration.

Villagers also planted 6,800 numbers of hazelnut saplings in about 31 acres of fallow land. Further, they also cultivated traditional crops such as wheat, barley, chilies, and perilla in three acres.

In July 2022, around 1.8 km access farm road was washed away by landslide and, despite requesting for several times, even after 11 months the Gewog administration didn't initiate any actions to clear the road.

The farmers also have the freedom to select their own choice of crop to cultivate along with the hazelnut trees. As for Ap Kelzang Tshering, he has opted to plant cardamom along with hazelnut.

According to Kezang, earlier villagers used to cultivate maize on their farms and the production was quite good. However, over the years many fields were left barren leading it to turn into bushes and forests.

He added that the climate smart agriculture project was proposed by the former director of Mountain Hazelnut Dr. Chenga Tshering to UNDP. Later, his proposal was accepted and the barren plots were finally transformed into productive fields.

UNDP funded over Nu 2.7 million for the project of which Nu 0.6 million were used to construct the farm road. Later, the1.8 km access road was handed to the Gewog administration by UNDP.

"Initially we struggled a lot while constructing the electric fencing since we had to carry electric poles in our back while we had to fetch water manually to water the plantation. However, we are hoping to reap the fruits of our labors after five years," Kelzang Tshering said.

Today, a total of 27 households are active members of the climate smart agriculture project. The members comprise of four households from Thrimshing and 23 households from Tsangpo. The communities provided labor contributions and materials in 2021.

This story is supported by Bhutan Media Foundation under the GEF-Small Grants Programme UNDP implemented in partnership with the Royal Government of Bhutan.

གནམ་གཤིས་འགྱུར་བགྱོད་ཀྱི་སོ་ནམ་རིག་པ་ ཡར་རྒྱས་མདུན་དུ་སྤོ་བའི་བསྐྱང་།

བདེ་སྐྱིད་ཆོས་སྒྲོན།

སྤྱིར་འཛམ་བུ་གླིང་དང་ ལྷག་པར་དུ་ འབྲུག་རྒྱལ་ཁབ་ནང་ དཔལ་འབྱོར་གོང་འཕེལ་གྱི་གནས་སྟངས་མགྱོགས་དྲགས་སྦེ་འགྱོ་མི་ལུ་བརྟེན་ གནམ་གཤིས་འགྱུར་བགྱོད་དང་འབྲེལ་བའི་དཀའ་ངལ་མ་འདྲཝ་ལེ་ཤ་ཅིག་རབྱུང་བཞིན་དུ་ཡོདཔ་ཨིན། དེ་གི་གནོད་ལེན་ལུ་ འབྲུག་གཞུང་དང་འབྲེལ་ཡོད་ལས་སྡེ་ཚུ་གིས་ ཐབས་ཤེས་དང་ཁྲིམས་ཡིག་ དེ་ལས་འཆར་གཞི་ཚུ་བརྩམ་སྟེ་ར་ཡོད།

འབྲུག་རྒྱལ་ཁབ་འདི་ གངས་རི་སྐྱེ་ལྡན་གནས་སྟངས་ནང་ཆགས་ཡོད་པའི་ཁར་ རྒྱལ་ཁབ་ཆུང་ཀུ་ཨིནམ་ལས་ རང་བཞིན་གནས་སྟངས་ ཀྱི་ དཀའ་ངལ་འབྱུང་ཉེན་ཡོདཔ་མ་ཚད་ ཡུན་བརྟན་གོང་འཕེལ་དང་ མིའི་འཚོ་སྐྱོང་ལུ་གནོད་ལེན་འབྱུངམ་ཨིནམ་ད་ རང་བཞིན་གནས་སྟངས་དེ་ ཨོ་ཤི་ཡཱན་ལུང་ཕྱོགས་རྒྱལ་ཁབ་ནང་ གཙང་སྦྲ་ལྡན་པའི་རླུངམ་དང་ཆུ་ དེ་ལས་ ནགས་ཚལ་ཚུ་ཡོདཔ་ཨིན་པས།

ཡུ་ཨེན་ཊི་པི་གོང་འཕེལ་ལས་རིམ་གྱི་ སྙན་ཞུ་དང་འཁྲིལཝ་ད་ མི་རློབས་བརྒྱ་ཆ་ ༨༠ དེམ་ཅིག་ འཚོ་བ་སོ་ནམ་ལུ་བརྟེན་སྡོད་དོ་ཡོདཔ་ད་ འབྲུག་གཞུང་དང་འབྲེལ་ཡོད་ལས་སྡེ་ཚུ་གིས་ གནམ་གཤིས་འགྱུར་བགྱོད་ལྷན་ཐབས་ལུ་ གནམ་གཤིས་འགྱུར་བགྱོད་སོ་ནམ་རིག་པའི་ལས་འགུལ་ ལེ་ཤ་ཅིག་འགོ་འདྲེན་ཐབས་ཏེ་འདུག

དཔེར་འབད་བ་ཅིན་ ཨུ་ཨེན་ཊི་པི་གི་ལས་འགུལ་ཆུང་བའི་གྲོགས་རམ་མ་དངུལ་དང་ འབྲུག་གཞུང་མཉམ་འབྲེལ་ཐོག་

ལས་ ཁྲིམས་ཤིང་དྲུང་ཁག་འོག་གི་ གཙང་པོ་གཡུས་ཚན་ནང་ གནམ་གཤིས་འགྱུར་བགྱོད་རིག་པའི་སོ་ནམ་ལས་འགུལ་ཅིག་འོག་བཙུགས་ནུག། དེ་ཡང་ གཙང་པོ་གཡུས་ཚན་ སྤྲིབ་ལ་ཟེར་ས་ལུ་ ས་གཞི་བཟའ་སྤྱོད་མ་འབད་བར་ལོ་ ༣༥ དེམ་ཅིག་ལུས་ཡོདམི་དེ་ སྤྱི་ལོ་ ༢༠༢༡ ལུ་གནམ་གཤིས་འགྱུར་བགྱོད་རིག་པའི་སོ་ནམ་ལུ་ ལེགས་བཅོད་འབད་ཡོདཔ་ཨིན་པས།

དེ་ཡང་ མི་སེར་ཚུ་གིས་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་གནོད་ལེན་དང་ མཐུན་འགྱུར་འབད་ནིའི་དོན་ལུ་ གློག་མེ་རཕ་བཙུགས་ གནམ་གཤིས་འགྱུར་བ་དང་བསྟུན་ སྐྱེ་བཏུབ་པའི་ཏ་ཟམ་ཤིང་དང་ ཚོད་བསྐྱེ་ཚུ་བཙུགས་ཏེ་ རང་མགོ་རང་འདྲོངས་བཟོ་ནིའི་དམིགས་གཏད་བསྐྱེད་དོ་ཨིན་པའི་ཁར་ གནས་གཤིས་འགྱུར་བགྱོད་ཀྱི་ གནོད་ལེན་ལུ་ ག་སྤྲི་འབད་དེ་ ཐབས་ལམ་སྣ་ཚོགས་སྟོན་བའི་བསྐྱང་ཨིན་པས།

སོ་ནམ་དང་སྒྲོ་ནོར་བློན་པོ་ ཡེ་ཤེས་དཔལ་འབྱོར་གྱིས་སྲུང་མིའི་ནང་ གནམ་གཤིས་འགྱུར་བགྱོད་སོ་ནམ་རིག་པ་གིས་ གནས་གཤིས་འགྱུར་བགྱོད་ལུ་ གནོད་ལེན་དང་ མཐུན་འགྱུར་འབད་ནི་རྐྱངམ་གཅིག་མེན་པར་ གཙོ་བོ་རསོ་ནམ་པ་ཚུ་ལུ་ མ་དངུལ་གྱི་ཁེ་ཕན་འབྱུང་དགོཔ་དེ་ གལ་ཆེཝས་ཟེར་བཤདཔ་ཨིན་པས།

སོ་ནམ་བློན་པོ་གིས་འབདབ་ཅིན་ ཏ་ཟམ་ཤིང་གིས་ སྲོག་རླུང་ཀར་བོན་མཐུན་འགྱུར་སྦེ་འགྱོ་མ་བཏུབ་མི་དེ་ ཏ་ཟམ་ཤིང་འདི་ རྫོག་མ་བཏགས་ནི་མེདཔ་ལས་ ཁུངས་མེདཔ་བཟུམ་ཅིག་མཐོངམས་ཟེར་ཨིན་པས། དེ་ཡང་ ཏ་ཟམ་ཤིང་འདི་ དམངས་གཙོའི་གཞུང་འགོ་ཐོག་སྐབས་ ས་གནས་གཞུང་དང་མི་སེར་ཚུ་དང་གཅིག་ཁར་ ཤིང་འགྱོ་བཏུབ་མ་བཏུབ་ག་ནི་ཡང་ གྲོས་སྡོན་མ་འབདབར་ ཨེཕ་ཊི་ཨའི་གཞི་བཙུགས་འབད་ཞིནམ་ལས་ ཕྲངམ་ཕྲང་སར་ཤིང་བཙུགས་ནི་འགོ་བཙུགས་ནུག་ཟེར་ཨིན་པས། ཤིང་འདི་ ལོ་གསུམ་གྱི་རྒྱབ་ལས་ རྫོག་མ་བཏགས་འོང་ཟེར་ ལོ་བཅུ་ཐམ་དང་བཅོ་ལྔ་དེམ་ཅིག་འགྱོ་རུང་ རྫོག་མ་བཏགས་ནི་མིན་འདུག་ཟེར་བློན་པོ་གིས་བཤདཔ་ཨིན་པས།

བློན་པོ་གིས་འབད་བ་ཅིན་ ཧ་ཟམ་ཤིང་རྐྱངམ་གཅིག་མེན་པར་སྨུས་ཚད་དང་ལྡན་པའི་ ཤིང་འབྲས་ཀྱི་རིགས་གཞན་ཚུ་ཡང་བཙུགས་པ་ཅིན་ གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པ་ལུ་གདོང་ལེན་དང་ མཐུན་འགྱུར་འབད་ཚུགས་པའི་ཁར་ སོ་ནམ་པ་ཚུ་ལུ་ ཁེབ་ས་ཡང་འོང་ནི་མས་ཟེར་ བཤད་ཡོདཔ་ཨིན་པས། དེ་ལས་ འབྲུག་གཞུང་དང་ ཕྱི་རྒྱལ་མ་དངུལ་རྒྱབ་སྐྱོར་ཐོག་ལུ་ སི་ཨེ་ཨར་ཨེལ་ཨི་པི་ཟེར་ འགྱུར་བསྒྱུར་རིག་པའི་ཞིང་ཆུ་འཕྲུལ་རིག་ལས་འགུལ་ཅིག་ འགོ་བཙུགས་ཡོདཔ་ད་ ད་རེས་ སྤྱི་ཟླ་ ༧ པའི་ནང་ལུ་ བི་ཨར་ཨི་སི་ཨེས་ཨེ་ཟེར་སོ་ནམ་ཚོང་བསྒྲགས་ཆུང་བཙོད་བསྲུན་བཟོ་དོན་ལས་འགུལ་ཅིག་ཡང་ འགོ་བཙུགས་ནི་ཨིན་ཟེར་ བློན་པོ་ ཡེ་ཤེས་དཔལ་འབྱོར་གྱིས་ བཤདཔ་ཨིན་པས།

སོ་ནམ་ལས་ཁུངས་ཀྱི་ ལྷུམ་ར་རིག་པའི་འགོ་དཔོན་གོངམ་ རིན་ཆེན་དབང་མོ་གིས་བཤད་མི་ནང་ ལོ་ཐོག་ཐོན་ཁུངས་ཡར་དྲག་བཏང་སྟེ་ མིའི་འཚོ་སྐྱོང་ལེགས་བཅོས་འབད་ནི་དང་ ས་ཞིང་ཚུ་གནམ་གཤིས་འགྱུར་བསྒྱུར་དང་མཐུན་འགྲིགས་བཟོ་སྟེ་འཛམ་གླིང་དྲོད་ཡར་འཕར་གྱི་གནོད་པ་ བཀག་ཆ་འབད་ཚུགས་མི་ཅིག་ལུ་ གནམ་གཤིས་འགྱུར་བསྒྱུར་རིག་པའི་སོ་ནམ་ལུ་གོཝ་ཨིན་ཟེར་ བཤདཔ་ཨིན་པས།

འབྲུག་གཞུང་དང་ འབྲེལ་ཡོད་ལས་སྡེ་ཚུ་གིས་ བསིལ་དྲོད་གནས་སྟངས་དང་འབྲེལ་བའི་ ཞིབ་འཚོལ་དང་ གནམ་གཤིས་འགྱུར་བསྒྱུར་རིག་པའི་སོ་ནམ་ཡར་དྲག་བཏང་ནི་ཐབས་ལམ་ལུ་གཙོ་བོ་བཏོན་དོ་ཨིན་པས། ཨུ་ཨེན་དང་ ལྷོ་ཨེ་ཤི་ཡའི་ལུང་ཕྱོགས་མཐུན་འབྲེལ་ཚོགས་པ་ གཉིས་ཀྱི་ཡང་ ལྷོ་ཨེ་ཤི་ཡ་ལུང་ཕྱོགས་ཀྱི་རྒྱལ་ཁབ་ཚུ་གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པ་ཡར་དྲག་བཏང་དགོ་པའི་གྲོས་བཤད་འབདཝ་ཨིན་ཟེར་ ལྷུམ་ར་རིག་པའི་འགོ་དཔོན་གོངམ་ རིན་ཆེན་དབང་མོ་གིས་ བཤདཔ་ཨིན་པས།

ད་རུང་མི་གིས་འབད་བ་ཅིན་ འབྲུག་གཞུང་དང་ ཕྱི་རྒྱལ་མ་དངུལ་རྒྱབ་སྐྱོར་ཐོག་ལས་ གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པ་གི་ འཕྲུལ་རིག་ཡར་དྲག་བཏང་ནི་ལུ་ གཙོ་བོ་བཏོན་ནི་ཟེར་ བཤདཔ་ཨིན་པས།

སོ་ནམ་ལས་ཁུངས་ཀྱི་ སྣན་ཞུ་དང་འཁྲིལཝ་ད་ གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པ་འདི་ ཨེས་ཨེ་པི་ཨེ་ ལས་སྡེའི་མཐུན་འགྱུར་ལས་འཆར་ ༢༠༡༨ དང་ ཨེན་ཨེ་པི་ཟེར་ རྒྱལ་ཡོངས་མཐུན་འགྱུར་འཆར་གཞི་ལས་ ལཱ་འབད་ཡོདཔ་ད་ ལས་འགུལ་ཡང་ སི་ཨེས་ཡུ་སི་ཨེས་ཨི་ཨེས་ཟེར་ ལྷོ་ཨེ་ཤ་ཡ་ནང་གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པའི་གོང་འཕེལ་མཐུན་ཚོགས་དང་ ཨེཕ་ཨེས་ཨེས་ཨེ་པི་ སོ་ནམ་འཕྲུལ་རིག་གོང་འཕེལ་ལས་འགུལ་ ཇི་སི་ཨེཕ་ གནམ་གཤིས་སྤྱི་ལྷུང་གི་མ་དངུལ་དང་ སི་ཨེ་ཨར་ཨེལ་ཨི་པི་ བི་ཨར་ཨི་སི་ཨེས་ཨེ་ཟེར་བའི་ གནམ་གཤིས་འགྱུར་བསྒྱུར་རིག་པའི་ལས་འགུལ་ཆུང་བ་ཚུ་ འབད་བའི་བསྒྲང་ཡོདཔ་ཨིན་པས།

རང་འབྱུང་འཐོན་བསྐྱེད་མཐོ་རིམ་སློབ་གྲྭའི་ སོ་ནམ་ལས་ཁུངས་ཀྱི་ ལས་རིམ་འགོ་ཁྲིདཔ་བསྟོན་འཛིན་དབང་ཕྱུག་གིས་འབད་བ་ཅིན་ ཡར་རྒྱས་མདུམ་དུ་སྤོ་བའི་བསྒྲང་ཨིན་པའི་ འབྲུག་རྒྱལ་ཁབ་བཟུམ་ནང་ གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་གི་ ཐབས་ལམ་དྲག་ཤོས་དེ་ ཆར་དཀོན་མཐུན་འགྱུར་ཨིན་པའི་ ལོ་ཐོག་དང་ ཞིང་ཆུ་འཛིན་སྐྱོང་ཐབས་ནི་ དེ་ལས་ ལོ་ཐོག་སྣ་ཚོགས་ཚུ་བཙུགས་དགོ་ཟེར་བཤདཔ་ཨིན་པས།

ད་རུང་ རང་འབྱུང་འཐོན་བསྐྱེད་མཐོ་རིམ་སློབ་གྲྭའི་ ཊོག་ཏར་ ར་ཁ་ཆེ་ཏྲི་རི་གིས་འབད་བ་ཅིན་ གནམ་གཤིས་འགྱུར་བསྒྱུར་སོ་ནམ་རིག་པ་གི་ ལུང་ཕྱོགས་དང་རྒྱལ་སྤྱིའི་ཐབས་ཤེས་དྲག་ཤོས་འདི་ སོ་ནམ་པ་ཚུ་གིས་ སོན་བསྡུ་བཞག་ནི་དང་ འབྲེལ་མཐུན་དང་ རིག་རྩལ་ལྡན་པའི་ཞིང་ལཱ་ དེ་ལས་ ཡུན་བརྟན་གྱི་ཞིང་ལཱ་ཚུ་འབད་དགོ་ཟེར་ བཤད་ཡོདཔའི་གནས་ཚུལ།

གནས་ཚུལ་འདི་ ཨུ་ཨེན་ཌི་པའི་ལས་འགུལ་ཆུང་བའི་ གྲོགས་རམ་མ་དངུལ་དང་འབྲུག་གཞུང་མཉམ་འབྲེལ་ཐོག་ལས་ འབྲུག་བརྡ་བརྒྱུད་གཞི་ཚོགས་ཀྱིས་རྒྱབ་སྐྱོར་འབད་ཡོདཔ་ཨིན།

Adapting to climate smart agriculture

Deki Choden

The growing global population is driving up the demand for food but the crop production is decreasing in many parts of the world. In order to approach the challenges, the government and development partners are coming up with an integrated approach to climate change.

Bhutan is a located in the fragile ecosystem and is a small land locked country in the Himalayas where climate change is the serious environment problem affecting the livelihoods of people and serious threat to sustainable development.

According to the UNDP Bhutan climate change adaptation report, approximately 80% of the country's population mainly depends on subsistence farming for their livelihoods. The government and its development partners have come up with the integrated approach to climate change in the form of climate smart agriculture projects in rural parts of the country.

One of the example of climate smart agriculture that the government and development partners have initiated could be the ongoing GEF-Small Grants Program of Tsangpo under Thrimshing, Trashigang where a degraded land was reverted into climate smart agriculture in 2021.

The people of have reverted their degraded fallow land into climate smart by installing electric fencings to prevent the crops from wildlife and by cultivating climate smart crops and fruits which could eventually help enhance the livelihoods of the farmers.

Minister of Agriculture and livestock, Lyonpo Yeshey Penjor, stated

that climate smart agriculture, with planting of hazelnut saplings in degraded fallow land should contribute to the livelihoods of its people by fetching some income from the hazelnut trees.

He said, mountain hazelnut project was initiated by first democratic elected government and was implemented right after the introduction of Foreign Direct Investment (FDI) without proper research on the feasibility of the hazelnut and they didn't even discuss the project with local government and its people.

"The hazelnut trees were supposed to fruit after three years but even after 10 years there are no yields. So it's absurd how they implement the project." Lyonpo said.

The minister said that other exotic fruit saplings should be planted so that people would be able to earn some income and at the same time integrated approach towards climate change is also fulfilled.

He added that the government with the help of the development partners will soon develop the Commercial and Agriculture and Resilient Livelihoods Enhancement Program (CARLEP) smart irrigation technology.

Senior horticulture officer from the department of Agriculture (DoA), Rinchen Wangmo, said that Climate Smart Agriculture (CSA) technologies aim at improving crop productivity to advance livelihood and make farms more resilient to climate impacts.

She said that the government and projects are focusing more on research and development of best CSA technologies according to our agro-climatic conditions. Technology generations and varietal development in responding to changing climatic conditions are main priority activity of the department of agriculture.

The projects based on UN and SAARC are also focusing on linking the member countries and offers knowledge sharing platforms on different climate smart agriculture technologies in south Asian regions. The government with the support from donor projects also focuses on scaling up of CSA technologies and policy framework development in promoting CSA technologies where the capacity development of officials under DoA and farmers training are also part of focus area of projects and activities, she added.

In response to the policies in place, Rinchen Wangmo said that climate smart agriculture approaches in the country are guided by the Renewable Natural Resources Sector Adaptation Plan of Action, 2016 (SAPA 2016), National Adaptation Plan (Bhutan would be submitting the first NAP to UNFCC during the upcoming CoP and this framework will get medium to long term adaptation strategies in the agriculture sector including the other climate sensitive sectors.

She also said that C-SUCSeS, FSSAP and GCF are some of the climate smart agriculture projects afoot around the country. CARLEP, Crop mulching, varietal selection in response to changing climatic conditions and Sustainable land management are the regional and international best practices.

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Climate Change and its impact on business

Pema Choki

The impact of climate change on the way people work and people live is directly and indirectly affecting the business sector. The impacts are sometimes minor with disturbances in service delivery due to climate change, induced weather conditions to major impacts, such as financial implications due to climate crisis.

Cumulative Impacts

The business fraternity ranging from the mining industry to the hotel and service sector is impacted

The Chair of Hotel and Restaurant Association of Bhutan (HRAB), Jigme, said, "There are disturbances in the operations of the hotels and travel plans for the guest. There is also a reduction in the number of the tourists because of extreme weather

highest revenue earners before the pandemic, and tourism mainly depends on Bhutan's bio-diversity and its beautiful landscape. However, with climate crisis, it will impact the biodiversity of the country, which can hamper the number of tourists coming in, especially eco-tourism.

One of the biggest industries in the country, the mining industry is also affected by climate change. According to the CEO of State Mining Corporation Limited, Kesang Jamtsho, although long-term impacts could be none, there are short-term impacts. "The impacts are basically felt in the mining operation, in terms of disruption of the operation due to flash floods, road washout, and rain."

As the mining operations are impacted, he pointed out that it causes financial implications, increasing the cost of operations due to many days lost in the mining operation. He also added that as the cost of production and supply chain cost would increase, efficiency would decrease and the net impact will be reduction in return per ton of any minerals traded.

Similar sentiments were also shared by the construction sector of the country. According to the Executive Director to the Construction Association of Bhutan (CAB), Tshering Yoenten, there are financial implications due to disruption in the works. "The impact is felt in terms of procuring goods, resources and also time. As we cannot complete our works on time due to disruptions, there are also cases of penalties for the contractors. And there are also cases of having to reorganize the works and

workers due to erratic weather conditions."

He also pointed out that although they have insurance, the climate induced weather conditions are considered Act of God, and the insurance does not cover it.

He also added that climate resilient technologies are very expensive, however, to adapt to the climate crisis in the future, such technologies will be needed.

Other business sectors are also impacted by the climate crisis. According to the President of the Bhutan's Chamber for Commerce & Industry, Tandy Wangchuk, climate change impact is very visible in the business sector and the economy.

"It has an unprecedent impact on the economy. It costs additional finance due to climate induced crisis and budget to mitigate climate induced hazards. In terms of industrial input, there are impacts, and also cross-border trade, and production capacity."

He also pointed out that in the agriculture sector, due to climate induced weather conditions, drought contributes to poverty and famine.

As climate change impacts almost every sector of the country, the impact felt on the economy at large and the people is huge. Globally, climate change induced weather has the potentials to weaken economic growth through damage to capital stock and

labor supply, and labor productivity due to growing temperature will weaken, weakening the world economy.

As business fraternities get impacted, the economy will get impacted too. As employment gets affected, it will affect the income generation and purchasing power of the people. And as cross-border trade gets affected, the price of imports will likely increase which will contribute to high inflation.

In 2019, the United Nation's (UN) International Labor Organization (ILO) report titled 'Working on a Warmer Planet: The Impact of Heat Stress on Labor Productivity and Decent Work' warned that increasing heat stress due to global warming will result in huge job and economic losses in 2030, with poor countries being the biggest losers.

The report also stated that rising temperatures and increasing heat stress at work will lead to loss of 80 million full time jobs and to global economic losses of USD 2.4 trillion in 2030.

The report also stated that the people from agricultural and construc-

tion sectors will be most affected by the rising temperatures. It also stated that although workers in the wealthy countries will be affected by excessive heat, it will be on a lesser extent than

those in the poorer countries which will widen the inequality gap between low-income and high-income countries and result in worsening working conditions.

Carbon neutral/negative status

Bhutan enjoys a carbon neutral/negative status, which means that Bhutan absorbs more carbon dioxide than it produces. Bhutan's Constitution also mandates for a more than 60 percent forest coverage for all times to come, having more than 70 percent of the country being covered in trees, more than the mandated coverage.

This carbon neutral/negative status arises the question of whether Bhutan is sacrificing its economic growth. According to the Minister for Industry, Commerce and Employment, Lyonpo Karma Dorji, remaining carbon neutral/negative has both demerits and merits. "Being carbon neutral/negative has several implications for the economy, both positive and negative. Overall, there are long term economic benefits of achieving carbon neutrality/negativity including job creation, investment opportunities, improved competitiveness, and reduced environmental risks. Economic and employment opportunities from greenhouse emitting industries will be refrained from creating a huge opportunity cost."

He also added some benefits for remaining carbon neutral/negative. "Environmental fund, conservation fund, climate fund accessibility can be better availed with carbon neutrality commitment. There are job opportunities in industries like renewable energy, energy storage, green construction, and electric mobility. And we can also gain a competitive advantage in the global market. Additionally, being carbon neutral/negative can improve trade relations and attract international investments."

Additionally, Lyonpo Karma also added that while transitioning to carbon neutrality while maintaining a strong and thriving economy requires a comprehensive and coordinated approach involving business, industries and government, more focus has to be on environment friendly, more digital, clean energy, and biotechnology for development and for the economy.

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Practices to be implemented when considering climate change

Pema Choki

Climate resilient practices

As climate change further implicates the world, it brings in significant changes and impacts in the business fraternity, challenges as well as opportunities.

"As extreme weather conditions become frequent, it causes damage to the businesses in the form of infrastructure damage, and disruption in the work process," shared the CEO of Construction Development Corporation Limited, Karma Galey.

As such cases happen, it is important to curtail the impacts through adapting climate resilient practices. Karma Galey pointed out that such practices are done through certain measures, like improvisation on the field, and keeping themselves at the safer side but technical measures are very expensive.

President of the Bhutan Chamber for Commerce & Industry (BCCI), Tandy Wangchuk, shared that as impact of climate change increases, climate resilient businesses are important.

He said, "At this stage, the private sector lacks access to finance to venture into projects, such as renewable energy. In terms of agriculture, there's also plans such as hydroponic farming, but access to finance is a huge challenge."

Tandy also added that the private sector is looking into helping the

business fraternity, having discussions with development partners from abroad.

According to the Minister for Industry, Commerce, and Employment, Lyonpo Karma Dorji, the government can effectively support the transition to carbon neutrality while minimizing the negative impacts on the economy by creating a supportive policy environment, providing incentives, fostering innovation, and facilitating collaboration.

However, he also added that certain sectors will be impacted, in terms of venturing into going green. Lyonpo said, "All greenhouse emitting industries will face challenges. All ferro silicon industries emit Greenhouse gases (GHG). One aluminum emitting industry can offset Bhutan's carbon negative status, and few ferro silicon industries in Samtse will soon make Bhutan carbon neutral from its carbon negative status."

Bhutan has ventured into hydropower projects, an investment in renewable energy and sustainable infrastructure. According to Lyonpo Karma, although the economic revenues may be more from such investments, however, it actually reduces job opportunities. He pointed out that Bhutan should pursue adaptation and resilient economic development instead of blindly committing to carbon neutrality.

Green Economy and Green Growth

Green economy and green growth refer to concepts related to sustainable development and climate friendly practices. Bhutan has ventured into promoting green entrepreneurship and creating green jobs. Bhutan has also initiated the use of EV vehicles as the country's goal towards zero-emission mobility by 2050.

The World Bank in 2021 also approved USD 52.5 million financing to help the Royal Government of Bhutan strengthen fiscal and financial sector stability, green and private sector led growth.

Royal Monetary Authority (RMA) has also developed a sustainable financial inclusion to advance the resilience of the most vulnerable to the climate change and the Green Finance Roadmap. The Governor of RMA, Dasho Penjore in 2020 said he sees a connection between financial inclusion and climate change adaptation and mitigation. He pointed out that there is a momentum to advance the resilience of the most vulnerable to the impacts of climate change, by advancing sustainable financial inclusion and committing to advance this agenda.

Although there are many challenges associated with climate change and its crises, it also opens opportunities for people, especially in terms of innovation. It creates a platform for green startups and green entrepreneurship and green jobs.

According to the Climate Centre's report 'Companies and Climate Resilience: Mobilising the Power of the Private Sector to Address Climate Risks', globally, in most economies, the private sector holds up to 85 percent of all investment and makes over USD 80 trillion of institutional investments globally each year.

The report pointed out that private sector is a vital partner to reduce the risk of disasters, and building resilience at the scale needed will not be possible without the active participation from the private sector.

In turn, the private sector needs to protect itself from the potential dangers of natural disasters and ac-

tively contribute to the crucial task of building resilience of its assets, workforce, supply chains and customers. The report stated that in doing so, the resilience of people and communities will be strengthened through access to economic security which builds capacity to withstand or recover faster from climate extremes.

In 2016, the World Economic Forum (WEF) described climate change as the highest impact risk to business. Research in the journal Nature suggests that the impact of climate change on the market value of global financial assets to be USD 2.5 trillion and could be as high as USD 24.2 trillion under the worst-case scenario.

In the Bhutanese context, the private sector in Bhutan is relatively underdeveloped and quite small. The representative of the private sector, the BCCI recognizes the impact of climate change on businesses sharing how it can impact the production to cross border trade. However, the access to finance has been a huge disadvantage, and it is high time for the national agencies to work with international organizations to adapt climate resilient practices and incentivize industries to go for climate technology.

As youth are now taking up interest in entrepreneurship, there are innovative ideas that are climate resilient in nature. For example, Aerotech is a start-up that focuses on drone technology. Started in 2020, it is the only tech-based startup that focuses on drone technology which can actually purify the air.

Another tech-based startup, Leaf Creative solutions which makes products using 3-D printer focuses on being environment friendly, targeting waste management through recycling as their products can be made through recycling PET bottles.

Innovative ideas are getting the frontliner in business ideas, with young people coming up with ideas to practice climate resilient practices. During the Fabfest organized by Druk Holdings and Investment on July 2023, there were few projects that were green in nature.

One project was about harvesting rainfalls during the monsoon to use for household chores, one project was on agriculture resilient product that will combat changing weather patterns, and a project on producing filaments for 3-D printing machines through recycling.

Tuvalu, a country in Oceania is expected to be one of the first countries in the world to be completely lost to climate change. As an attempt to preserve its culture and history, the country is going digital, the first digitized nation in the world.

Taking this as an example, as climate change increases its impact, innovative and creative ideas, and digital work will take the frontlines. The future will be digital economy.

This story is supported by the BMF and GEF Small Grants Program of UN in partnership with RGoB

སོ་ནམ་པ་ཚུ་གི་ བྱང་ཕྱུད་གསརཔ་ ཨར་མི་ཕམ་འབུབ་ཚུ་གིས་ བཟའ་སྤྱོད་ཉེན་སྲུང་ལུ་གནོད་ཉེན།

ཨོ་རྒྱན་རྡོ་རྗེ།

ཐ་ ལོ་ངོ་༥ དེ་ཅིག་གི་ཧེ་མ་ སྐྱེས་ལོ་༨༤ ལངམི་ སོ་ནམ་པ་ པདྨ་ཏ་མང་གིས་ མོ་རའི་གེ་ཟ་ཞིང་ ཨེ་ཀར་༡ ནང་ལས་ གེ་ཟ་ཀེ་ཇི་༧༠༠ དེ་རེ་ ཐོན་སྐྱེད་འབདཝ་མི་དེ་གིས་ བཟའ་ཚང་གི་དོན་ལས་ ནང་འདྲེན་འབདཝ་མི་ཆུམ་དང་ སྣ་བསྲེ་སྟེ་ བཟའ་སྤྱོད་འབད་ནི་ལུ་ ལྷན་ཐབས་བྱུང་ཡོདཔ་ཨིན་པས།

དེ་ཡང་ རྩི་རང་རྫོང་ཁག་ རང་ཐང་གླིང་ལུ་ པདྨ་ཏ་མང་གི་ ས་ཞིང་བཙུད་ལྷན་ཡོདཔ་ལས་ ལོ་ཐོག་གེ་ཟ་གིས་གཙོས་པའི་ འབྲུ་སྣ་དགུའི་རིགས་དང་ ཚོད་བསྲེ་ དེ་ལས་ ཤིང་འབྲས་ཚུ་ འཚོ་སའི་ ས་གནས་ཅིག་འབདཝ་མི་ལུ་བརྟེན་ཨིན་པས།

པདྨ་ཏ་མང་བཟུམ་སྦེ་ སོ་ནམ་པ་གཞན་ཚུ་གིས་ཡང་ ལོ་ཐོག་གེ་ཟ་ལས་འགོ་བཙུགས་ འབྲུ་སྣའི་རིགས་ཚུ་ འཛུགས་སྐྱོང་འབདཝ་ རང་མགོ་རང་འདྲོངས་སྦེ་ འཚོ་བ་སྐྱོང་སྟོདཔ་མི་ མི་སྡེ་ཅིག་ཨིན་པས།

རྩི་རང་གི་ མི་སེར་ཚུ་གིས་ གེ་ཟ་ཚུ་ཡང་ བཟའ་སྤྱོད་དང་ ནོར་ཚུ་ལུ་ ཆགས་ཕྱིན་ནིའི་དོན་ལུ་ འཛུགས་སྐྱོང་འབདཝ་དོ་ ཡོདཔ་ཨིན་པས།

དེ་འབདཝ་ལས་ རྩི་རང་དེ་ རྒྱལ་ཁབ་ནང་ གནམ་བྱུར་དཀྲུན་མེདཔ་ར་ ལོ་ཐོག་དང་ ཚོད་བསྲེ་ཐོན་སའི་ རྫོང་ཁག་ཅིག་སྦེ་ ཡོངས་གྲགས་ཐལ་ཡོདཔ་བཞིན་དུ་ རྫོང་ཁག་གིས་ རྒྱལ་ཁབ་ཀྱི་ བཟའ་འཐུང་ཉེན་སྲུང་ལུ་ ལྷན་ཐབས་སྦོམ་སྦེ་ར་འབདཝ་ནུག།

རྒྱལ་ཡོངས་རྩིས་དཔྱད་བཀོད་འཛིན་གྱི་ སོ་ནམ་དཔྱེ་ཞིབ་སྙན་ཞུ་༢༠༢༡ ཅན་མ་དང་འཕྲིལ་བ་ཅིན་ ལོ་དེ་ནང་ རྩི་རང་རྫོང་ཁག་ལས་ གེ་ཟ་མེ་ཏིག་ཊོན་༡,༩༢༣ དེ་ཅིག་ ཐོན་སྐྱེད་འབད་ནུག།

ཨིན་རུང་ ད་རེས་ནངས་པར་ སོ་ནམ་པ་ཚུ་ལུ་ ཨ་རྟག་དང་མ་འདྲ་བའི་ གནོད་ལེན་བྱུང་སྟེ་ཡོདམི་དེ་ཡང་ ལོ་ཐོག་ཚུ་ འབུབ་ཚུ་གིས་ མེདཔ་བཏང་སྟེ་ ཐོན་སྐྱེད་མར་འབབ་འགྱོཝ་མ་ཚད་ ཆར་ཆུ་དཀོན་པའི་ཁར་ ཚ་དྲོད་ཡར་འཕར་འགྱོ་མི་དེ་ཡང་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་ ཁ་གཏངམ་ཨིན་པས།

ལོ་ཐོག་ཚུ་ལུ་གནོད་སྐྱོན།

ད་རེས་ནངས་པར་ རྩི་རང་ལུང་གཞོང་དེ་ སྤོ་ལྷོང་དང་ལྷོནམ་སྦེ་ ཧོ་བྲེམ་བྲེ་སྦེ་ མཐོང་གསལ་བྱུངམ་མ་ཚད་ གཡུས་ཚན་ཚུ་ནང་ ལས་ཕར་ འགྱོ་བལྟཝ་ད་ གེ་ཟའི་ཞིང་ཚུ་ནང་ གཡུརམ་རྒྱབ་ཚར་ཏེ་ སོ་ནམ་པ་ཚུ་ རང་སོའི་ཁྱིམ་ནང་ བཟའ་ཚང་ཚུ་དང་ གཅིག་ཁར་ དགའ་ཧོག་ཧོ་སྦེ་སྡོདཔ་སར་ མཐོངམ་ཨིན་པས།

དེ་འབདཝ་ད་ སོ་ནམ་པ་ཚུ་དང་ འབྲེལ་བ་འཐབ་པའི་སྐབས་ གནས་སྟངས་མ་འདྲཝ་སྦེ་ གསལ་སྟོན་བྱུང་མི་དེ་ཡང་ ཁོང་ལུ་ བྱང་ཕྱུད་མ་འདྲཝ་ཅིག་ ཐོན་ཡོདམི་དང་ གནོད་ལེན་འབད་དགོཔ་བྱུང་ཡོདཔ་ལས་ དུས་ཅི་འབདཝ་ད་ ལོ་༥ འགྱོཝ་ཨིན་པས།

སོ་ནམ་པ་ཚུ་གི་ བྱང་ཕྱུད་དེ་ཡང་ རི་དྭགས་སེམས་ཅན་ དཔེར་ན་ སྤྲེ་དང་ རི་ཕག་ བྱི་བྱུར་ ཀ་ཤ་ཚུ་མེན་པར་ ཕུལ་ཨར་མི་ཕམ་ (Fall Armyworm) ཟེར་མི་འབུབ་ཚུ་ཨིནམ་ད་ འབུབ་དེ་ཚུ་གིས་ ལོ་ཐོག་ཚུ་གི་གྲས་ལས་ དམིགས་བསལ་དུ་ གེ་ཟ་ཚུ་ལུ་ གནོད་པ་སྦོམ་སྦེ་ར་ རྐྱབ་སྟེ་འདུག།

དཔེར་ན་ སོ་ནམ་པ་ པདྨ་ཏ་མང་གི་ གེ་ཟའི་ཐོན་སྐྱེད་ཀེ་ཇི་ ༧༠༠ ལས་ ད་རེས་ ཀེ་ཇི་༡༠༠ ཡང་ ཐོན་ཚུགས་པར་ ལཱ་ཁག་བཏང་སྟེ་ཡོདཔ་ད་ མོ་གིས་འབདཝ་ཅིན་ གེ་ཟའི་ཐོན་སྐྱེད་ མར་འབབ་འགྱོཝ་ད་ བཟའ་ཚང་གི་ འཚོ་སྐྱོང་ལུ་ཡང་ ཐོ་ཐོགཔ་མས་ཟེར་ཨིན་པས།

རང་ཐང་གླིང་གི་ སོ་ནམ་པ་གཞན་ཚུ་གིས་ བཤད་མིའི་ནང་ ཨར་མི་ཕམ་འབུབ་ཀྱིས་ གེ་ཟ་ཚུ་ སྐྱེ་ནི་ལས་ འགོ་བཙུགས་ཏེ་ འབྲས་བུ་མ་ཐོན་པའི་བར་དུ་ གནོད་སྐྱོན་རྐྱབ་མི་ལུ་བརྟེན་ ཐོན་ཤུགས་མར་འབབ་འགྱོ་དོ་ཡོདཔ་ལས་ ལཱ་འབད་ནི་ལུ་ སྐྱིད་ཐག་སྐྱུར་ཕ་མས་ཟེར་ཨིན་པས།

ལོ་ཐོག་འབུབ་ཀྱི་ གནོད་ལེན་དེ་ རང་ཐང་གླིང་རྐྱངམ་གཅིག་ མེན་པར་ རྩི་རང་རྫོང་ཁག་གི་ རྒེད་འོག་མང་ཤོས་ཅིག་ནང་ བྱུང་སྟེ་འདུག།

མཚོ་གླིང་མཁར་ལས་ སོ་ནམ་པ་ཅིག་གིས་ སླབ་མིའི་ནང་ འབུབ་དེ་གིས་ ལོ་ཐོག་མ་ཚད་ ཚོད་བསྲེ་ཚུ་ཡང་ ཟཝ་མས་ ཟེར་ཨིནམ་ད་ རྒེད་འོག་ནང་ འབུབ་ཐོན་ཏེ་ ལོ་༣ དེ་ཅིག་ ལང་

དོ་ཡོདཔ་བཞིན་དུ་ ལོ་ཐོག་ཚུ་ལུ་ གནོད་སྐྱོན་རྐྱབ་མི་དེ་ མར་འབབ་འགྱོ་ནི་མེནམ་པར་ ལོ་བསྟར་བཞིན་དུ་ ཡར་སེང་འགྱོཝ་མས་ཟེར་ བཤདཔ་ཨིན་པས།

སྐྱེས་ལོ་༥༩ ལངམི་ ཏི་ལ་རུ་པ་མོང་གར་གྱིས་འབདཝ་ཅིན་ འདས་པའི་ལོ་དང་ཕྱདཔ་ད་ དུས་ཅི་ ཆརཔ་དུས་ཚོད་ཁར་ མ་རྐྱབ་མི་ལུ་བརྟེན་ འབུབ་ཚུ་གིས་ ལོ་ཐོག་ཚུ་ལུ་ གནོད་སྐྱོན་མངམ་རྐྱབ་ཅི་ཟེར་ཨིན་པས།

སོ་ནམ་པ་ཚུ་དང་འབྲེལ་བ་ཅིན་ འབུབ་ཚུ་གིས་ གནོདཔ་བཀལ་བའི་ཤུལ་ལས་ ལོ་ཐོག་གི་ རྟོག་མ་ཚུ་ མེདཔ་གཏངམ་མས་ཚད་ ཤིང་ཚུ་ཡང་ ནོར་ལུ་བྱིན་རུང་ ཟ་མི་བཏུབ་པས་ཟེར་ཨིན་པས།

རྫོང་ཁག་གི་ གནས་སྡུད་དང་འབྲེལཝ་ད་ སྤྱི་ལོ་༢༠༢༡ ལུ་ གེད་འོག་༨ ནང་ ལོ་ཐོག་ཞིང་ཨེ་ཀར་༢༠ དེ་ཅིག་ལུ་ གནོད་འབུབ་ཀྱིས་ གནོད་སྐྱོན་རྐྱབ་སྟེ་ ལོ་ཐོག་མེ་ཊྲིག་ཊོན་༨ དེ་ཅིག་མེདཔ་བཏང་ནུག།

དེ་བཟུམ་སྦེ་ སྤྱི་ལོ་༢༠༢༢ ལུ་ གེད་འོག་༢ ནང་ ས་ཞིང་ཨེ་ཀར་༡༡ ལྷགཔ་ཅིག་ལུ་ འབུབ་ཀྱིས་ གནོད་སྐྱོན་རྐྱབ་སྟེ་ ལོ་ཐོག་ཊོན་༡.༥ མེདཔ་བཏང་ཡོདཔ་ཨིན་པས།

སྨན་གྱི་ཕན་ནུས་མེདཔ།

མ་གཞི་ སོ་ནམ་པ་ཚུ་ལུ་ རྫོང་ཁག་དང་ གེད་འོག་སོ་ནམ་རྒྱ་སྐྱེད་འགོ་དཔོན་ཚུ་གིས་ འབུབ་བསད་སྨན་ཚུ་ བྱིན་ཡོད་རུང་ སོ་ནམ་པ་ཚུ་གིས་འབདཝ་ཅིན་ སྨན་རྫས་དེ་གིས་ ཨར་མི་ཕམ་འབུབ་ཚུ་ བསད་མི་ཚུགས་དོ་ཡོདཔ་ལས་ ཕན་ཐོགས་དེམ་ཅིག་ར་ མིན་འདུག་ཟེར་ཨིན་པས།

དེ་འབདཝ་ལས་ སོ་ནམ་པ་ལ་ལོ་ཅིག་གིས་ ནོར་གྱི་ཆབ་གསང་བསྡུསཔ་བསགས་བཞག་སྟེ་ ལོ་ཐོག་ཞིང་ཚུ་ལུ་ གཏོར་དོ་ཡོདཔ་རུང་ ལ་ལོ་ཅིག་གིས་འབདཝ་ཅིན་ ཆབ་གསང་བསྡུསཔ་ལག་ལེན་འཐབ་མི་གིས་ དུམ་གྲ་ཅིག་ ལྷན་ཐབས་བྱུང་ཡོདརུང་ ཚུ་གིས་ ས་ཆ་ཨེ་ཀར་ལས་བཅད་དེ་ ཁྲབ་མི་ཚུགས་དོ་ ཡོདཔ་ལས་ ལོག་སྟེ་ར་ ཧེ་མའི་ གནས་སྟངས་ནང་ ལྷོདཔ་མས་ཟེར་ཨིན་པས།

ཆརཔ་རྐྱབ་པའི་སྐབས་ འབུབ་ཚུ་ གེ་ཟ་ཤིང་དང་ ས་འོག་ལུ་ འཛུལ་སྡོད་དེ་ ཉིནམ་ཤརཝ་ད་ ཕྱི་ཁར་ཐོན་ཏེ་ གེ་ཟ་ཚུ་ལུ་ གནོདཔ་བཀལཝ་མས་ཟེར་ གསེར་གྱི་ཐང་གེད་འོག་ལས་ སོ་ནམ་པ་ཅིག་གིས་ བཤདཔ་ཨིན་པས།

སོ་ནམ་མཁས་མཆོག་ཚུ་གིས་ བཤདམིའི་ནང་ འབུབ་ཚུ་གིས་ ཉིནམ་ཤརཝ་ད་ གེ་ཟ་ཤིང་ཚུ་ མེདཔ་བཏང་མི་དེ་ཡང་ ཧེ་མ་ སྨན་རྫས་གཏོར་མི་ཚུ་ ཆརཔ་གིས་ འཁྱུགས་བདའ་མི་ལུ་བརྟེན་ཨིན་ཟེར་ཨིན་པས།

གསེར་གྱི་ཐང་གེད་འོག་གི་ སོ་ནམ་རྒྱ་སྐྱེད་འགོ་དཔོན་ ཊི་བི་ག་ལས་ཀྱིས་ སླབ་མིའི་ནང་ རྩི་རང་ལུ་ ཨར་མི་ཕམ་གྱིས་ ལོ་ཐོག་ཚུ་ གནོད་སྐྱོན་རྐྱབ་སྟེ་ ལོ་༥ དེ་ཅིག་སོང་ཡོདཔ་བཞིན་དུ་ འབུབ་ཚུ་ཡང་ གེ་ཟའི་དུས་ཚོད་སྐབས་ ཐོནམ་མས་ཟེར་ཨིན་པས།

ཁོ་གིས་འབདཝ་ཅིན་ སོ་ནམ་པ་ཚུ་ལུ་ གནོད་སྐྱོན་བཀག་ཐབས་ལུ་ ལ་ཡཏི་ཊེབ་ཟེར་མི་དེ་ ལག་ལེན་འཐབ་དགོཔ་སྦེ་ སླབ་ཡོད་རུང་ ལག་ལེན་འཐབ་མི་བཏུབ་པས་ཟེར་ཨིནམ་ད་ འཕྲུལ་ཆ་ལག་ལེན་འཐབ་སྟེ་ ཕྱི་རུ་མེ་བཏེགས་ཐོག་ལས་ ཨར་མི་ཕམ་འབུད་མི་ཨའི་ཚུ་ བསད་དོ་ཡོདཔ་ཨིན་པས།

སོ་ནམ་རྒྱ་སྐྱེ་འགོ་དཔོན་ཚུ་གིས་ སྨན་རྫས་ལུ་ འབུབ་བསད་ནི་གི་ ནུས་པ་མེདཔ་ལས་ ལོ་ཐོག་ཚུ་གི་ སོན་ཚུ་ཡང་ ཨར་མི་ཕམ་གྱིས་ སྙོང་རྟོག་འབྱུང་བའི་དུས་ཚོད་ མཐུག་བསྡུ་ཞིནམ་ལས་རྒྱངམ་གཅིག་ བཏབ་དགོཔ་སྦེ་ སོ་ནམ་པ་ཚུ་ལུ་ སེམས་ཤུགས་བྱིན་དོ་ཡོདཔ་ཨིན་པས།

རྩི་རང་རྫོང་ཁག་གི་ སོ་ནམ་གཙོ་འཛིན་འོགམ་ དོ་རྗེ་རྒྱལ་མཚན་གྱིས་ འབུབ་ཀྱིས་གནོད་སྐྱོན་ ཚབས་ཆེ་ཉིད་དེ་ གནམ་གཤིས་གནས་སྟངས་དང་འབྲེལ་ འགྱོཝ་མས་ཟེར་ བཤདཔའི་ཁར་ འདི་བཟུམ་མའི་འབུབ་ཚུ་ ཁྱབ་སྤྱེལ་འགྱོ་ནི་ལས་ བཀག་ཐབས་ལུ་ སོ་ནམས་པ་ཚུ་ལུ་ ཐབས་ལམ་ཅིག་སྦེ་ ལོ་ཐོག་ཞིང་ཚུ་ དུས་རྒྱུན་ལྟ་རྟོག་འབད་དེ་ ཞིང་གི་མཐའ་འཁོར་ཚུ་ ཉིང་སངས་ས་སྦེ་ བཞག་དགོཔ་སྦེ་ སླབ་དོ་ཟེར་ བཤདཔ་ཨིན་པས།

སོ་ནམ་པ་ཚུ་ལུ་ སྨན་རྫས་ཚུ་ བྱིན་དོ་ཡོདཔ་ལས་ ས་གནས་མང་ཤོས་ནང་ ཞིང་ཆུའི་དཀའ་ངལ་ཡོདསར་ འབུབ་ཚུ་ཐོན་མི་ལུ་བརྟེན་ བཀག་མི་ཚུགས་པས་ཟེར་ཨིན་པས།

སོ་ནམ་རྒྱ་སྐྱེད་འགོ་དཔོན་ཚུ་དང་འབྲེལ་བ་ཅིན་ རྒྱལ་ཡོངས་སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བའི་ ལམ་སྟོན་དང་འབྲེལ་ཏེ་ སོ་ནམ་པ་ཚུ་ལུ་ འབུབ་བཀག་ཐབས་ལུ་ རྒྱབ་སྐྱོར་ཚུ་འབད་དོ་ཟེར་ཨིན་པས།

ཉམས་མྱོང་དང་འབྲེལཝ་ད་ སོ་ནམ་པ་དང་ ཁྱིམ་གུང་ག་ར་གིས་ pheromone traps ཟེར་མི་ ཐབས་ལམ་ལག་ལེན་འཐབ་པ་ཅིན་ ཕན་ཐོགས་འོང་ནི་ཨིན་རུང་ སོ་ནམ་པ་ཚུ་གིས་ ཆོས་ལུགས་ཀྱི་འཆར་སྣང་དང་འབྲེལ་ ལག་ལེན་འཐབ་ནི་ལུ་ སྤྲོ་བ་བསྐྱེད་མི་བཏུབ་པས་ཟེར་ དོ་རྗེ་རྒྱལ་མཚན་གྱིས་ བཤདཔ་ཨིན་པས།

སོ་ནམ་པ་ཚུ་གིས་ བཤདམིའི་ནང་ གལ་སྲིད་ གནས་སྟངས་དེ་ དེ་བཟུམ་སྦེ་ར་ སྡོདཔ་ཅིན་ ལོ་ཐོག་གི་ ལཱ་འབདནི་ལུ་ སེམས་ཤུགས་ཉམས་འགྱོ་ནི་དང་ དེ་གིས་ བཟའ་འཐུང་ལུ་ཡང་ ཐོ་ཐོག་ནི་མས་ཟེར་ཨིན་པས།

ཙི་རང་རྫོང་ཁག་ནང་ འབྲུང་ཆུ་དང་ ཞིང་ཆུ་གི་ དཀའ་ངལ་ཡོདཔ་ལས་ སོ་ནམ་པ་ཚུ་ ད་རེས་ ལོ་ཐོག་གཞན་ཚུ་འཛུགས་སྐྱོང་འབད་ནི་ལུ་ ཐབས་ལམ་བཏོན་ཏེ་མེདཔ་ཨིན་པས།

ཨར་མི་ཕམ་དར་ཁྱབ།

དར་དཀར་ནང་རྫོང་ཁག་ སོ་ནམ་གཙོ་འཛིན་འོགམ་ ཊི་བི་ ཙ་རྣན་ བླུན་དྲ་རི་གིས་ སླབ་མིའི་ནང་ འབྲུབ་ཨར་མི་ཕམ་དེ་ རྒེད་འོག་དག་པ་ཅིག་ནང་ ཐོན་ཡོདཔའི་ སླན་ཞུ་ཡོད་རུང་ རྫོང་ཁག་ནང་ དེ་ཅིག་ར་ དར་ཁྱབ་སོང་སྟེ་མེད་ཟེར་ཨིནམ་ད་ གཞན་ཁར་དར་ཁྱབ་འགྱོ་ནི་ལས་ བཀག་ཐབས་ལུ་ འབྲུབ་དེ་ཚུ་ ལེགས་ཤོམ་སྦེ་ ལྟ་རྟོག་འབད་ཐོག་ལས་ ཕ་རོ་སྨན་ཧིང་ཚུ་ ལག་ལེན་འཐབ་དོ་ཟེར་ཨིན་པས།

ཁོ་གིས་འབདབ་ཅིན་ སོ་ནམ་པ་ཚུ་གིས་ འབྲུབ་ཐོན་ཡོདཔའི་སྐོར་ལས་ དུས་ཚོད་ཁར་ སླན་ཞུ་འབད་ཡོདཔ་ལས་ བཀག་ཐབས་ཀྱི་ ཐབས་ལམ་ཚུ་ བཏོན་དོ་ཟེར་ཨིན་པས།

རྒྱལ་ཡོངས་སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བ་དང་འབྲེལ་བ་ཅན་ ཨར་མི་ཕམ་འབྲུབ་དེ་ འགོ་དང་པ་ར་ སྤྱི་ལོ་༢༠༡༧ ལུ་ སྤུ་ན་ཁ་ ཤེལ་ཛ་ནང་ལུ་ དར་ཁྱབ་སོང་ཡོད་རུང་ ལྟེ་བ་དང་འབྲེལ་བ་ཅན་ གེ་ཟ་ལུ་ གནོདཔ་བཀལ་མི་ ཨར་མི་ཕམ་གྱི་ རིགས་ཅིག་ཨིན་མི་ ཕལ་ཨར་མི་ཕམ་ཟེར་མི་ འབྲུབ་ཚུ་ཐོན་ཡོདཔ་ད་ དེ་ཡང་ འགོ་དང་པ་ར་ སྤྱི་༢༠༡༩ ཟླ་༩ པའི་ནང་ སྤུ་ན་ཁ་མགུ་མ་རྒེད་འོག་ སྟེང་ཅ་སྒང་དང་ པདཔ་ཆུ་ འཛོམས་མི་རྒེད་འོག་ སྨིན་དྲུག་སྒང་ལུ་ ཐོན་ཡོདཔ་ཨིན་པས།

སྤྱི་ལོ་༢༠༢༡ ལུ་ གཞལམ་སྣང་ཁེམ་ཤར་ལུ་ ཨར་མི་ཕམ་ཐོན་ཏེ་ གེ་ཟ་ཞིང་ཨེ་ཀར་ལས་བཅད་དེ་ མེདཔ་བཏང་ཡོདཔའི་ཁར་ མོང་སྒར་ཀ་ལ་སྦྱང་ལུ་ཡང་ ཐོན་ཡོདཔ་ཨིན་པས།

ན་ཧིང་ དུས་ཚོད་རིམ་ཅིག་ནང་ བཀྲིས་སྒང་སག་སྟེང་ལུ་ཡང་ ཨར་མི་ཕམ་ཐོན་ཏེ་ གེ་ཟ་ཚུ་ མེདཔ་བཏང་ཡོདཔ་ད་ ད་རེས་ འབྲུབ་དེ་ཚུ་ ཆུ་ཁ་དང་ སྤུ་ན་ཁ་ སྤུ་རོ་ མོང་སྒར་ དར་དཀར་ ནང་ ཙི་རང་ དབང་འདུས་ཕོ་བྲང་ གསར་སྤང་འབདཔ་ཕྱད་ རྫོང་ཁག་༩ ནང་ཐོན་ཏེ་ གེ་ཟ་ཚུ་མེདཔ་གཏང་སྟེ་ཡོདཔ་ཨིན་པས།

འབྲུབ་ཐོན་མིའི་རྒྱུ་རྐྱེན་གཞན།

སོ་ནམ་པ་ཚུ་གིས་ ལོ་ཐོག་གི་ཐོན་སྐྱེད་ མར་བབས་སོང་མི་དང་ འབྲུབ་ཐོན་མི་དེ་ཡང་ ས་བཅུད་ཉམས་མི་དང་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་བརྟེན་འོང་ནི་མས་ཟེར་ བཤདཔ་ཨིན་པས།

རྒྱལ་ཡོངས་ཆུ་དཔྱད་དང་གནམ་གཤིས་རིག་པའི་ལྟེ་བ་གི་ གནས་སྡུད་དང་འབྲེལ་བ་ཅན་ ཙི་རང་ལུ་ དྲོད་ཤུགས་མཐོ་ཤོས་ར་ ན་ཧིང་ཚ་དྲོད་ ཊི་གི་རི་སེལ་ཤེ་སི་༢༡ ལྷོད་མི་དེ་ འདས་པའི་ལོ་༥ ནང་འཁོད་ལུ་ མཐོ་ཤོས་ཅིག་ཨིན་པས།

དེ་ཡང་ སྤྱི་ལོ་༢༠༡༨ ལུ་ དྲོད་ཤུགས་དེ་ ཊི་གི་རི་སེལ་ཤེ་སི་ ༢༠.༨ ལས་བརྒལ་མེདཔ་ཨིན་པས།

ལྟེ་བའི་སྤྱི་ཤིང་སྲུང་སྐྱོབ་འགོ་དཔོན་གོངམ་ ཚུལ་ཁྲིམས་བཟང་པོ་གིས་ སླབ་མིའི་ནང་ ལོ་ཐོག་གི་ འབྲུབ་ཐོན་མི་དེ་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་བརྟེན་ འོང་སྲིད་ནི་ཨིན་རུང་ ད་རེས་ ཞིབ་འཇུག་ཅིག་འབད་དེ་མེད་ཟེར་ཨིན་པས།

ཁོ་གིས་འབདབ་ཅིན་ གནམ་གཤིས་འགྱུར་བགྱོད་དང་ དམིགས་བསལ་དུ་ ཚ་དྲོད་ཡར་སེང་འགྱོ་མི་ལུ་བརྟེན་ འབྲུབ་ཚུ་གིས་ཡང་ གེ་ཟ་ཤིང་ཚུ་ ལེ་ཤ་ཟ་དོ་ཡོདཔ་ད་ ཨར་མི་ཕམ་དེ་ གནས་སྤོ་འགྱོ་མི་ འབྲུབ་ཅིག་འབདཝ་ལས་ ཉིན་རེ་ལུ་ ཀི་ལོ་མི་ཏར་༡༠༠ རེ་ འགྱོ་ནི་ཡོདཔ་ལས་ ཁྱབ་སྤེལ་མགྱོགས་དྲགས་སྦེ་ འགྱོཝ་མས་ཟེར་ཨིན་པས།

པདྨ་ཏ་མང་གིས་ སླབ་མིའི་ནང་ འབྲུབ་ཚུ་གིས་ ལོ་ཐོག་ཚུ་ལུ་ གནོདཔ་བཀལ་ཏེ་ ཐོན་ཤུགས་མར་བབས་སོང་ཡོདཔ་ལས་ གཡུས་མི་ཚུ་གིས་ ཆུམ་དང་ མར་ཁུ་ དེ་ལས་ ཚོད་བསྲེ་ཚུ་ ནང་འཛིན་འབད་ནི་དེ་ ཡར་སེང་སོང་སྟེ་ཡོད་ཟེར་ཨིན་པའི་གནས་ཚུལ།

Tsirang farmers struggle against destructive pest

Ugyen Dorji

Five years ago, Pema Tamang, a Rangthangling farmer, harvested about 700kg of maize from his one-acre land. This helped his family, supplementing their rice supply.

Rangthangling gewog in Tsirang dzongkhag, Bhutan, has fertile soil where Pema grows maize, cereals, vegetables, and fruits. Many farmers in the area do the same, aiming for self-sufficiency. Tsirang dzongkhag is known for its vegetables in both winter and summer, helping the country's food security.

However, farmers have been facing a major challenge. Over the past five years, Fall Armyworm has damaged their crops, leading to lower yields. This pest is particularly harmful to maize.

Pema Tamang now struggles to yield even 100kg. Other farmers in Rangthangling report similar issues. The pest damages maize from its early stages to when it bears fruit, deterring their efforts. "It is no different," she said.

The Fall Armyworm has affected not only Rangthangling gewog but also many other places in the dzongkhag.

Another farmer from Rangthangling said, "The worm's impact goes beyond maize; it also damages vegetables."

Farmers report increased damage during dry periods when the pests attack the crops, even rendering the plants inedible for cows.

In 2021, the pest destroyed around four metric tons of crops across 20 acres in four geowgs. Similarly, in 2022, 1.5 metric tonnes of crops were damaged in 11 acres across two gewogs.

Farmers have tried using pesticides provided by the dzongkhag and gewog agriculture officers. However, these pesticides aren't effective against the pests.

Some farmers have resorted to using cow urine and manure, but this doesn't fully solve the problem. The pests thrive in sunny weather and emerge when it rains, washing away pesticides.

Agricultural experts recommended light traps to control the pests, but many farmers are hesitant.

The spread of the Fall Armyworm has been observed in various regions. Climate change might be contributing to the pest's emergence, as increased temperatures accelerate insect metabolism. This pest can travel long distances quickly, worsening its impact. Due to these challenges, farmers are witnessing a decline in crop cultivation and an increase in food imports, impacting local food production and self-sufficiency.

To counteract the pest, experts advised farmers to sow crops after the time when armyworms lay eggs. "We were told to monitor the fields regularly and keep field boundaries clean as preventive measures," Pema Tamang said.

While pesticides are provided, they often prove ineffective due to water shortages in many places. The use of pheromone traps could be effective, but many farmers are hesitant due to religious reasons.

Farmers said that if the situation persists, crop cultivation will become discouraging and food deficiency will increase.

Tsirang Dzongkhag's water shortage problem also means that farmers are unable to plan for other crops. The spread of the Fall Armyworm has been reported in multiple gewogs, with measures taken to control it.

Farmers said that factors like decreasing soil fertility and climate change might contribute to the pest's emergence. "Climate change could increase the metabolic rate of pests like the Fall Armyworm," a farmer said.

This situation has led to a decrease in local food production and an increase in imports.

Pema Tamang laments that the destructive armyworm has decreased production, leading to more rice, oil, and vegetable imports in the village. The challenge remains ongoing, impacting both the farmers and their communities.

ལོ་ཐོག་ལུ་ གནོད་པ་རྐྱབ་མི་འབུབ་ བཀག་ཐབས་ལུ་ ཡུན་ཐུབ་ཀྱི་ཐབས་ལམ་ ལག་ལེན་འཐབ་དགོཔ།

ཨོ་རྒྱན་རྡོ་རྗེ།

༣ འདས་པའི་ལོ་ངོ་དྲུག་པ་ཅིག་ལས་ སོ་ནམ་པ་ཚུ་གི་ བྱང་ཕྱུད་གསརཔ་ ཨར་མི་ཝམ་ཟེར་མི་ ལོ་ཐོག་ཚུ་ལུ་ གནོད་སྐྱོན་རྐྱབ་མི་འབུབ་ཚུ་ འཐོན་མ་བཅུག་པར་ སྔོན་འགོག་འབད་ནིའི་ ཐབས་ལམ་ཡོདཔ་ཨིན་ན?

དེ་ཡང་ རྩི་རང་རྫོང་ཁག་ རང་ཐང་གླིང་གཡུས་ཚན་ལས་ སྐྱེས་ ལོ་༨༤ ལངམི་ སོ་ནམ་པ་ཅིག་གིས་ དྲི་བཀོད་འབད་དོ་ཡོདཔ་ ད་ ཕྱལ་ཨར་མི་ཝམ་འབུབ་ཀྱིས་ པདྨ་ཏ་མང་གི་ ལོ་ཐོག་གཙོ་བོ་ཅིག་ཨིན་མི་ གེ་ཟ་ཞིང་ཚུ་ལུ་ གནོད་སྐྱོན་རྐྱབ་མི་ལུ་བརྟེན་ ནང་འདྲེན་འབད་མི་ རྒྱ་ཆུམ་ལུ་བརྟེན་དགོཔ་བྱུང་ནུག།

བྱང་ཕྱུད་གསརཔ་གིས་ པདྨ་ཏ་མང་ལུ་རྐྱངམ་གཅིག་མེན་པར་ རྒྱལ་ཁབ་ཀྱི་ ས་གནས་ཐདམ་ཐད་ཁ་ལས་ཕར་ ལོ་བསྟར་བཞིན་དུ་ ལོ་ཐོག་ཚུ་ལུ་ གནོད་སྐྱོན་རྐྱབ་ཡོདཔ་ལས་ སྙན་ཞུ་ལྷོད་མི་ལུ་བལྟ་བ་ཅིན་ ཨར་མི་ཝམ་འབུབ་ཚུ་ སྔོན་འགོག་དང་ བཀག་ཐབས་ དེ་ལས་ འཛིན་སྐྱོང་འབད་ནི་གི་ ཐབས་ལམ་ག་ནི་ཡང་ མེདཔ་བཟུམ་སྦེ་ མཐོང་སྣང་བྱུངམ་ཨིནཔས།

ཨིན་རུང་ འབུབ་ཚད་འཛིན་དང་ སྔོན་འགོག་འབད་ནིའི་དོན་ལུ་ རང་ལུགས་དང་ ཚན་རིག་གཉིས་ཆ་རའི་ ཐབས་ལམ་ཚུ་ ཡོདཔ་ཨིནཔས།

རང་ལུགས་ཀྱི་ཐོག་ལས་ ཨར་མི་ཝམ་སྔོན་འགོག་དང་ ཚད་འཛིན་འབད་ནིའི་ ཐབས་ཤེས་དེ་ཡང་ ལོ་ཐོག་གི་ཞིང་ཚུ་ ཉིང་སངས་ས་བཞག་ནི་དང་ འབུབ་ཀྱི་གནོད་ཉེན་ཚུ་ དབྱེ་ཞིབ་དང་ ལྟ་རྟོག་འབད་ནི་ གཡུར་མ་རྐྱབ་ནི་ ལོ་ཐོག་བཏབ་ནིའི་ དུས་ཚོད་སོར་ནི་ ས་ཞིང་བཅུད་ལྡན་བཟོ་ནི་ དེ་ལས་ ལོ་ཐོག་ཚུ་ ཨ་རྟག་ལག་ལེན་འཐབ་མི་མེན་པར་ སོན་སོར་ཏེ་ བཏབ་ནི་ཚུ་ཨིན་པས།

ཚན་རིག་ཐོག་ལས་འབད་བ་ཅིན་ འབུབ་འཕྱུལ་འགྱོ་མ་བཅུག་པར་ ཚད་འཛིན་སྨན་ བཞག་ནི་དང་ སྣུན་རྫས་གཏོར་ནི་ འབུབ་ཀྱི་ཚང་ཚུ་ མེདཔ་བཟོ་ནི་དང་ འབུབ་གསད་ནི་ ཕེ་རོ་མོན་ཟེར་མིའི་ ཐབས་ལམ་ཚུ་ ལག་ལེན་འཐབ་པ་ཅིན་ འབུབ་བཀག་འཛིན་འབད་ཚུགས་ནི་ཨིན་པས།

ཐབས་ལམ་ཚུ་གི་ཕན་ཁྱད?

འབྲེལ་ཡོད་དབང་འཛིན་གྱིས་ ལོ་ཐོག་གནོདཔ་བཀལ་མི་ ཨར་མི་ཝམ་འབུབ་ སྔོན་འགོག་དང་ ཚད་འཛིན་ དེ་ལས་ འཛིན་སྐྱོང་འབད་ནིའི་དོན་ལས་ ཐབས་ལམ་གྱི་ ལམ་སྟོན་དང་ འབུབ་བསད་སྨན་ཚུ་ བྱིན་ཐོག་ལས་ སོ་ནམ་པ་ཚུ་ལུ་ རྒྱབ་སྐྱོར་འབད་བཞིན་དུ་ཡོད་རུང་ རྩི་རང་རྫོང་ཁག་བཟུམ་ཅིག་ལུ་ ཆ་བཞགཔ་ཅིན་ ཐབས་ལམ་དེ་ཚུ་གིས་ སོ་ནམ་པ་ཚུ་ལུ་ ཕན་ཁྱད་བྱུངམ་ཚུགས་པས།

སོ་ནམ་པ་ཚུ་གིས་ སླབ་མིའི་ནང་ ཁོང་གི་ ལོ་ཐོག་གི་ཟ་ཚུ་ འབུབ་དེ་ཚུ་ལས་ ཉེན་སྐྱོབ་འབད་ནིའི་ ཐབས་ཤེས་ག་ཅིར་བརྟོན་རུང་ གླུགས་ཁེལ་མ་ཚུགས་པར་ཡོད་ཟེར་ཨིནམ་ད་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་བརྟེན་པའི་ གདོང་ལེན་འགྲོ་མཐུད་དེར་ འབྱུངམ་ཅིན་ སོ་ནམ་གྱི་ ལཱ་འབད་ནི་ཚུ་ བཤོལ་བཞག་དགོཔ་ འཐོན་ནི་མས་ཟེར་ཨིན་པས།

རྒྱལ་ཡོངས་སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བ་གིས་ འབྲུབ་དབྱེ་ཞིབ་དང་ ལྟ་རྟོག་འབདཝ་ནིའི་ ལས་རིམ་ཅིག་ བཟོ་སྟེ་ཡོདཔ་མི་དེ་ཡང་ ལོ་ཐོག་ཚུ་ ཉེན་སྲུང་འབད་ནིའི་དོན་ལས་ དུས་ཚོད་ཁར་ བརྡ་དོན་བྱིན་ཐབས་ལུ་ཨིན་པས།

ཨར་མི་ཕམ་འབྲུབ་ཀྱི་དོན་ལུ་ དུག་ཅུང་སུ་ཡོདཔ་པའི་ འབྲུབ་སྨན་མ་འདྲཔ་༨ དབྱེ་ཞིབ་འབད་ཡོདཔ་ད་ སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བའི་ནང་ཡོདཔ་མི་ འབྲུབ་བསད་སྨན་ཚུ་ ནུས་པ་མེདཔ་ལས་ བརྟག་ཞིབ་ལས་རིམ་ འགོ་འདྲེན་འཐབ་ནུག།

སོ་ནམ་ལས་ཁུངས་ཀྱི་ འགོ་དཔོན་ཅིག་གིས་ སླབ་མིའི་ནང་ འབྲུབ་ཚུ་ བཀག་ཐབས་ལུ་ ཐབས་ལམ་དང་ ཐབས་ཤེས་ཚུ་ སོ་ནམ་པ་ཚུ་ལུ་ གོ་བརྡ་སྤྲོད་དོ་ཟེར་ཨིན་པས།

སོ་ནམ་དང་སྒྲོ་ནོར་སློན་པོ་ ཡེ་ཤེས་དཔལ་འབྱོར་གྱིས་ སླབ་མིའི་ནང་ རྫོང་ཁག་ཚུ་གིས་ འབྲུབ་ཚད་འཛིན་འབདཝ་ནི་ལུ་ ཐབས་ལམ་སྣ་ཚོགས་བརྟོན་རུང་ ཁེ་ཕན་ཅིག་ བྱུང་མ་ཚུགས་པའི་ཁར་ གཞུང་གི་ཧོངས་ལས་ ཨར་མི་ཕམ་ བཀག་ཐབས་ལུ་ དང་པ་ར་ རྩ་མེདགཏང་ནི་ལུ་ གཙོ་རིམ་བཟུང་དོ་ཟེར་ བཤདཔ་ཨིན་པས།

སོ་ནམ་པ་ཚུ་གིས་ འབྲུབ་ཤི་ནིའི་དོན་ལས་ སྨན་རྫས་ཚུ་ ལོ་ཐོག་ཞིང་གི་ ཕྱི་ཁ་ལས་ཕར་ ཤིང་གི་འདབ་མ་ཚུ་ལུ་ གཏོར་བཞག་དོ་ཡོདཔ་ལས་ ཆརཔ་རྒྱབ་ད་ སྨན་ག་ར་ འཕྱུག་བདའ་ནི་དེ་གིས་ ཁེ་ཕན་དེ་ཅིག་ར་ འབྱུང་མི་ཚུགས་ཟེར་ སོ་ནམ་སློན་པོ་གིས་ བཤདཔ་ཨིན་པས།

གནད་དོན་དེ་ལུ་བརྟེན་ སོ་ནམ་པ་ཚུ་ལུ་ འབྲུབ་བསད་སྨན་ཆུ་ གཏོར་དགོ་པའི་ སེམས་ཤུགས་བསྐྱེད་བཅུག་དོ་ཡོདཔ་རུང་ ཁོང་གིས་ ཉོམ་ཚུགས་པར་ གཞུང་ལས་ རིན་མེད་སྟོངཔ་སྦེ་ འཐོབ་ནི་ལུ་ རེ་སྒུག་སྡོདཔ་མས་ཟེར་ཨིན་པས།

སྨན་ཆུ་གཏོར་བའི་སྐབས་ ཨར་མི་ཕམ་ཤི་རུང་ སོན་ལུས་དོ་ཡོདཔ་ལས་ ཚ་དྲོད་ཡར་འཕར་འགྱོཝ་ད་ ལོག་འཐོན་ཉེན་ཡོད་ཟེར་ཨིན་མ་ད་ སྨན་ཆུ་གཏོར་མི་ལུ་བརྟེན་ ལོ་ཐོག་གི་ཟླ་ཚུ་

བསྡུ་གསོག་འབདཝ་བའི་ཤུལ་ལུ་ ས་ཞིང་ཚུ་ མེ་གཏང་པ་ཅིན་ ཨར་མི་ཕམ་འཐོན་ནི་ལས་ སྔོན་འགོག་འབད་ཚུགས་ཟེར་ སོ་ནམ་སློན་པོ་གིས་ བཤདཔ་ཨིན་པས།

ཁོ་གིས་འབདཝ་ཅིན་ གལ་སྲིད་ སོ་ནམ་པ་ཅིག་གིས་ འབྲུབ་རྩ་མེདགཏང་ནིའི་དོན་ལས་ ལོ་ཐོག་ཞིང་ཚུ་ མེ་གཏང་རུང་ ཉེ་འདབས་ཀྱི་ སོ་ནམ་པ་གཞན་ཚུ་གི་ ལོ་ཐོག་ཞིང་ཚུ་ མེ་མ་གཏང་པ་ཅིན་ འབྲུབ་འཐོན་འོང་ཟེར་ཨིནམ་བཞིན་དུ་ དེ་ཡང་གཏན་འཇགས་ཀྱི་ ཐབས་ལམ་ཅིག་ཨིན་ཟེར་ཨིན་པས།

འབྲུབ་བཀག་འཛིན་གྱི་གྲོས་འདེབས།

རང་བཞིན་ཐོན་སྐྱེད་མཐོ་རིམ་སློབ་གྲྭའི་ ལེགས་སྦྱར་བ་ དབང་པོ་ལེབ་ཙ་གིས་ འབྲུབ་ཚད་འཛིན་འབདཝ་ནིའི་དོན་ལུ་ གྲོས་འདེབས་བཀོདམིའི་ནང་ སྤྱི་ཤིང་ཚུ་ སོ་སོར་སྦེ་ བཞག་དགོཔ་མ་ཆད་ ཤིང་གི་རིགས་ག་ཅི་ཨིན་རུང་ རྒྱལ་ཁབ་ནང་ འབག་འོང་པའི་སྐབས་ ཁྲིམས་དོན་དབང་འཛིན་ཚུ་གིས་ དམ་དམ་སྦེ་ ཚད་འཛིན་འབད་དགོ་ཟེར་ཨིན་པས།

ཤིང་དང་ ཤིང་འབྲས་ཚུ་ ནང་འདྲེན་འབདཔ་ད་ ཚད་འཛིན་ཐབས་ལམ་ཚུ་ ལག་ལེན་མ་འཐབ་པ་ཅིན་ འབྲུབ་ཀྱི་སྔོང་རྟོག་དང་ ཕྱུག་གུ་ཚུ་ རྒྱལ་ཁབ་ཚུ་ནང་ འཛམ་ཧོང་ཧོ་སྦེ་ སྤེལ་དོ་ཡོདཔ་ལས་ དེ་ཚུ་ ནང་འདྲེན་འབདཝ་བའི་སྐབས་ འབྲུག་སོ་ནམ་ཟ་ཆས་ཁྲིམས་དོན་དབང་འཛིན་གྱིས་ ལོ་ཐོག་ལུ་ གནོདཔ་བཀལ་མི་ འབྲུབ་བཀག་ཐབས་ལུ་ ལྟ་རྟོག་དམ་སྒྲིང་འབད་ནི་དང་ འགར་ཁུར་ཚུལ་ལྡན་ འབག་དགོ་ཟེར་ དབང་པོ་ལེབ་ཙ་གིས་ བཀོདནུག།

ལེགས་སྦྱར་བ་གིས་ གཙུག་ལག་གོང་མའི་ ཤེས་ཡོན་སྦྱངམ་ད་ ཐུལ་ཨར་མི་ཕམ་འབྲུབ་ཀྱི་སྐོར་ལས་ ཞིབ་འཚོལ་འབད་ཡོདཔ་ཨིན་པས།

མཁས་མཆོག་ཚུ་དང་འཁྲིལ་བ་ཅིན་ ལོ་ཐོག་སོན་བཏབ་ནི་གི་ དུས་ཚོད་ཚུར་འཐེན་ནི་ ཡང་ཅིན་ ཕར་འགྱངས་འབདཝ་ཅིན་ འབྲུབ་ཚུ་ བཀག་འཛིན་འབད་ཚུགས་ནི་ཨིན་རུང་ ས་གནས་ཀྱི་

སོ་ནམ་དང་འཁྲིལ་བའི་ སྐྱེ་ལྡན་གནས་སྟངས་ ལེགས་ཤོམ་སྦེ་ ཤེས་དགོ་ཟེར་ཨིན་པས།

ཁོང་གིས་ འབྲུབ་བཀག་ཐབས་ལུ་ རང་ལུགས་ཀྱི་ ཐབས་ལམ་དང་ འཕྲུལ་རིག་ སྐྱེ་ལྡན་ཐབས་ལམ་ཚུ་ ལག་ལེན་འཐབ་དགོ་པའི་ གྲོས་འདེབས་བཀོད་ཡོདཔ་ད་ གལ་སྲིད་ ལོ་ཐོག་ཚུ་གི་ བཅུད་འཛིན་སྐྱོང་འབདཝ་ཅིན་ ཨར་མི་ཕམ་གྱིས་ གནོདཔ་རྐྱབ་རུང་ ཐོན་སྐྱེད་ལེགས་ཤོམ་འོང་ནི་ཨིན་པས།

ཨིན་རུང་ ཡུ་རི་ཡ་བཟུམ་མའི་ ལུད་ ནའི་ཊོ་ཛེན་ ལག་ལེན་འཐབ་ནི་ལས་ འཛེམ་དགོ་ཟེར་ བཤདཔ་ཨིན་པས།

རྒྱལ་ཡོངས་སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བའི་ སྤྱི་ཤིང་སྲུང་སྐྱོབ་གོངམ་ ཚུལ་ཁྲིམས་བཟང་པོ་གིས་ ཤུལ་མའི་གེ་ཟའི་དུས་ཚོད་ནང་ དབྱེ་ཞིབ་འགོ་འདྲེན་འཐབ་སྟེ་ འབྲུབ་བསད་སྨན་གསརཔ་ཚུ་ གསར་བཏོན་འབད་འོང་ཟེར་ཨིནམ་ད་ ཨར་མི་ཕམ་གྱི་ གདོང་ལེན་ལུ་ གེ་ཟའི་རིགས་ མ་འདྲཔ་ཚུ་ དབྱེ་ཞིབ་འབདཔ་དང་ འབྲེལ་ རྒྱུ་ཁ་དང་ ལྟུན་རྩེ་ མོང་སྒར་ དེ་ལས་ གསར་སྤང་རྫོང་ཁག་༨ ནང་ སེཏསི་ ཕེ་རོ་མོན་ཊེབ་ཟེར་མི་ ལག་ལེན་འཐབ་སྟེ་ འབྲུབ་ཀྱི་གྲངས་ཁ་ བལྟ་ནི་ཨིནམ་ལས་ དེ་གིས་ དུས་ཚོད་ངེས་ཏིག་ནང་ འབྲུབ་བསད་སྨན་ཆུ་གཏོར་ནི་ལུ་ ལྷན་ཐབས་འབྱུང་འོང་ཟེར་ཨིན་པས།

སྤྱི་ཤིང་སྲུང་སྐྱོབ་ལྟེ་བ་གིས་ འབྲུབ་དེ་གིས་ ལོ་ཐོག་ལུ་ གནོད་སྐྱོན་རྐྱབ་མི་ལུ་ ཞིབ་འཚོལ་འགོ་འདྲེན་འཐབ་འཐབ་མེད་རུང་ རྩིས་ལོ་༢༠༢༣-༢༨ ལུ་ འབྲུབ་ཀྱིས་ གེ་ཟའི་ཐོན་སྐྱེད་མེདཔ་བཏང་མི་ཚུ་ལུ་ བརྟག་ཞིབ་འབདཝ་ནི་ཨིན་པས།

ཁྲིམས་ལག་ལེན་དང་མཉམ་འབྲེལ།

སོ་ནམ་པ་ཚུ་ལུ་ གཅིག་སྒྲིལ་འབྲུབ་འཛིན་སྐྱོང་འབད་ཐངས་ཀྱི་ སེམས་ཤུགས་བྱིན་དོ་ཡོདཔ་ད་ རྒྱལ་ཁབ་ནང་ འབྲུབ་བཀག་ཐབས་ལུ་ སྤྱི་ཤིང་བཅའ་ཁྲིམས་༡༩༩༣ ཅན་མ་ལུ་བརྟེན་ སྤྱི་ཤིང་དང་ དེ་གི་ཐོན་སྐྱེད་ཚུ་ ནང་འདྲེན་དང་ ཕྱིར་ཚོང་བརྒྱུད་དེ་ རྒྱལ་ཁབ་ནང་ འབྲུབ་གསརཔ་འཐོན་ནི་ལས་ བཀག་འཛིན་འབདཝ་ནི་ལུ་ ལྷན་ཐབས་བྱུང་ནུག།

སོ་ནམ་བློན་པོ་གིས་ སྲིད་བྱུས་དང་ བཅའ་ཁྲིམས་ལེ་ཤ་ཡོད་རུང་ ལག་ལེན་འཐབ་ནི་ལུ་ ཐོ་ཤོག་སྐྱེ་ཡོད་ཟེར་ བཤདཔ་འི་ཁར་ ནགས་ཚལ་དང་ སོ་ནམ་ལས་ཁུངས་ ས་གནས་གཞུང་ དེ་ལས་ སོ་ནམ་པ་ཚུ་གིས་ མཉམ་འབྲེལ་ཐོག་ལས་ ལྷ་མ་འབད་བ་ཅིན་ འབུབ་ཕྲ་མེད་གཏང་མི་ཚུགས་ཟེར་ཨིན་པས།

དེ་འབདཝ་ལས་ འབྲེལ་ཡོད་ལས་འཛིན་ཚུ་གིས་ འབུབ་ཀྱི་ དཀའ་ངལ་སེལ་ཐབས་ལུ་ མཉམ་འབྲེལ་གང་དྲག་ འབད་ དགོཔ་བཞིན་དུ་ ཨར་མི་ཝམ་ཚུ་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་བརྟེན་ བྱུང་དོ་ཡོདཔ་ལས་ སྲིད་བྱུས་དང་ བཅའ་ཁྲིམས་ག་ཅིར་ཨིན་རུང་ ནད་འབུབ་ཐོན་ས་དང་ ས་ཞིང་འཛིན་སྐྱོང་ དེ་ལས་ འབུབ་ཚུ་ཐོན་པའི་སྐབས་ གནོད་ལེན་འབདནི་དེ་ ཁག་ཆེ་ཟེར་ སོ་ནམ་བློན་པོ་གིས་ བཤདཔ་ཨིན་པས།

གནད་དོན་དེ་ལུ་ མཐུན་རྐྱེན་དང་ མཁས་མཆོག་ དེ་ལས་ འབྲེལ་ཡོད་ལས་སྡེ་ཚུ་ལས་ མཉམ་འབྲེལ་དགོ་ཟེར་ སོ་ནམ་བློན་པོ་གིས་ བཤདཔ་འི་ཁར་ གནམ་གཤིས་འགྱུར་བགྱོད་ལུ་ བརྟེན་ ལོ་ཐོག་གི་འབུབ་དང་ ནད་གཞི་ཚུ་ ལོ་བསྟར་བཞིན་དུ་ མངམ་འཐོན་ཉེན་ཡོདཔ་ལས་ གནོད་ལེན་གྱི་དོན་ལུ་ ཀྲ་སྒྲིག་འབད་དགོ་ཟེར་ བཤདཔ་ཨིན་པས།

འཛམ་གླིང་སྤྱི་ཚོགས་ཀྱི་ རྐྱེན་ངན་མར་ཕབ་བརྟག་ཞིབ་སྙན་ཞུ་ ༢༠༢༡ ཅན་མ་དང་འཁྲིལཝ་ད་ ཕྱལ་ཨར་མི་ཝམ་དེ་ འཛམ་གླིང་ནང་ ཐོན་ཏེ་ཡོདཔ་ལས་ འཛམ་གླིང་གིས་ དང་ལེན་འབད་ དགོཔ་བཞིན་དུ་ བཟའ་འཐུང་དང་ སོ་ནམ་ཚོགས་སྡེ་གིས་ ལུང་ཕྱོགས་དང་ རྒྱལ་ཁབ་ཀྱི་ གནས་ཚད་ནང་ ཡུན་བརྟན་ཐོག་ལས་ ཨར་མི་ཝམ་དེ་ བཀག་འཛིན་དང་ འཛམ་གླིང་ནང་ ག་ར་ལས་ མཉམ་འབྲེལ་ངེས་བརྟན་ཡོདཔ་ བཟོ་ཐབས་ལུ་ མཉམ་འབྲེལ་འབདནུག།

འཛམ་གླིང་སྤྱི་ཚོགས་ རྐྱེན་ངན་མར་ཕབ་བརྟག་ཞིབ་སྙན་ཞུའི་ ཞིབ་འཚོལ་པ་ཚུ་གི་ ཞིབ་རྟོག་དང་འཁྲིལཝ་ད་ ཟད་འགྲོ་ཉུང་ཤོས་དང་ རྫས་སྦྱོར་ལག་ལེན་མ་འཐབ་པར་ སོ་ནམ་དང་ འབྲེལ་བའི་ སྐྱེ་ལྡན་གནས་སྟངས་ཀྱི་ ཐབས་ལམ་བཏོན་ཏེ་ འབདབ་ཅིན་ ཨར་མི་ཝམ་བཀག་འཛིན་འབད་ཚུགས་ནི་ཨིན་པས།

གལ་སྲིད་ ཐབས་ལམ་ཚུ་ དུས་ཚོད་ཁར་ མ་བཏོན་པ་ཅིན་ མ་འོངས་པ་ལུ་ ནད་འབུབ་དང་འབྲེལ་བའི་ དཀའ་ངལ་ཚབས་ཆེན་ཅིག་ལུ་འགྱུར་ཏེ་ བཟའ་འཐུང་ཉེན་སྲུང་ལུ་ ཐོ་ཤོག་ཉེན་ཡོད་པའི་གནས་ཚུལ།

Fighting the Army Worm

… farmers grow desperate for lack of lasting solutions

Ugyen Dorji

The maize harvest in Tsirang for this year is over. Farmers battled hard against the invasion of Fall Armyworm and could save much of their crops.

Farmers said that the fight was not over. At least not yet given the lack of an effective pest control mechanism.

Fall Armyworms have been invading fields in Tsirang and other farms across the country every year. Agriculture officials and researchers have been trying to help through various means. However, the impact of these efforts has been limited, farmers said.

Most farmers use the conventional method of controlling the fall armyworm by clearing the boundaries around their fields, regularly monitoring crops, improving soil fertility, altering the sowing dates to create unfavourable conditions for the pest, and practising crop rotations.

Agriculture officials recommend farmers monitor the pest build-up, spray the pesticides and set pheromone traps.

National Plant Protection Centre (NPPC) has been monitoring pest incidents and cautioning farmers of outbreaks. The centre carried out four low-toxic insecticides after the pesticides the centre provided were found ineffective in controlling the pests.

An official from the agriculture department said that they briefed farmers on pest control.

Agriculture Minister Yeshi Penjor said that although numerous mea-

sures have been taken the government prioritised resolving the pest issues.

“Farmers are spraying the pesticide on the maize leaves when it rains and the pesticide is washed away and it is not working,” he said.

Farmers, he said, are encouraged to use the spray guns but many cannot afford them.

“Though the army worms die after spraying the pesticides, the genes are left and it can damage the crops due to increase in temperature. So it is good if the farmer burns out their field after harvesting their crops,” lyonpo said.

However, if even one farmer does not burn the infected plants, it will not help to mitigate the pests and the worms will recur. “So the permanent method to overcome the pest problems is to burn the fields.”

A lecturer of the College of Natural Resources (CNR), Ongpo Lepcha, recommends quarantining the plants and a relevant authority should strictly monitor the import of plants.

“If regulatory measures are not taken while importing plant and plant products, eggs and young ones of many pests can be easily introduced here,” said the lecturer who studied the worm in his Master’s degree.

He said that the pest problem can also be managed by either preponing or postponing the sowing dates from the actual sowing dates.

However, implementing this method requires a good understanding of the agro-ecosystem of the area.

If the nutrient is managed well in the crops, the worm-affected maize can still grow and give a certain yield. However, one should avoid nitrogen fertilizers like Urea as they can make plants more susceptible to pests, said Ongpo Lepcha.

NPPC’s Senior Plant Protection Officer Tsheltrim Zangpo said that the centre will conduct research in the next maize season and will introduce the new pesticides.

He said that they will evaluate maize varieties against the worm and monitor its population using sex pheromone traps in four Chukha, Lhuentse, Mongar, and Sarpang. “With this, we can use pesticides at the correct time.”

The NPPC has not conducted research on the effect of FAW on food production (maize) though. In FY 2023-2024, NPPC plans to conduct damage assessment on maize production.

Lyonpo said that although there are many policies and Acts, they are not properly implemented.

The minister said that to overcome the pest problem all stakeholders should work together. “The pests are emerging due to climate change and it is very important to implement the policies and rules in the pest-prone area and confront the pests.”

If serious measures are not taken on time, the pest-related problems will have implications on the country’s food security in the long run, Lyonpo said.