Agriculture Highlights 2024-2025

Department of Agriculture

Ministry of Agriculture and Livestock

Agriculture Highlights
2024-2025

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Department of Agriculture
Ministry of Agriculture and Livestock
Royal Government of Bhutan, Thimphu

Executive Summary

In the fiscal year 2024–2025, the Department of Agriculture, Ministry of Agriculture and Livestock, made significant progress in advancing Bhutan's agriculture sector through strategic investments, infrastructure development, and innovation-led initiatives in alignment with the priorities of the 13th Five Year Plan. The Million Fruit Tree Plantation, Phase IV, saw the planting of 1.12 million high-value seedlings sourced entirely from domestic nurseries, bringing the cumulative total since 2022 to 4.74 million. Moving forward, the focus will be on mortality replacement and aftercare to ensure sustained impact.

Irrigation infrastructure was strengthened through the completion of three out of five centrally funded schemes worth Nu. 126 million, alongside 114 Local Government-led schemes, benefiting over 6,500 households and providing reliable water to 11,530 acres of farmland. To address wildlife-induced crop losses, 420 km of chain-link fencing were installed across 20 dzongkhags, protecting 9,964 acres of cultivated land and benefiting 4,919 households. The Gyalsung Fruit and Vegetable Supply initiative delivered 254 MT of fresh produce, 65% locally sourced to Gyalsung academies, generating Nu. 11.4 million in income for farming communities.

A major milestone was the nationwide rollout of the Farmer Registration System (FRS), a fully integrated digital platform serving as the Single Source of Truth for agricultural data, enabling informed policy decisions and efficient service delivery. Climate resilience efforts included the use of the Agromet Decision Support System, disseminating over 140 advisories, development of crop suitability maps, and training of more than 500 stakeholders in climate-smart practices. Innovative farming models such as the Chirub farms and the Yarjugang Open-Air Prisoners' farm, with a combined investment of Nu. 427 million, were advanced to promote skills development, community enterprise, and inclusive farming.

Research and innovation outputs included the release of 18 new crop varieties, piloting of drone-based precision agriculture, development of IoT-enabled walnut grafting with up to 80% success rates, and evaluation of climate-resilient potato and maize varieties. Soil and land management interventions improved 7,472 acres of farmland, while the Bhutan Soil Information System (BhuSIS) was initiated to strengthen soil health monitoring and decision-making. The Department also distributed over 2,750 MT of fertilizers, 106 MT of seed potato, 520,000 fruit seedlings, and essential plant protection inputs to support production.

Mechanization was expanded to 3,067 acres, benefiting 1,689 households, with national standards and certification protocols introduced to ensure machinery safety, quality, and efficiency. Collectively, these initiatives have strengthened national food security, enhanced rural incomes, fostered agricultural innovation, and built resilience to climate change, reflecting the Department's continued commitment to sustainable, inclusive, and technology-enabled agricultural transformation.

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Million Fruit Tree Plantation, Phase-4

Since the inception of MFTP in 2022, approximately **4.4 million** high-value fruit seedlings have been planted nationwide. Around 106,697 temperate and 1,009,147 sub-tropical seedlings have been planted in the 4th phase (Table 1). Unlike the past three phases, the 4th phase was implemented with seedlings sourced entirely from in-country (60 nurseries), including **18,955** assorted seedlings from nursery of Desuung Skilling Program at Chimipang, providing revenue of **Nu. 2.2 million** to the Desuups operating the nursery. Further, both the number of Desuups and the duration of their engagements were rationalized.

While on an average, around **Nu. 149 million** per phase had been spent for the last three phases, the expenditure for the current phase is around **Nu. 138 million**. According to **mortality surveys** of **phases I and II**, around **60-70%** of the seedlings planted have survived. Moving forward, the department aspires to concentrate on mortality replacements and aftercare services.

Table 1. Information on the MFTP Phase I to Phase IV

Phases	No. of seedlings	No. of beneficiary	No. of desuups engaged	Budget (Nu. in millions)
MFTP Phase I	1,014,785	46,478	2,576	132
MFTP Phase II	1,351,607	42,050	2,107	172
MFTP Phase III	1,255,808	30,327	1,747	154
MFTP Phase IV	1,115,844	20,060	988	138
Total	**4,738,044**	**138,915**	**7,418**	**149**

Key features of the 4th phase of MFTP: Target – 1.12 million

Walnut 6,759

Pecan nut 33,784

Pear 3,416

Macadamia nut 87,335

Mango 24,776

Irrigation

Irrigation water, being the most essential factor for crop production, the department continues to prioritize the development of irrigation infrastructure. The department in collaboration with the Irrigation Division of the DoID, MoIT, has focused on improving the quality of irrigation infrastructure by establishing sustainable and climate-resilient irrigation through durable intake weirs, piped main and distribution lines, and renewable energy-powered lift irrigation systems.

Trench laying of HDPE, Gayrikha scheme in Haa

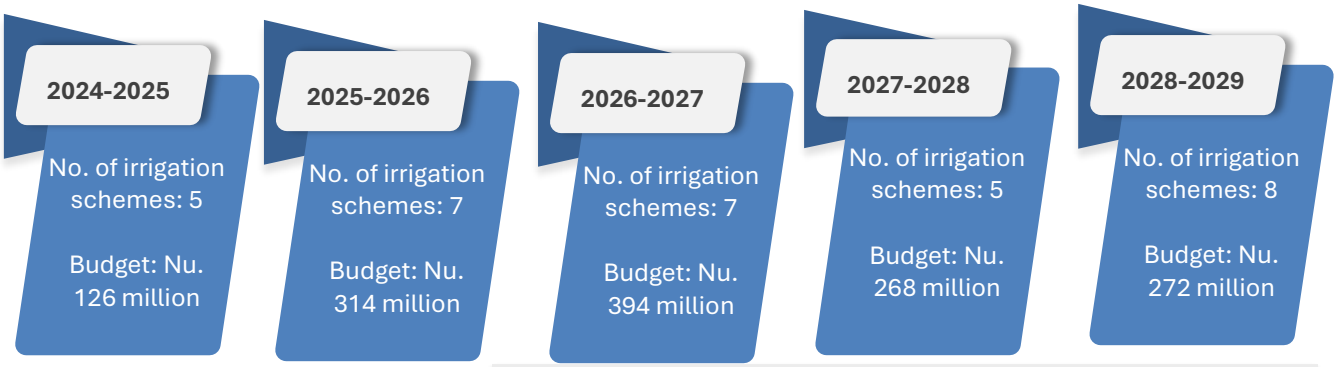
Side intake at Khangma Scheme in PemaGatshel

Out of 24 schemes prioritized in the 13 FYP to be implemented centrally, five centrally funded schemes were implemented in this reporting period (See table 2). Three schemes; Gayrikha-Tsonglina (Haa), Khangma (Pemagatshel) and Khameythang (S/J) are completed.

Table 2. Information of the centrally executed irrigation schemes

Name of the scheme	Length (km)	Command area (acres)	No. of beneficiaries	Budget (Nu. in millions)	Fund source	Completion status
Gayrikha-Tsonglina, Haa	3.0	69.0	21	14.4	GoI	COMPLETED
Khangma, Pemagatshel	3.2	130.0	60	15.1	GoI	COMPLETED
Khameythang, S/jongkhar	6.0	253.5	86	28.3	BFL	COMPLETED
Changwa-Rongchhu Scheme, Bumthang	6.0	75.0	98	38.2	GoI	65%
Changyul-Ritsa Lift irrigation, Punakha	3.0	500.0	255	29.9	GoI	15%
Total	**21.2**	**1,027.5**	**520**	**125.8**		

Additionally, Local Governments implemented 114 schemes, with 81 completed and 33 ongoing, covering 287.24 km, 11,530 acres, and benefitting 6,512 households. To ensure timely implementation next year, survey works for seven new schemes are already completed. The year-wise plan for centrally executed irrigation schemes is as follows;



Khangma farmers prepare to scale up cultivation after irrigation project fast-tracked, Pema Gatshel

"We receive seeds for free, so we plan to grow as many vegetables as possible. However, in the past, we struggled due to a shortage of water. Now that we have separate sources for irrigation and drinking water, things will be more convenient. We are confident that our livelihoods will greatly improve with this water supply," said Tenlha, a resident of Khangma, Yurung Gewog ~ Source: June 16, 2025 BBS

Excerpt from Bhutan Broadcasting Service on irrigation

Chain-link fencing

Around 19-43% of crop yield is lost to wild animals annually, which hinders the achievement of food production targets. Considering this significant loss of crop yield, the department has allocated Nu. 5.1 billion for chain link fencing in the 13 FYP, to mitigate crop depredation by wild animals.

The pilot phase, initiated in 2022–2023, implemented 19 schemes with a total investment of Nu. 154.4 million. In this reporting period, a total budget of Nu. 667.5 million (Nu. 637.5 million from the GoI-PTA and Nu. 30 million from FSAPP) was allocated for implementing 83 chain-link schemes (420 km) across 20 Dzongkhags. For the upcoming financial year, Nu. 862.5 million has been allocated for the execution of 116 additional schemes (Table 3).

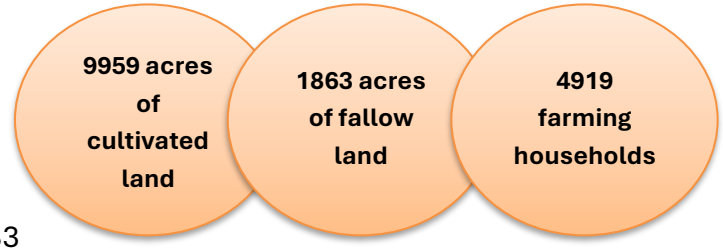


Table 3. Details of chain link fencing carried out in FY2024-2025

Dzongkhag	Actual Length in KM	No. of Chiwog Covered	No. of Schemes	Cultivated land Protected (acres)	Expenditure (Nu. M)
Bumthang	18	2	2	470	23.55
Chhukha	22	6	6	481	22.68
Dagana	14	3	3	444	16.46
Gasa	5	1	1	15	7.50
Haa	38	8	8	558	63.01
Lhuentse	11	2	2	325	16.27
Mongar	19	2	2	282	18.31
Paro	39	9	8	1065	49.81
Pema Gatshel	14	5	5	219	16.52
Punakha	30	5	5	465	49.50
Samdrup Jongkhar	22	8	6	777	28.62
Samtse	13	3	4	172	20.15
Sarpang	20	2	2	705	26.35
Thimphu	9	2	3	127	9.99
Trashigang	17	3	3	287	24.46
TrashiYangtse	41	11	8	892	57.04
Trongsa	14	3	3	281	20.25
Tsirang	23	6	2	1126	23.79
Wangdue Phodrang	28	5	4	608	33.67
Zhemgang	23	6	6	667	32.17
Grand Total	**420**	**92**	**83**	**9964**	**560.095**

Stories from the field

As night falls, a blind woman takes her post in the middle of her field. Her biggest battle isn't with wild boars—it's with monkeys. "Monkeys are smart and aggressive. Sometimes, they even try to attack me," she says fearlessly.

Thankfully, the electric fence has eased part of her burden. "It's been a big help against wild boars," she adds.

Her story mirrors the struggles of many farmers in Bhutan. While fences help, monkeys remain a relentless challenge. That's why the Department of Agriculture is now stepping up efforts to find smarter solutions to protect farmers from crop loss especially from monkeys.

Chain link fencing helps revive abandoned farmland in Chhoekhorling, Pema Gatshel

Wildlife threat recedes as chain-link fencing nears completion in Mitshig, Paro

"*The chain-link fencing will last for generations and will benefit us a lot. It has motivated us to work even harder. Now we are planning to make full use of our farmlands without leaving them fallow*," said Kinzang Wangchuk, a farmer from Riserbu.

"*Forget about porcupines and deer, the chain-link fence even prevents birds from entering the fields. It also protects against jungle fowls that feed on maize seeds*," said Tobgay, another farmer from Riserbu.

~Source: BBS, April 2025

Chain-link fence brings hope to Mendrelgang farmers battling wildlife crop damage, Tsirang

Chain-link fencing brings hope to Samarchen farmers

Gyalsung Fruit and Vegetable Supply

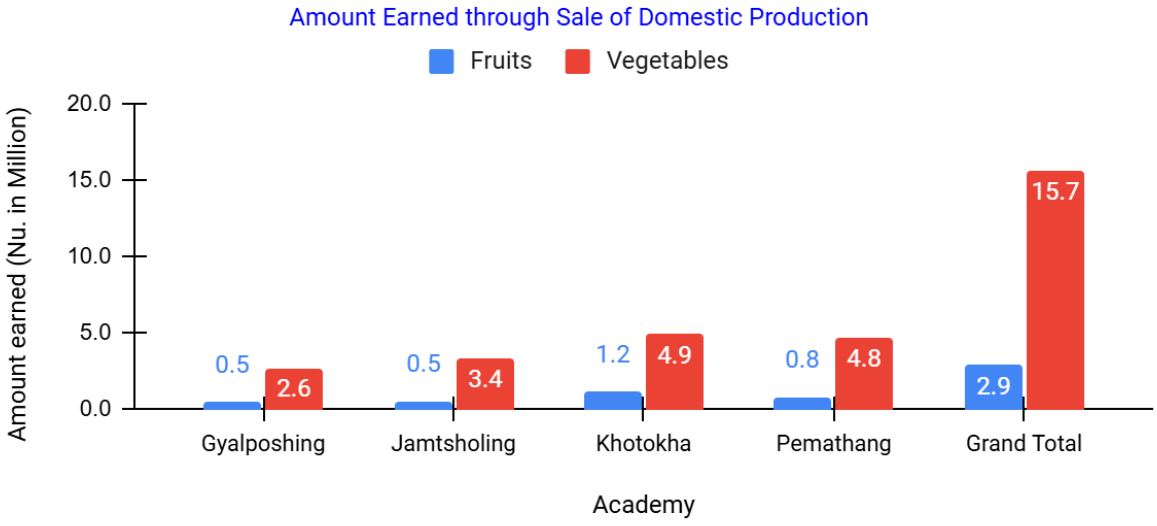
The Gyalsung Fruit and Vegetable Supply initiative is more than just a food supply program, it is a bridge connecting Bhutan's farmers with the nation's future leaders. The goal is simple yet powerful: to deliver fresh, healthy, and locally grown fruits and vegetables to Gyalsars, while creating reliable markets for our farmers. To date, 6908 Gyalsars across four Gyalsung academies have benefitted from this initiative. Behind every meal is a story of local hands working the land.

Approximately 254 MT of fruits and vegetables have been supplied, with an impressive 65% about 166 MT sourced directly from domestic production (Table 4). This not only ensures that Gyalsars enjoy nutritious meals, but also brings meaningful economic impact generating Nu. 11.4 million in income for local farming communities. It's a win-win: Gyalsars stay healthy, and farmers stay empowered.

Protected cultivation are promoted for crops such as chilies, beans, and tomatoes and distributed 332 greenhouse sets, 1,553 sets of drip and sprinkler irrigation systems, and 419 rolls of mulching plastic to farmers on a cost-sharing basis

Table 4. Supply of fruits and vegetables to Gyalsung Academy

Academy	Fruits (MT)	Vegetables (MT)	Grand Total
Gyalposhing	5.4	30.5	35.9
Jamtsholing	8.4	57.5	65.9
Khotokha	13.7	64.4	78.1
Pemathang	10.1	64.4	74.5
Grand Total	37.6	216.8	254.4



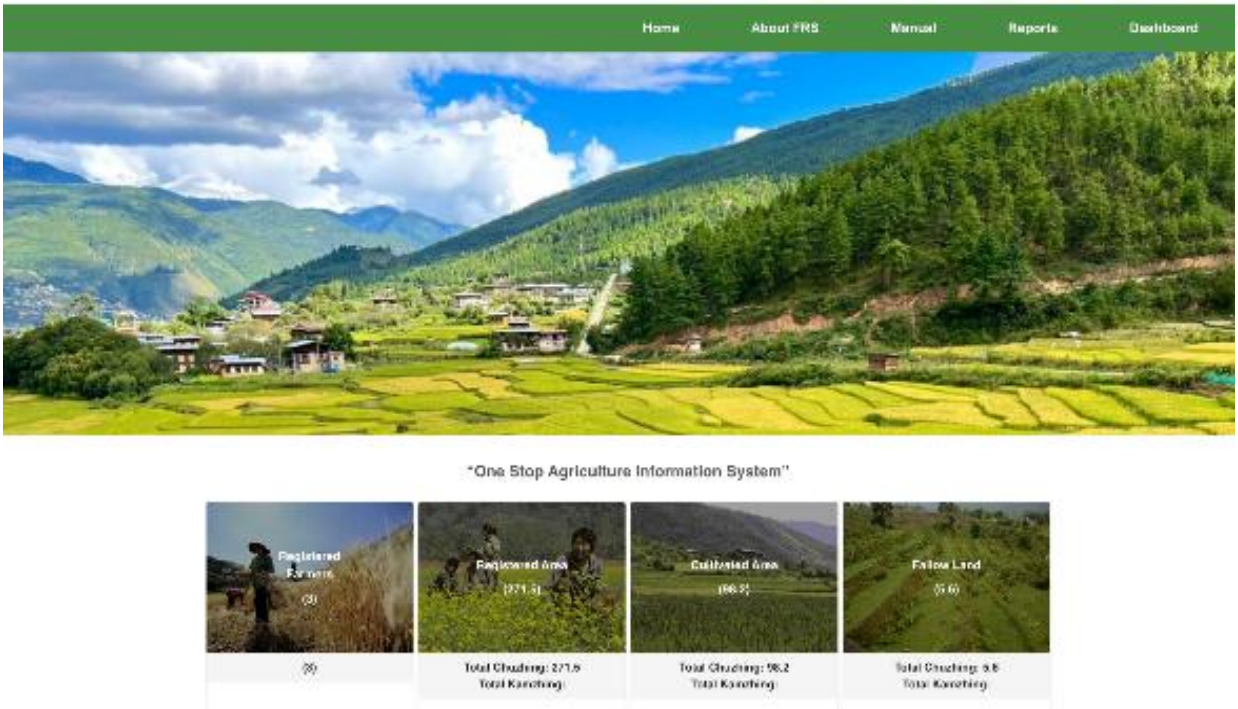
Farmer Registration System (FRS)-A Foundational Step towards Data-Driven Agricultural Transformation

The discrepancies between the data published through the IALC and the administrative data maintained by the LGs had been persistent. To address this issue, the Department, with funding support from the EU-TAAS, launched the **Farmers' Registration System** (FRS) - a game-changing digital platform that brings every Bhutanese farmer into one national system.

For the first time, Bhutan's farmers will be officially registered with detailed information on landholding, crop production, farm machinery, and support services. The FRS is the Single Source of Truth (SSOT) for the agriculture sector ensuring accurate, real-time data to inform smarter policies, targeted support, and better services for farmers. In addition, the system targets to map the irrigation and chain-link fencing schemes with geo-codes.

This system is fully integrated with key national databases, including the National Land Commission (NLC) and the Department of Civil Registration and Census (DCRC), and aligned with the National Digital Identity (NDI) framework.

After a successful pilot in Samtse and Norbugang Gewogs in April 2025, the FRS is now rollout nationwide and will be completed by September 2025 marking a historic step towards modern, data-driven agriculture. Moving forward, the department will provide services based on this system.



Dashboard of Farmer Registration System

Good Agricultural Practice (GAP)

Following the outcome of the Joint Trade Committee meetings between the Royal Government of Bhutan and the Government of the Kingdom of Thailand, Bhutan can now export fresh apples, potatoes, and oranges to Thailand, subject to the completion of a pest risk analysis and compliance with Good Agricultural Practices (GAP) standards.

However, many growers are still unaware of the certification requirements and farm management practices under GAP. Therefore, the Department of Agriculture organized comprehensive training sessions on GlobalGAP and BhutanGAP standards, facilitated by international experts. A total of 30 officials from the Department of Agriculture, Dzongkhag Agriculture Sectors, research centers, central programs, and the Bhutan Food and Drug Authority (BFDA) participated in the program.

Subsequently, the Department trained 104 apple growers in Thimphu and Paro from 17-22 March, 2025 aimed at enhancing their understanding of GAP principles and sustainable farm management practices.

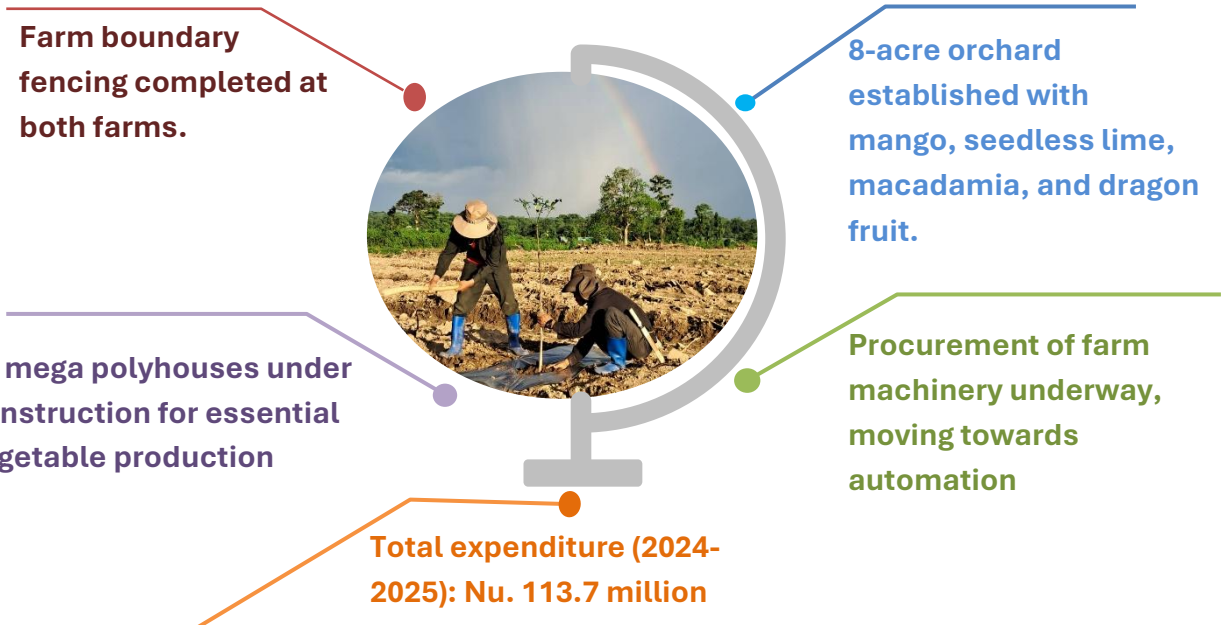
As a result of the training, **45 farmers were registered for GAP certification** with the BFDA. These registered farmers are now receiving continued technical support, particularly in areas of **record keeping** and **pest management** in line with prescribed BhutanGAP standards.

Chirub and OAP farms

Sustainability has long been a challenge for collective farming models in Bhutan, including past initiatives like the Land User Certificate (LUC) program and cooperative farming. But a new chapter is being written, one that blends ***innovation***, ***livelihood creation***, and ***social reintegration***.

Under this initiative, the Department of Agriculture (DoA) and Desuung Headquarters are developing mega farms called **Chirub Farms** at Pemathang (60.15 acres) and Samrang (39.39 acres). These farms are designed to empower local Desuups and youth, offering them skills, income, and a pathway to sustainable farming. The Department leads the farm development and technical support, after which management will transition to Desuung HQ to engage local Desuups. The long-term goal is to enable them to independently operate the farms as self-sustaining, community-driven businesses.

Key achievements as of June, 2025



These foundational milestones mark significant progress toward developing resilient, desuup-led farming models under the Chirub initiative.

Simultaneously, the first-of-its-kind, **Yarjugang Open-Air Prisoners (OAP) Farm,** is being established in collaboration with the **Royal Bhutan Police, and The PEMA Secretariat**. While the commercial farm development is taken up by the department, The Pema Secretariat is funding the reintegration facilities. The ARDC-Bajo and Dzongkhag Administration, Wangdue Phodrang are engaged in the farm development in around 300 acres of land. About 300 open-air prisoners are gaining valuable farming skills, rebuilding their lives, reintegrating them into society as productive, self-reliant citizens.

Major achievements of FY 2024-2026

Land development (22 acres)

Chain link fencing: 7 km

Beyond production goals, the farms will function as training hubs for value chain development in horticulture, offering hands-on training to farmers across the country, thereby reinforcing Bhutan's path to self-reliance, skills development, and inclusive socio-economic growth. This initiative marks a significant milestone in inter-agency collaboration for inclusive socio-economic development.

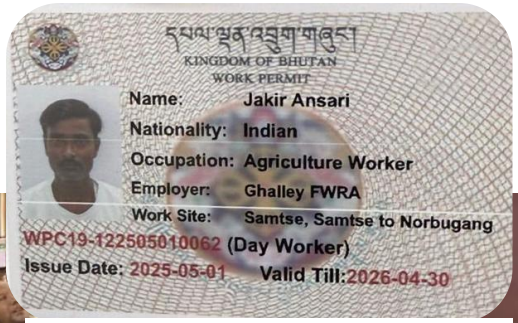
The total investment for the three farms stands at **Nu. 427.01 million**, fully funded through the **Government of India's PTA** support. Of this, **Nu. 242.21 million** is secured for the **Chirup farms** and Nu. **184.8 million** for the **Yarjugang OAP farm**, respectively. The farms will be completed by June 2026.

Foreign Worker Engagement in Agriculture

To combat growing labor shortages in agriculture leading to **fallow lands, high production costs, and declining youth interest**, the Cabinet has approved the piloting of **Foreign Worker Engagement in Agriculture on a Sandbox model**. Following government approval, mass consultations were held, receiving strong support from local farmers. The SoP for piloting was developed by the Ministry in collaboration with the MoICE.

The department has initiated the pilot engagement of foreign workers in Samtse Gewog in May 2025. **126 foreign workers** were formally engaged by **13 farmers** in Samtse, through a Foreign Worker Recruitment Agent. Numbers are expected to grow significantly during the paddy transplanting season (July). Recruitment is strictly regulated, done through licensed agents under the Ministry of Industry, Commerce, and Employment, ensuring full compliance with health checks, insurance, and work permits.

The program in Langchenphu is set to commence in late June 2025, with future expansion dependent on the pilot's success. Lessons learnt from this Sandbox model implementation will determine the



Card of Foreign Agriculture Worker

SanamJabchor app downloaded into farmers' mobile

Weather and Climate Services in Agriculture

In a major step toward climate-resilient agriculture, the **Department of Agriculture** and **National Centre for Hydrology and Meteorology** successfully rolled out the **Agromet Decision Support System** (ADSS) to deliver timely weather and climate information to farmers. In the 13th FYP, the Department aims to provide weather-based crop advisory services weekly during the critical growth stages of the crops.

In FY 2024–25, over **140 Agromet Advisory Bulletins** were issued, helping farmers make informed decisions.

The program also trained 22 agriculture officers in advanced agrometeorology and engaged 540 stakeholders, including 264 farmers, through nationwide awareness programs.

A key highlight was the development of five crop suitability maps to support better planning. Backed by the **World Bank** and **Adaptation Fund**, this marks a major milestone in strengthening Bhutan's agricultural resilience against climate risks.

Urban and Peri Urban Farming

The Peri-urban and Urban Farming (PUUF) concept was initiated during the COVID-19 pandemic (2020–2021) to engage and provide livelihoods for unemployed and laid-off youths and women from the tourism and hospitality sectors residing in urban areas and their peripheries. The initiative also aimed to increase access to nutritious food and diversify income opportunities.

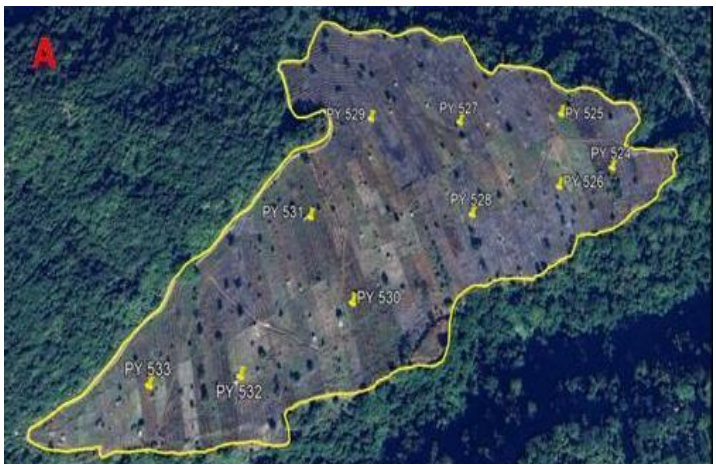
Besides contributing to food security, urban and peri-urban agriculture is an essential component promoting green urban spaces and improving environmental sustainability.

A total of **191 acres** of fallow lands in five dzongkhags have been converted to gardening with production of **112 MT** of vegetables such as asparagus, mushroom and strawberry by **344 registered youths**. This project was a spillover from the 12 FYP and ended successfully by December 2024. It was supported by the FAO.

Land Conversion

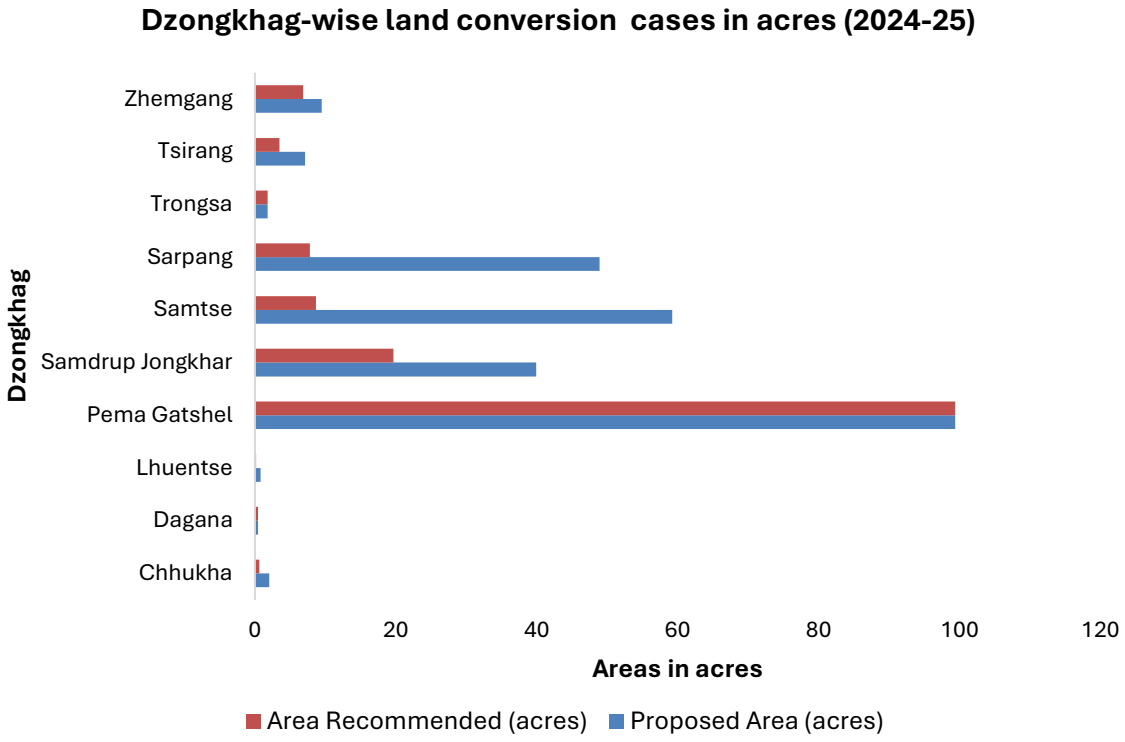
One of the important public services delivered by the Department of Agriculture is the final field verification of the land conversion applications received from 20 Dzongkhags in accordance with the section 166 of the Land Act of Bhutan, 2007

In FY 2024-2025, a total of **294 cases** of **Chhuzhing** to **Khamzhing from** across 10 Dzongkhags were verified by the Field Investigation Team comprising members from the National Soil Services Centre and the Department of Infrastructure Development, Ministry of Infrastructure and Transport.



Land conversion area of Bafudhar, Pemagatshel

Based on detailed technical assessments of soil conditions, irrigation availability, and surrounding land use, **171 cases** (**148.87 acres)**, were recommended for conversion. The major highlight of this service in this reporting period was at Bafudhar village, Pemagatshel, covering about 100 acres belonging to over 107 households. While the registered category of land is Chhuzhing, the soil conditions were not suitable for paddy cultivation and therefore, recommended for conversion to Kamzhing or Khimsa.



Chhuzhing Optimization & Rationalization Exercise

The Chhuzhing Optimization/Rationalization Exercise was conducted based on the Royal Command issued on June 21, 2024. A high-level Committee chaired by the Secretary of NLCS was formed. The DoA, in collaboration with the NLCS, the Department of Culture and Dzongkha Development, and the Department of Human Settlement carried out the Chhuzhing optimization/rationalization exercise across the four-capital region (Thimphu, Paro, Punakha, and Wangduephodrang). This was aimed to address growing concerns related to Chhuzhing use and conservation.

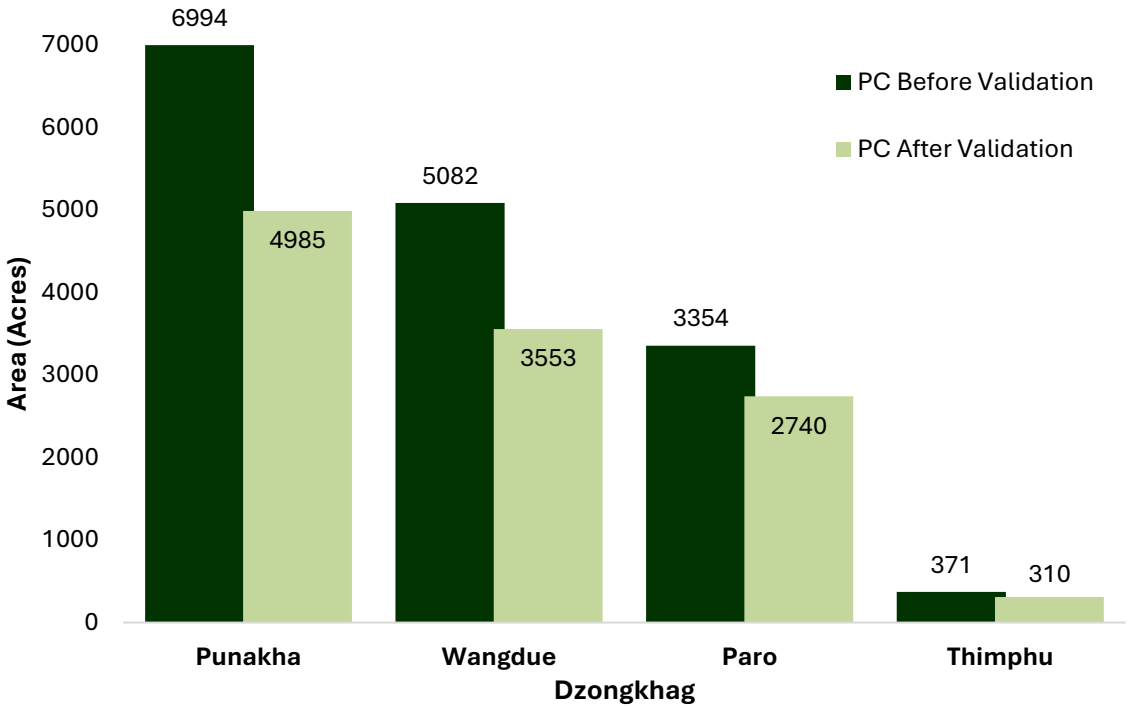
CORE's Objective

1. Protect and promote the sustainable use of Chhuzhing (wetlands) for food security.
2. Allow conversion of unproductive wetlands for alternative uses in a controlled manner.
3. Preserve Bhutan's cultural landscape by creating construction-free buffer zones around heritage sites and settlements.

Given the national importance of addressing Chhuzhing conversion issues, the four National Capital Region Dzongkhags (**NCRD**); **Paro, Thimphu, Punakha, and Wangdue Phodrang** were prioritized.

Chhuzhing was classified into two categories: **Protected Chhuzhing** (PC) wetlands below 2500 masl with at least 10 acres of contiguous plots connected by five-meter buffers or man-made features like roads and irrigation channels and **Regulated Chhuzhing** (RC) for all others not meeting PC criteria.

Graph showing acreage of PC across the 4NCRs, before and after, ground truthing



Bhutan Innovation Forum

The Department of Agriculture participated in the Bhutan Innovation Forum held from 1–3 October 2024 at Dungkhar Dzong, Pangbisa, Paro, and showcased transformation of Bhutan's agriculture sector.

Showcasing traditional farming with tools (wooden ploughs, yokes, stone grinder, oil expeller, rice de-husker) and indigenous crops (Rice, Maize, Pulses, native medicinal herbs) and organic inputs

Modern Agriculture with technological advancements including grafted fruit plants with drip irrigation, hydroponic systems with automated environment control, live mushroom cultivation display under a protective structure

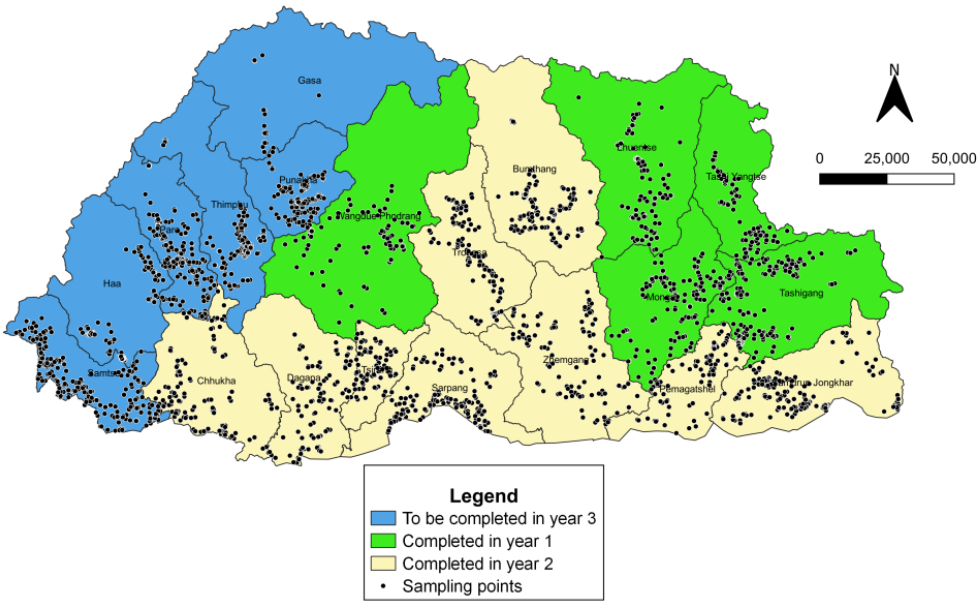
Land development is crucial to crop cultivation. In 13 FYP the MoAL targets to bring 15,220 acres of land under sustainable land management/land development. In this reporting period, a total of **7,472 acres** of agricultural land was brought under **Sustainable Land Management (SLM) / Agriculture Land Development (ALD)** interventions (Table 5). These included bench terracing, terrace consolidation, orchard terracing, surface stone removal, orchard establishment, check dam construction, stone bunds construction and hedgerow establishment.

Table 5. SLM/ALD carried out during 2024-2025 FY

Sl. No.	ALD/SLM	Area (Acre)
1	Dry land terracing, terrace consolidation, orchard terracing & surface stone removal	1255.44
2	Fallow land reversion	113.79
A	**Total area under ALD**	**1,369.23**
3	Hedgerows establishment	718.80
4	Contour stone bund construction	222.27
5	Check dam construction	4,039.40
6	Orchard establishment & improvement	1,032.87
7	Landslide stabilization	38.80
8	Water source protection	0.40
B	**Total area under SLM**	**6,102.54**
	Total area brought under ALD & SLM	**7,471.77**

Reconnaissance Soil Survey

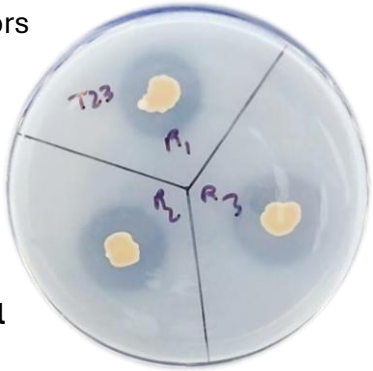
A **reconnaissance soil survey** was carried out in **Bumthang, Chhukha, Dagana, Pemagatshel, Trongsa, Tsirang, Samdrup Jongkhar, Sarpang & Zhemgang** Dzongkhags, collecting 517 samples (**141 profiles & 376 auger points**).



Map showing status of soil survey in Bhutan till date for Soil+ AFACI Project

Isolation of Phosphate Solubilizing Bacteria (PSB)

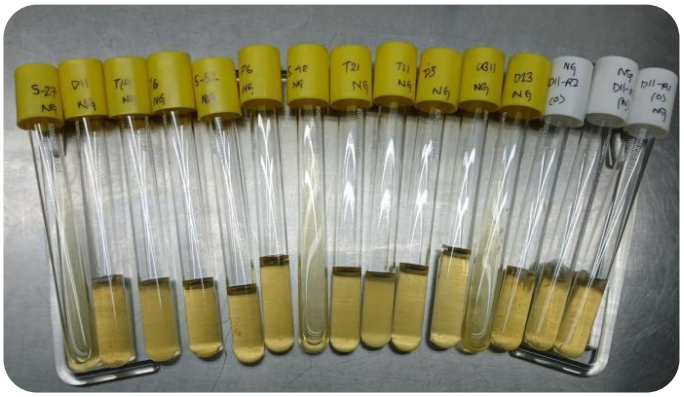
Phosphorus is a key nutrient for healthy plants. Despite the use of natural or synthetic inputs, crops often face potassium (K) deficiency due to factors such as soil fixation, leaching, slow nutrient release from organics, and nutrient imbalances that limit K availability for plant uptake.



Phosphorus-solubilizing bacteria (PSB) offer a **sustainable, eco-friendly solution** to enhance **phosphorus availability** in **organic agriculture** without compromising **soil or ecosystem health.**

The National Soil Service Centre (NSSC) isolated 16 beneficial bacteria from the 32 soil samples collected from Yusipang, Dagana, and Tsirang using high-tech tools like MALDI-TOF (Matrix-Assisted Laser Desorption/Ionization Time-of-Flight) mass spectrometry, a widely used method for bacterial identification.

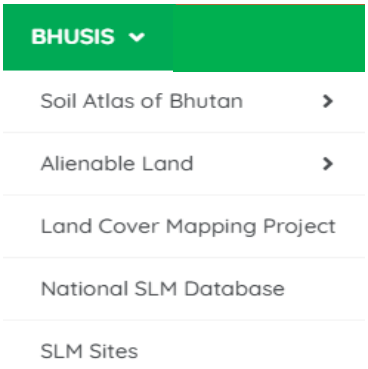
The 16 bacteria species; **nature's own soil boosters** identified, belongs to eight different bacterial species: *Burkholderia cenocepacia, Burkholderia multivorans, Burkholderia vietnamiensis, Pseudomonas fluorescens, Burkholderia cepacia, Acinetobacter calcoaceticus, Klebsiella pneumoniae* and *Pseudomonas putida*.



In subsequent years, biochemical characterization and antimicrobial sensitivity test of the bacterial isolates will be undertaken. Additionally, efficacy trials will be conducted to quantitatively assess their phosphate solubilization potential. Isolates demonstrating promising results in these assays will be subjected to controlled environment (indoor experiment) experiments to evaluate plant growth promotion effects. Furthermore, molecular identification will be carried out to accurately characterize the isolates at the species level.

Development of Bhutan Soil Information System (BhuSIS)

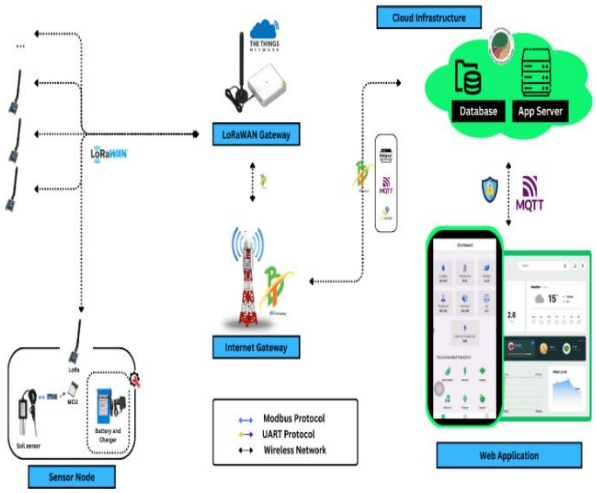
NSSC initiated the development of **Bhutan Soil Information System (BhuSIS)** with funding support from AFACI project at Nu. 1.262 million to address the reliable soil data gap. The system will comprise of **National Soil Database** and **Information Management System** including **app for soil data collection** in the field to enhance informed decision making related to agriculture and environment.



SMART Soil Analysis and Nutrient Management

Further, a **smart soil sensor system** was developed to **transform soil health management and agricultural practices** by offering **real-time soil data** in collaboration with **Druk Holding and Investments** (DHI) through its **InnoTech Department's Research and Innovation Venture Excellence** (DRIVE) Centre. It will help **farmers** and **researchers** to **make informed decision** on **use of fertilizer, irrigation and crop selection**. The total cost of the project amounts to approximately Nu. 2 million.

The NSSC enhanced its capacity to improve its soil **analytical services** by NSSC procuring a new set of state-of-the-art **Segmented Flow Analyzer worth Nu. 7.4 million**. It has been funded by the EU project entitled *"Promoting inclusive, sustainable and resilient Agri-Food Systems in Bhutan"*



Agriculture Input Support

1. Seeds supplied by National Seed Centre

Seed potato:
106 MT

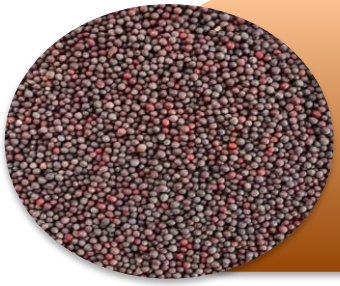
Maize
49 MT

Paddy
18 MT

Wheat
12 MT

Vegetable seeds
5 MT

Organic seeds
4 MT
Beans, quinoa &
Buckwheat

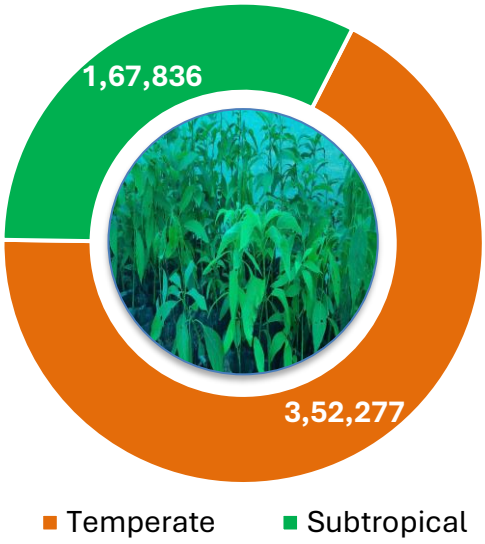


Oilseeds(mustard)
2 MT

2. Seedlings supplied by National Seed Centre

A total of 520,113 fruit seedlings were distributed by NSC across 20 dzongkhags for the 4th phase of the MFTP

Quantity of seedlings supplied (No.)

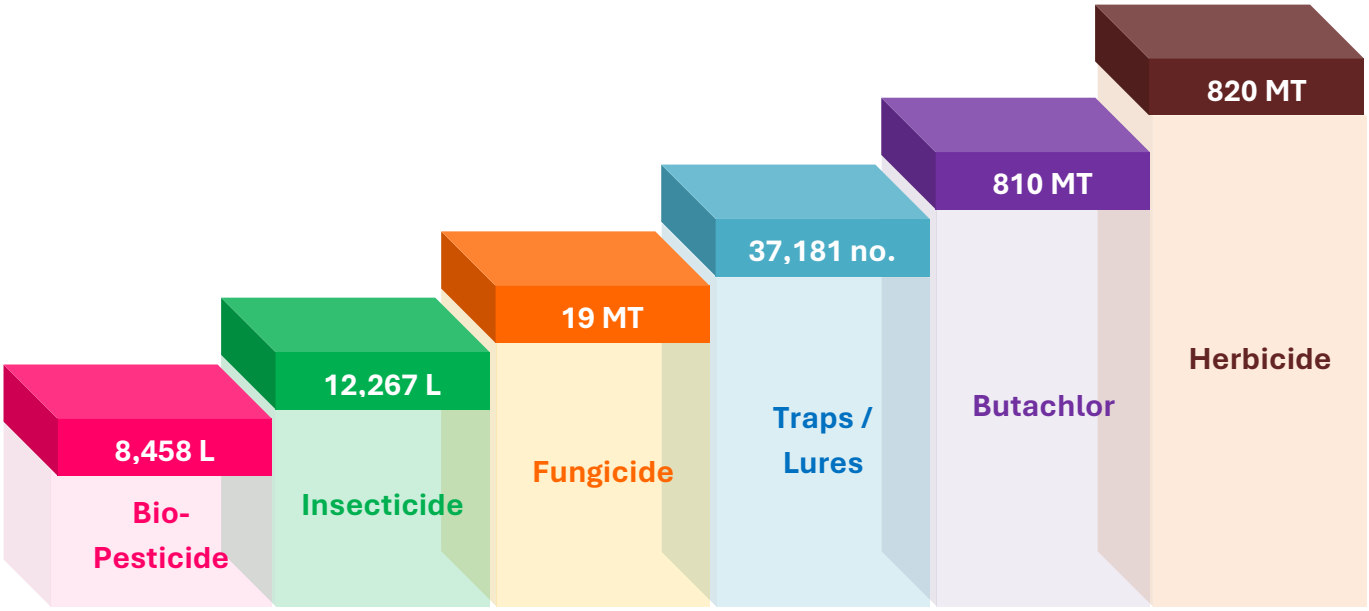


3. Supply of fertilizers by National Seed Centre

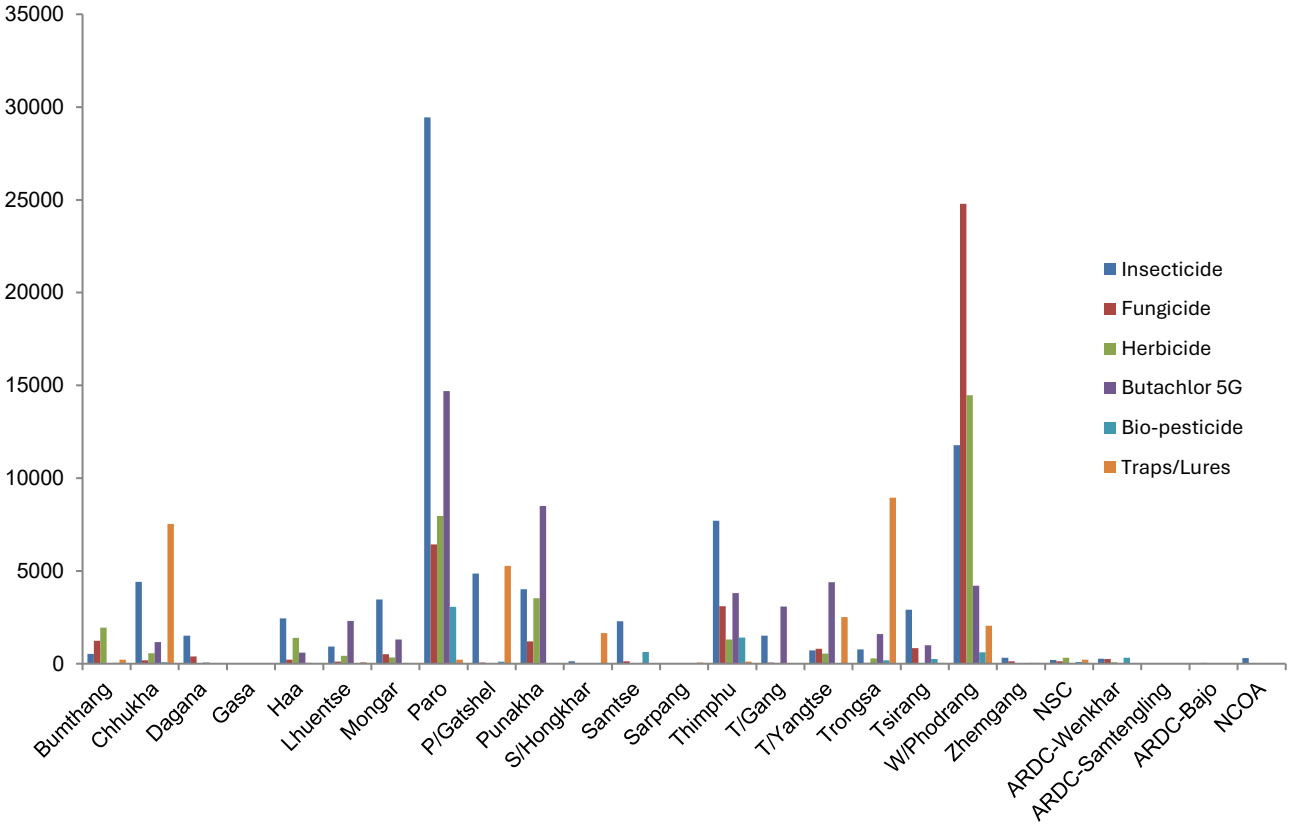
A total of 2,750 MT fertilizers supplied

- Urea: 1000MT
- Single Super Phosphate :380 MT
- NPK: 1500 MT
- Muriate of Potash: 7 MT
- Borax & Hydroponic nutrients: 0.4 MT

4. Supply of Plant Protection Chemicals by National Plant Protection Centre



5. Dzongkhag wise Plant Protection Chemicals Distribution by National Plant Protection Centre



6. Supply of mushroom spawns by National Mushroom Centre (NMC)

Shiitake

13,200 bottles / bags

Oyster

90,700 bottles

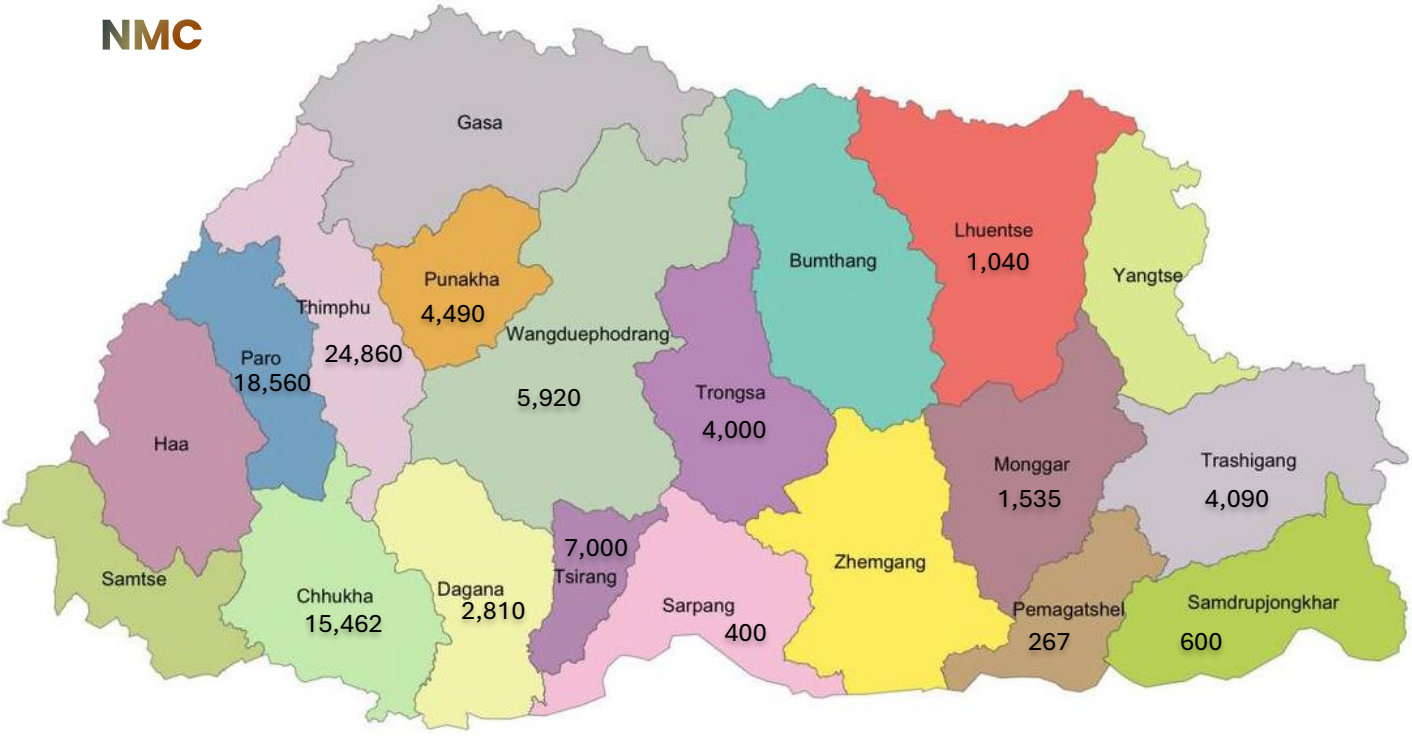
Nameko

1,700 bottles / bags

Ganoderma

450 bottles

6.Wood billets inoculated with shiitake mycelium by NMC



Farm Mechanization

The agricultural sector is increasingly challenged by labor shortages resulting from rural-to-urban migration and an aging farming population. To address this issue, the Department has prioritized farm mechanization as a key intervention under the 13th Five Year Plan. In the current fiscal year, a total of 3,067 acres have been brought under mechanized cultivation, benefiting 1,689 households (Table 6).

Table 6. Details of farm mechanization

Region	Household No	Area in Acre	No. of Days
Farm machinery			
RFMCL Bajo	631.00	935.01	1,067.50
RFMCL Bumthang	179.00	142.15	262.00
RFMCL Khangma	5.00	844.01	112.68
RFMCL Paro	727.00	900.80	7,855.00
RFMCL Samtenling	110.00	114.70	224.63
Total	**1,652.00**	**2,936.67**	**9,521.80**
Heavy Vehicle & Machinery			
RFMCL Bajo	26.00	77.22	231.00
RFMCL Bumthang		44.80	332.11
RFMCL Paro	7.00	3.00	125.50
RFMCL Samtenling	4.00	5.00	191.75
Total	**37.00**	**130.02**	**958.34**
Grand total	**1689**	**3066.69**	**10,402**

Major Research Activities and Innovations

Release of crop varieties and technologies

By the end of 13 FYP, the DoA has targeted to develop 50 new technologies (including crop varieties). In this reporting period, a total of **18 crop varieties** that demonstrated **superior yield performance**, enhanced **resistance to pests and** diseases, and growers' preferences were released, exceeding the annual target of 10 technologies.

Purple-flesh sweet potato (Murasaki)

One black rice variety

One blight-tolerant tomato variety (ATVO-1712)

One passion fruit variety suitable for processing (Summer queen)

Oyster Mushroom

5 varieties of oyster mushroom released

Wine grape

Nine wine grape varieties released in collaboration with Bhutan Wine Pvt. Ltd.

Bhutanese Journal of Agriculture, Vol. 8, Issue 1

The BJA, ever since its launch in the year 2017 published 7 volumes. For the 8th volume this year, a total of 14 papers were received from researchers across the country. The manuscripts were put under a rigorous peer review process and a collection of eight peer-

reviewed research articles that address diverse challenges and advancements in Bhutan's agriculture sector were published online by June 2025.

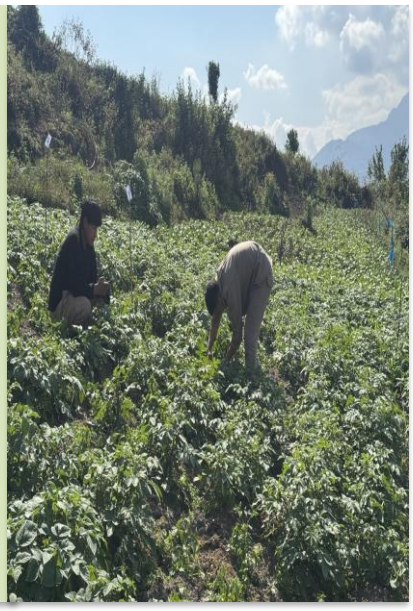
These articles shed light on key challenges and innovations in Bhutanese agriculture. Rising maximum temperatures are linked to declining maize yields in eastern Bhutan, though agronomic practices also play a major role. Other research highlights improved chili shelf-life through better storage, adoption of rice varieties in Sarpang, and the impact of ICT in western Bhutan's extension services. Technological advances, like turmeric drying and IoT-based walnut grafting, point to the growing need for climate-smart practices and post-harvest innovations to boost productivity and resilience.

For access to the full article
Scan the QR Code
Or visit
https://www.bja.gov.bt /

Plant Protection Services

1. Detection of the devastating Potato Brown Rot

Caused by *Ralstonia solanacearum*
Spreads through: Infected seeds, soil, water & contaminated tools
First confirmed: Trashigang (2024), likely present since 2014. It can cause substantial yield loss. It was also detected in several other Dzongkhags due to low awareness, informal seed exchange and rising temperatures (climate change)
Initiatives of NPPC: Awareness creation at both policy and farmers' level (151 farmers); on-farm trial at Kanglung to study the efficacy of potassium phosphite on potato brown rot
Recommended control: Potassium phosphite (2g/L) can reduce disease severity and spread



2. Conserted effort in control of Citrus Greening Disease or Huanglongbing (HLB)

Caused by *Candidatus liberibacter* asiaticus (CLas)
HLB survey was conducted to establish a repository of Clas-positive samples for future assay calibration and validation.
Samples were collected from Tsirang and Wangdue Phodrang. The samples were analyzed using **real-time PCR** with **CLas-specific** primers and probes.
The positive samples will be used as positive controls which are essential for maintaining diagnostic accuracy as existing controls degrade over time.

3. NPPC confirms a natural enemy of Fall Armyworm (FAW)

FAW is a **major threat** to **maize** in Bhutan

Parasitoid is an effective biocontrol agent

NPPC detected tiny natural allies **– two parasitoid taxa** were identified based on morphological characteristics**: *Cotesia* spp.** and ***Charops* spp.**

The results will inform the development of an Integrated Pest Management (IPM) strategy, reducing dependence on chemical pesticides

Future plans: Examine seasonal trends, and conduct field-based parasitism assessments. Additionally, molecular identification of Cotesia and Charops species would refine ecological understanding and improve targeting in biocontrol programs.

Adult parasitoids emerged from reared FAW larvae: (left) Cotesia spp. and (right) Charops spp., collected from maize fields in Bhutan

4. Monitoring of hopper in Paddy

Rice planthoppers and **leafhoppers** are major threats to paddy production

A study on population dynamics was carried out in key **rice areas (ARDC Bajo, Wokuna & Sirigang)** to understand how hopper populations vary over time and across sites, providing insights into their temporal patterns and potential impact on rice cultivation.

The population of Green Leafhopper, Brown Planthopper, Zigzag Leafhopper, and White-Backed Planthopper peaked during the reproductive stage of the rice with Green Leafhopper being the most dominant.

These results emphasize the need for timely pest surveillance, particularly during the reproductive stage of the crop, to enable early intervention and minimize potential yield losses.

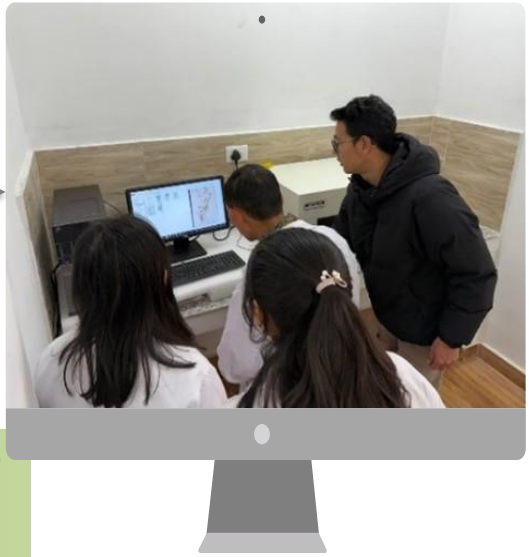
Furthermore, the variation in hopper abundance across sites highlights the importance of integrating site-specific integrated pest management (IPM) strategies that consider both ecological conditions and pest behavior.

Sampling of hoppers using yellow sticky trap at Wokuna, Punakha

Awareness campaign on safe & efficient use of pesticides

As part of the annual initiative to promote safe pesticide use, the National Plant Protection Centre (NPPC), in collaboration with the Bhutan Food and Drug Authority (BFDA) and the Royal Centre for Disease Control (RCDC), conducted pesticide awareness campaigns between August and October 2024. These campaigns were carried out in Gangtey and Phobji Gewogs under Wangduephodrang, Chapcha Gewog in Chhukha, and Katsho Gewog in Haa. A total of 789 farmers were sensitized on the safe handling, storage, and application of pesticides, the associated health and environmental risks, and the importance of regulatory compliance to prevent the illegal import of pesticides. This activity forms part of the Centre's broader effort to ensure sustainable pest management practices across the country.

Weed herbarium digitization



NPPC established **Digital Weed Herbarium** with over **300 weed specimens** archived so far, offering a foundational resource for taxonomy, ecological research, and training.

Biological control innovations

Cabbage White Butterfly (*Pieris brassicae*): Two native larval parasitoids were identified, but low parasitism rates suggest the need for augmentative releases and conservation strategies to improve biocontrol efficacy.

Fall Armyworm (*Spodoptera frugiperda*): Native entomopathogenic fungi (*Metarhizium and Beauveria spp.*) were isolated from infected larvae, supporting the development of locally adapted biopesticides.

Vertebrate Pest Management

- **Portable Electric Fencing (PEF)**:

Monitoring across 33 sites showed significant reduction in crop damage, especially from elephants. Community-led maintenance and reinforcement support is key to long-term success.

- **JICA Technical Cooperation Project**: A new technical cooperation initiative the "***Project for Community-based Human-Wildlife Conflict Management on human-wildlife***" was launched in May, 2025 to blend technical expertise with local engagement, ensuring that communities at the forefront of human-wildlife interactions are equipped with sustainable solutions.

Pest Surveillance and Diagnostics

MARPLE Diagnostics, one of the first of its kind in the world, has been introduced at NPPC for improved diagnosis of wheat rust disease pathotypes applying molecular tools with support from CIMMYT.

NPPC confirmed the presence of yellow and leaf rust diseases of wheat crop across Bhutan through "Sentinel Plots & National Surveillance" initiative support under CYMMIT. Through the study, increasing incidence of Fusarium Head Blight (FHB) has also been observed which could be detrimental to any future commercial wheat production if not managed timely.

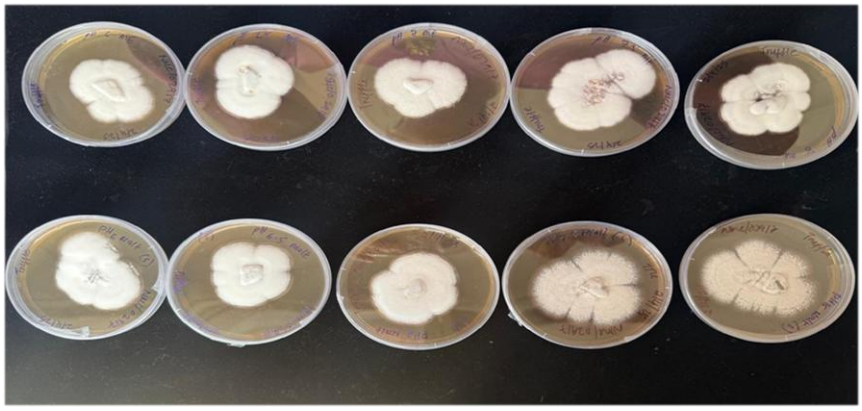
Capacity Building & Awareness: Over 200 extension staff and farmers received hands-on training in wheat disease identification, data collection, and sample handling, strengthening Bhutan's plant protection capacity.

Wild Mushroom Biodiversity Assessment

Geney Gewog: A thorough survey of wild-mushrooms in Genekha, a niche area for mushroom growth was carried out to study the growth habitat and identify the thriving varieties.
Sarpang – A fungal diversity survey was conducted in seven gewogs of the Gelephu Mindfulness City area to assess mushroom resources in potential settlement zones. A total of 122 specimens representing 34 species were recorded.
Danashey, Tsirang– A targeted survey in the subtropical forests of Danashey documented wild mushrooms and their habitats, resulting in the collection of approximately 154 specimens.

Herbarium Specimen Processing
The herbarium conserves voucher specimens essential for documenting fungal biodiversity and supporting taxonomic, ecological, and DNA studies. This year, 206 specimens were processed and recorded in www.bhutanbiodiversity.net with relevant collection details.

Culture, collection and domestication by NMC



Successful Isolation of truffles mushroom

The Centre collected and cultured **mulberry - associated fungal** samples from four regions in Bhutan. Laboratory analysis, confirmed by Zenomiz Biolab Pvt. Ltd. (India), identified the species as ***Tropicoporous linteus***, a **medicinal fungus** widely recognized in traditional medicine across Asia (known as "**sanghuang**" in China, "**meshimakobu**" in Japan, and "**sangwhang**" in Korea).

- Successfully cultured truffles and the culture is used to conduct trials on different pH levels to determine the best pH level for the particular truffle species.

Evaluation of Wild and Exotic Strains of *Hericium erinaceus* (Lion's Mane) on Sawdust Medium

Initiated in January 2025, this trial evaluated three wild/local strains and one exotic (Thai) strain. The first harvest from the Thai strain and a wild strain from Thimphu yielded an average of 145g per bag. Fruiting has begun for the Punakha strain, while one wild strain has yet to fruit despite full mycelial colonization. Further trials are planned to generate comprehensive

National Mushroom Festival 2024

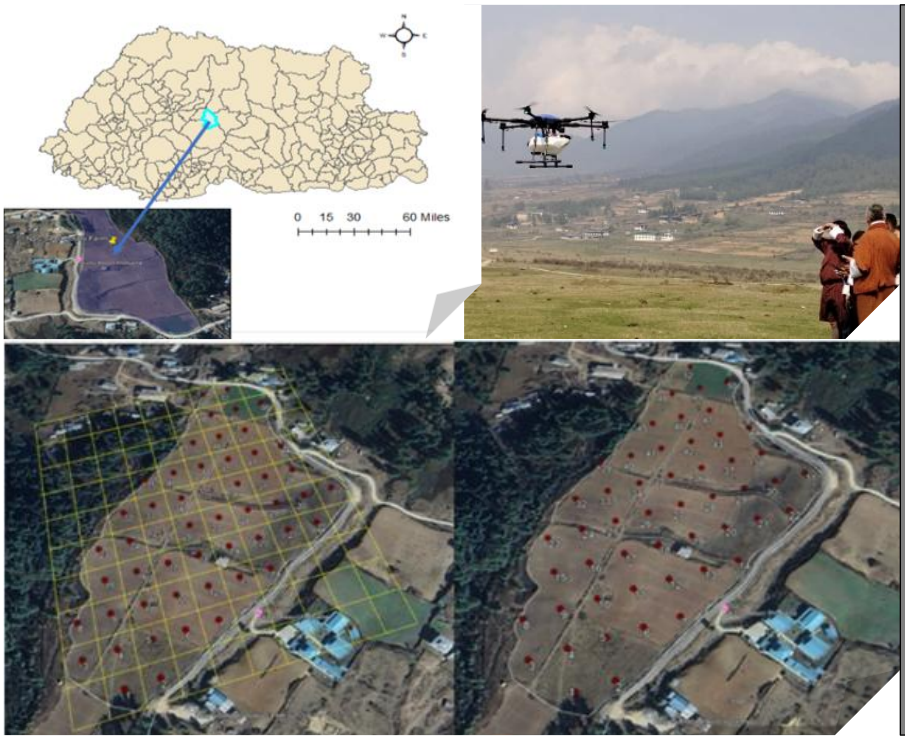
The Centre co-organized the Annual Mushroom Festival held in Geney Gewog, Thimphu (15-16 August) and Ura, Bumthang (23–24 August) to sensitize on wild mushroom specimens, mushroom identification, mushroom poisoning, and displayed informative posters on fungal biodiversity and ecology.

Mushroom and the Desuung Skilling Program

A three-month long training was conducted for 15 Desuups on the cultivation of shiitake, oyster, nameko, ganoderma, needle and Hericium mushrooms

The NMC developed the General Standard for Edible Fungi and Fungus Products and was approved by the **Food and Agriculture Technical Committee (TC 02)** and endorsed by the **Bhutan Standards Bureau** on May 16, 2025. The standard applies to all edible fungi, fresh or processed, approved for sale, excluding fresh matsutake, dried *Ophiocordyceps sinensis*, and canned *Agaricus* mushrooms. It covers guidelines on cultivation, harvesting, processing, and packaging to prevent risks like contamination and spoilage.

AMTC Advances in Drone Use in Agriculture



AMTC, in collaboration with GovTech, NSSC, and NSC, piloted drone-based applications for crop monitoring, pest management, and precision spraying. A proof-of-concept using multispectral imaging in potato fields was successfully completed. Bhutan's first UAS Guidelines for Precision Agriculture,

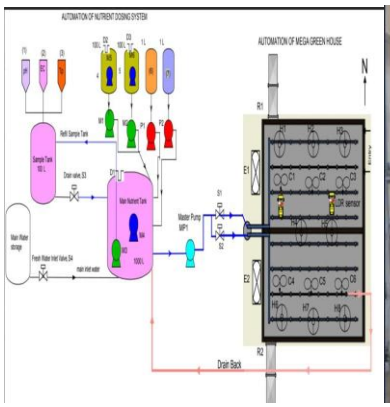
AI-Enabled Animal Repellent System

AMTC, in collaboration with CST, developed an **AI and IoT-based animal repellent**, tested successfully on a cow. The system builds on existing timer-based models of AMTC, with ongoing work to improve detection accuracy and camera efficiency.

Enhancing Automation system

Aimed at enhancing year-round cultivation and resource efficiency, the AMTC has developed a **smart automation system** for **Mega Greenhouse and hydroponic production.** The system integrates **environmental** and **nutrient sensors** to **automatically manage temperature, humidity, water levels, lighting, and nutrient delivery** offering a **scalable** and **cost-effective** solution for modern, climate-resilient agriculture.


Mega Greenhouses & Integrated Automation system at Chimipang



Home Assistant Based Automation system

Farm machineries and Equipment

Technology Developed: Small-scale, single-phase corn sheller by AMTC.
Purpose: Designed for household-level use to reduce labor requirements and save time.
Status of Testing: Prototype successfully tested under laboratory conditions.
Current Stage: Under refinement to improve performance and reliability.
Next Step: To be proposed to TRC for review and release.

Technology Developed: Small-scale grain dryer by AMTC.
Purpose: Designed to boost milling recovery of paddy by reducing post-harvest losses.
Status of Testing: Successfully tested for multi-grain application.
Current Stage: Under refinement to ensure consistent performance at 50°C drying temperature.
Next Step: To be finalized for wider application and potential release.

Technology Developed: Locally fabricated compost soil sieve, developed by AMTC in collaboration with NCOA.
Purpose: Designed to promote organic farming and reduce production costs.
Status of Testing: Developed and successfully tested for functionality.
Current Stage: Ready for refinement and potential upscaling.
Next Step: To be promoted for adoption among farmers

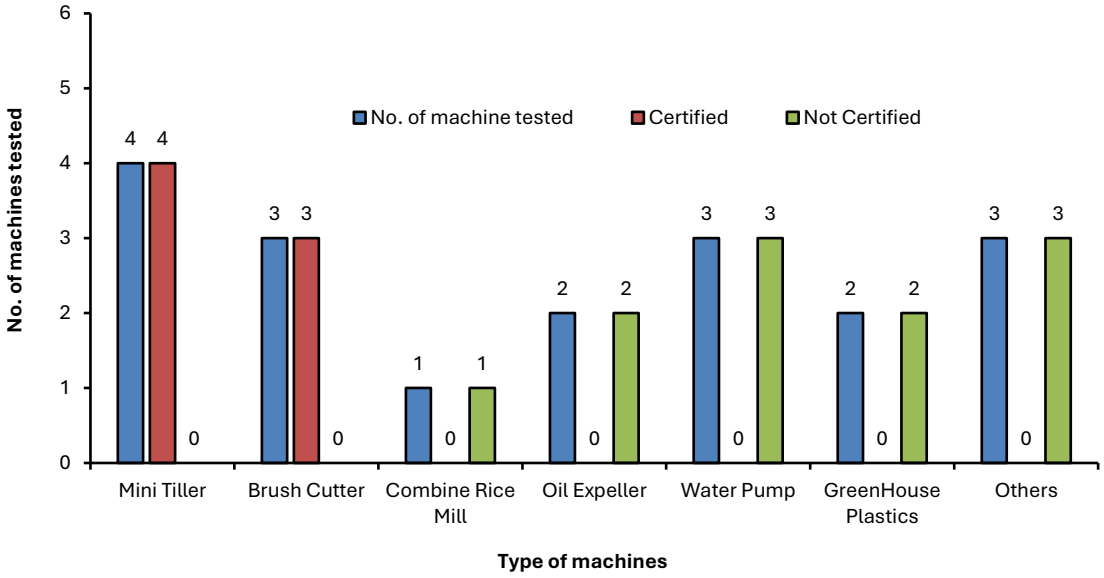
Standardization and Certification of Farm Machinery

During FY 2024-2025, AMTC in collaboration with the Bhutan Standard Bureau (BSB) and as member of TC-08, formulated and harmonized farm machinery standards and test codes to ensure the safety, quality, and efficiency of farm machinery in the country in the (see table 7).

Table 7. Standardization of farm machinery

SN	Standards/Test codes	Level	Status	Remarks
1	Single Phase Electric Motor	National Level	Deliberated and endorsed at AMC-TC and BSB TC-03 meeting.	Wide-circulation, Adopted and Endorsed at BSB, TC-03
2	Three phase Electric Motor	National Level	Deliberated and endorsed at AMTC-TC	Deliberated at BSB TC-03, and under wide circulation
3	Paddy Transplanter	National Level	Deliberated and endorsed at AMTC-TC Level.	Deliberated at BSB TC-08 committee and under wide circulation
4	Combine Harvester	National Level	Deliberated and endorsed at AMTC-TC Level	Will be submitted to BSB TC-08 for deliberation and endorsement

AMTC also tested and certified 18 numbers of farm machineries to ensure safety and suitability, using lab, field, and paper-based evaluations.



Graph showing number of machines Certified against test conducted

Hot callusing technology for improved walnut grafting

Walnut grafting under open field conditions in Bhutan is constrained by low success rates (20–30%) due to suboptimal temperatures and humidity during the grafting season (February–March), when ambient temperatures typically remain below 15°C. Optimal graft union formation requires a temperature of 27°C and relative humidity of 90%, conditions difficult to maintain in open environments. To address this limitation, a study was undertaken at ARDC Wengkhar and Drepong in Mongar Dzongkhag to develop and evaluate a hot callusing system integrated with Internet of Things (IoT) technology for environmental control and monitoring. The study began with an on-station trial involving 180 walnut seedlings, which achieved an 80% graft success rate. Following this, the system was deployed in on-farm conditions with 1,170 seedlings, resulting in a 76% success rate. Investment analysis indicated a positive Net Present Value (NPV) and a high Internal Rate of Return (IRR) with 40 %, confirming the technical and economic viability of the hot callusing technology for enhancing walnut propagation and supporting enterprise development.

Breeding Chili and Tomato

A **local cherry tomato**, though **tolerant** to **open field conditions**, produced small, unmarketable fruits. To improve its traits, a successful **F1 cross** with **Yusi Lambenda** was carried out at NCOA, with backcrossing planned for the coming year.

Similarly, a chili breeding between Sha Ema and **AVPP 1111 was initiated**. The objective of the chili hybridization is to; Develop F1 chili with chili blight resistance, better yield performance and acceptable taste. F1 seeds extracted will be regrown to ensure segregation of characteristics and desirable characteristics will be identified from the F2 lot for disease resistance.

Evaluation of climate resilient potato clones

As climate change brings new challenges for farmers, **five climate-resilient potato clones** from the **International Potato Center** (CIP) was evaluated in Yusipang in a plot size of 2.8 m^2. These "**climate-smart**" potatoes were chosen for their **heat, drought, and disease tolerance**.

The clone, CIP 309028.56 showed impressive results yielding **26.4 MT/acre** (potential yield), nearly matching the local favorite, Yusi Maap (26.5 MT/ acre). This promising performance suggests it could play a key role in helping farmers maintain stable potato harvests even as weather patterns shift.

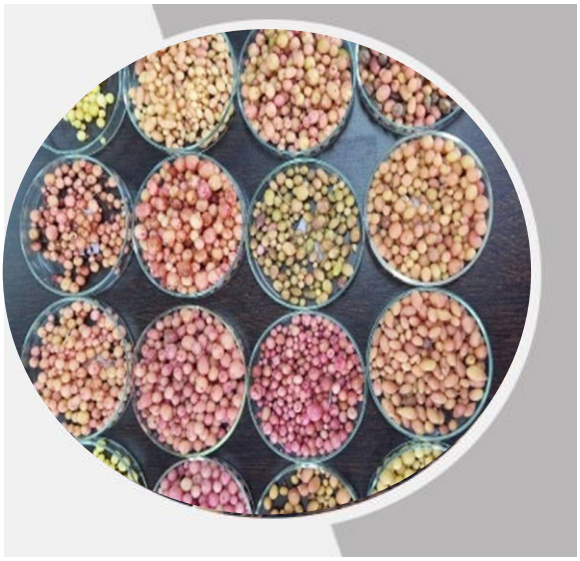
With further testing, CIP 309028.56 could become a climate-resilient variety for Bhutan's future food security.

Table 8. Details of numbers of marketable tuber, non-marketable per plot (2.8 m^2) and total yield (Mt/ac) of climatic resilient clones under organic condition

Clones	No. of marketable tubers	No. of non-marketable tubers	Yield Mt/acre
302476.19	61	13	11.5
397196.3	60	17	15.5
309077.116	85	8	18.2
304357.31	57	69	9.4
309028.56	**82**	**20**	**26.4**
Yusi Maap	96	19	26.5

Initiation of Pre-Basic Seed production of released (potato) and micro-tuber production through tissue culture for seed replacement

To support farmers with **healthier** and **high-yielding** seed potato, the NCOA is multiplying clean planting materials of **Desiree, Khangma Kewa Kaap, Yusi Maap, and Yusi Maap 2**, along with 12 new clones from the International Potato Center (CIP).



In 2024, **micro-tubers** were planted in NCOA greenhouses for mini-tuber production. Certified seeds of the four varieties will be ready by 2029, while the CIP clones are under evaluation to select a promising new variety.

To speed up production, **Apical Rooted Cutting (ARC) technology** is also being tested under field and protected conditions.

Evaluation of high-yielding hybrid maize varieties across diverse agro-ecological zones (NCT)

Maize production has declined in recent years due to multiple factors, one of which is lack of high-yielding varieties. To support this, three high-yielding maize varieties — **Xellano Hishell, Xellano 900M Gold and DEKALB 9144** in collaboration with Reva Seeds— were introduced and evaluated for their performance in a temperate climate and as a winter crop in a subtropical climate.

Although the yield differences among the varieties were not statistically significant, **Xellano 900M Gold** produced the **highest grain yield**, followed by Xellano Hishell, likely due to a higher number of kernels per ear (Table 10). This evaluation aims to identify and promote a high-yielding variety suitable for cultivation in farmers' fields.

Table 9. Agronomic traits evaluation of Hybrid maize

Location	TMT	Grain yield (t/ac)	PH (cm)	Shelling (%)	100 Kernel Wt (g)	Kernel/ ear
Samtenling	Xellano Hishell	2.77	187	0.77	46.4	404.4
	Xellano 900M Gold	3.16	196	0.75	39.0	503.6
	DEKALB 9144	2.85	198	0.73	47.0	366.5
Wengkhar	Xellano Hishell	2.96	261[a]	0.64	29.6	627.0
	Xellano 900M Gold	3.09	245[b]	0.62	30.6	668.2[a]
	DEKALB 9144	2.73	257[a]	0.68	31.3	585.7[b]
ANOVA	Location (L)	NS	***	***	***	***
	Treatment (TMT)	NS	NS	NS	NS	0.001
	L x TMT	NS	NS	0.03	NS	NS

Community -based hybrid maize seed production group in collaboration with NSC

The DoA released **a Hybrid maize** variety four years ago. However, synchronization of parental lines restrained its reach to the farmers' field. Accordingly, ARDC Wengkhar has managed to overcome this hurdle. To improve access to hybrid seeds, a **community-based seed production group** was established at Lamzang, Trashigang in 2024. The group successfully produced 320 kg of F1 hybrid seeds from just 0.33 acres of land. These high-yielding seeds were then promoted across 12 acres by 49 households to assess field performance and foster community-wide confidence in hybrid seed adoption. In the following years, the group will be formally registered and handed over to the National Seed Centre with certification from BFDA, to produce the hybrid seeds.

Characterization of premium Traditional Rice varieties

ARDC Bajo has taken a deep dive into our **traditional rice varieties** conserved in the national gene bank. Using the **International Rice Research Institute** (IRRI) Standard Rice Evaluation System, **ten premium local rice** varieties were studied to uncover their unique traits and potential for the future.

The findings revealed a treasure trove of diversity: **Dawa Yangkum** stood out as the tallest (2.33 m) with the widest grains (3.83 (L/W) ratio), while Ngab-bja delivered the highest yields (2.92 MT/acre). Some varieties such as Janam, Shenga maap, Dumbja and pangbara matured early (130 DAT) making them perfect for short-season regions.

a) Ngab-bja

b) Tan

c) Bondey

d) Wangdra

e) Janam

f) Shenga Maap

g) Dum-bja

h) Pangbara

i) Dawa Yangkum

j) Zhakha

Rice breeding

A **crossbreeding** program was carried out at ARDC Samtenling using **15 local landraces** and **3 improved rice varieties** for the first time. Out of 45 hybridization attempts, **6 crosses** were **successful.** The primary objective was to **improve grain yield** and **reduce plant height**. The resulting F_1 hybrids from these successful crosses will undergo further evaluation in upcoming trials. Meanwhile, F_1 seed multiplication from six selected crosses showed varying success rates, with the **Champha × SRK-3** cross producing the highest seed yield (14). These F_1 seeds will be used for advancement and selection of superior rice genotypes.

Evaluation of Upland Paddy Varieties

In **Norbugang, Sergithang** Gewog, Tsirang Dzongkhag (1230 masl), an **upland paddy** trial tested **eight Nepal-origin rice varieties** alongside the **local Khangma Maap** on fallow terraces by ARDC Bajo. Managed only with FYM and no chemicals, **Sukha Dhan-5** and **NR2169-10-4-1-1-1-1-1** outperformed the local check, **yielding 1.40 MT/acre** and **1.03 MT/acre**, compared to just **0.62 MT/acre** respectively. In irrigated plots, these varieties even crossed **1.5 MT/acre**.

No major pests or diseases were observed, though one plot struggled with germination due to dry weather. Conducting research on the performance of upland paddy under both dryland and irrigated conditions will enable researchers to generate evidence-based recommendations for optimal cultivation practices.

Second Year Evaluation of Indian Durum Wheat Semolina

Durum wheat was first introduced in Bhutan during the 2023–2024 wheat season, both at research stations and in farmers' fields, in response to its emerging commercial significance; particularly for value-added products such as semolina and pasta. Building on the initial efforts, the 2024–2025 season marks the second year of multi-location trials aimed at evaluating the crop's adaptability, agronomic performance, and overall potential under Bhutan's diverse agro-ecological conditions.

The primary objective is to assess the crop's growth, yield potential, disease resistance, and overall suitability for commercial-scale semolina production, with the long-term goal of identifying appropriate production zones and developing best management practices for wider adoption.

Morphological characterization of six varieties of small cardamom

The ARDC Samtenling carried out on-station research and on-farm cultivation for **six varieties** of **small cardamom**. The trials were initiated at ARDC (Samtenling), Sadomadu (Phuentsholing), ARDSC Lingmethang and on-farm trial at Dramedtse from May 2023 which will be completed in December 2027.

Trial Locations	Lingmethang (ARDC, Wengkhar	Drametse (ARDC, Wengkhar)	Sadumadu (NCOA, Yusipang)	Samtenling ARDC
Varieties grown	1)ICRI-1 2) ICRI-2, 3) IISR-vijetha, 4) Appangala-2, 5) ISSR-Avinash, 6) PV-1	1)IISR-vijetha, 2) Appangala-2, 3) ISSR-Avinash, 4) PV-1	1)ICRI-1 2) ICRI-2, 3) IISR-vijetha, 4) Appangala-2, 5) ISSR-Avinash, 6) PV-1	1)ICRI-1 2) ICRI-2, 3) IISR-vijetha, 4) Appangala-2, 5) ISSR-Avinash, 6) PV-1

Improving black pepper cultivation technology

A comparative study on **black pepper** (*Piper nigrum*) cultivation using three different methods of **vertical column** was carried out at ARDC Samtenling. The methods used were, ***1) vertical column with MS angle iron posts with added growing medium, 2) vertical column on areca nut palms with added growing medium, and 3) conventional method using areca nut palms without added growing medium***. The growing media added were sawdust, cocopeat, and farmyard manure. The parameters used for evaluation were plant height, number of lateral shoots and number of runners.

Table 10. Performance of black pepper using different cultivation methods

Treatment	Mean plant height(cm)	Lateral shoots (Nos.)	Runner shoots (Nos.)
MS angle iron posts	194.58	9.9 (10)	2.4 (2)
areca nut palm	225.67	5	1
Conventional method	56.75	3.67 (4)	1

Evaluation of Date Palm at ARDC Samtenling

At ARDC Samtenling, **Medjool date palms** have been introduced to see how well they can adapt to Bhutan's unique agro-climate. The first steps—planting, and tracking their early growth. To give them the best chance to thrive, the young palms were moved to the Desuup Nursery Project, where they're getting regular care and close attention.

The data gathered from this experiment will reveal the potential of Medjool dates in Bhutan and could open doors to new and diverse farming opportunities in the country.

Characterization of cocoa cultivars at ARDC Samtenling

A study conducted at ARDC Samtenling assessed the **morphological and phenological traits of two cocoa cultivars**; ***Forastero and Trinitario*** to evaluate their potential for cultivation in Bhutan's sub-tropical zones. Notable differences were observed in leaf morphology: ***Forastero*** produced the largest leaves, while both cultivars exhibited elliptical leaf shapes with convex surfaces and long acuminate apices. The immature leaves displayed distinct coloration, with ***Trinitario*** showing red-purple tones and Forastero yellowish-green, and neither cultivar showed leaf pubescence.

In terms of productivity, ***Trinitario*** outperformed Forastero in pod yield per tree, indicating its greater potential for commercial cultivation in the region. These findings provide valuable insights for diversifying Bhutan's agricultural portfolio through cocoa farming.

Advance Evaluation Trial of Chickpea

An advance Evaluation Trial of **chick pea** was conducted at ARDC Samtenling and ARDSC Tsirang to assess the adaptability and yield performance of three chick pea line (**JG 14, NBeG 3 and BTN1 1654**) which are **brown seeded**, resistant to **fusarium wilt** and widely adapted in India. The two lines (JG 14, NBeG) were introduced from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) India and line BTN1 1654 was sourced from the national genebank at National Biodiversity Centre, Serbithang.

The study shows that out of three treatments evaluated, all the treatments had similar characteristics except plant height of BTN1 1654, with height of 27.90 cm as the tallest and JG14 as shortest with the plant height of 20.13 cm. In the upcoming season, all three treatments will be evaluated in farmers' fields to assess the adaptability under field condition.

Evaluation trial for Lentils

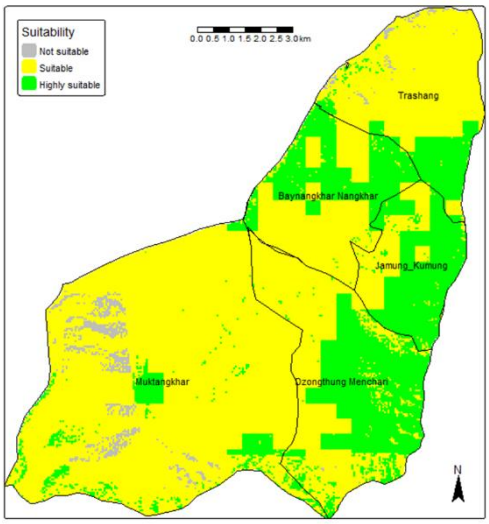
Pre-production Evaluation Trial of **four Lentil** (***Lens culinaris*** Medik.) lines, received from Uttar Banga Krishi Vishwavidyalaya (VBKV), West Bengal were evaluated at ARDC, Samtenling to study the **adaptability** and **production** performance. The three lentil lines **(WBL 77 (Moitree), L 4717 (Pusa Ageti Masoor), and IPL 220** were evaluated along with WBL 58 (Subrato) as the standard check.

The Advanced evaluation trial in 2024-25, showed the **highest yield** in **WBL 77** with **435.20 kg/ac** and the lowest was recorded from PL 220 with 258.50 kg/ac. Based on the result, the trial will be evaluated as an on-station and a production evaluation trial at the farmers' field in 2025-26.

Geographical Indications, Environment and Sustainability (GIES) Certification of Quinoa

Quinoa is identified as the **Special Agricultural Product** (SAP) and is declared as **Country One Priority Product** (OCOP), FAO initiative for its **nutritional value**, **climate resilience**, and **income-generating potential**. To explore its branding GIES, a case study was launched in Bartsham, focusing on traditional cultivation, environmental benefits, and the region's unique agroecology.

Local insights show that over half of **Bartsham** Gewog's households grow quinoa—some commercially, others for home use or as part of mixed farming systems. The initiative engages key players including farmers, government agencies, businesses, and even religious organizations. Achieving GI status could boost market recognition, strengthen local branding, and unlock new economic opportunities for producers.

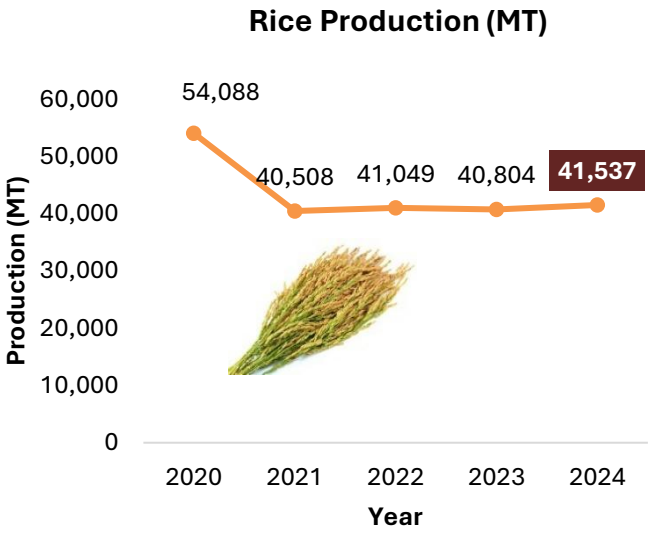


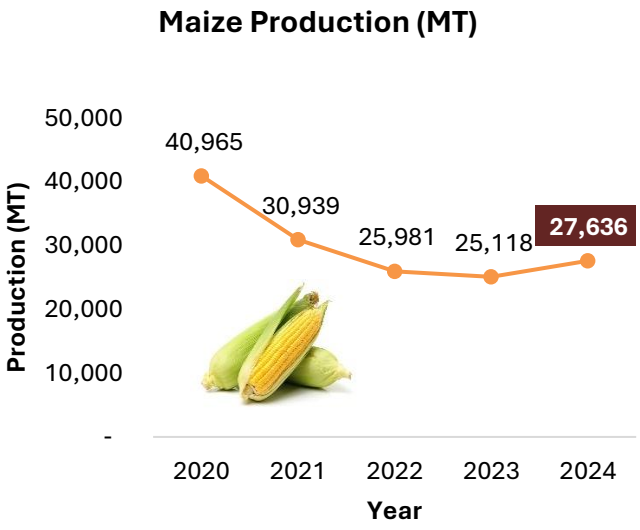
So far, soil and water assessments, consultations, surveys, and climate-land analyses have been completed, with findings now shaping a detailed manuscript to guide quinoa's future.

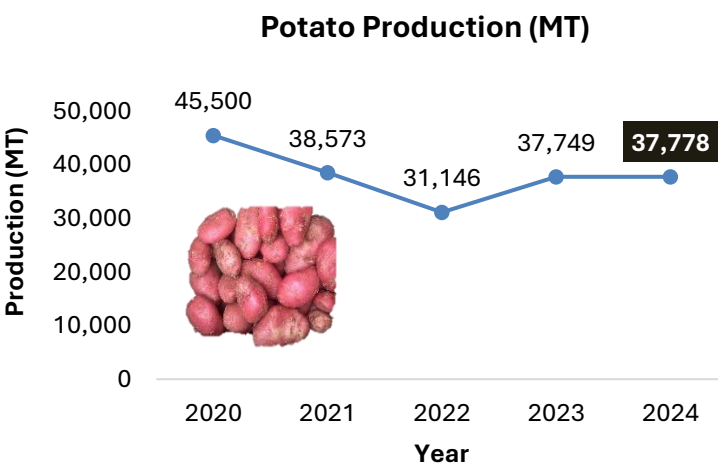
Agriculture Production

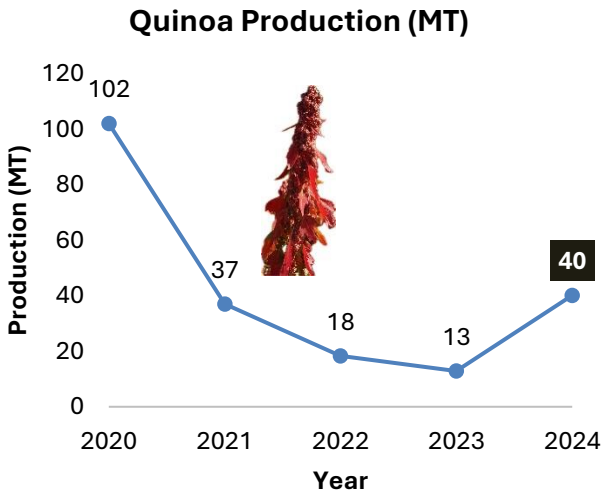
The National Statistics Bureau reports overall improvement in crop production in 2024 compared to 2023. Production of major crops such as **paddy, maize, quinoa, potato, vegetables, and fruits**, has **increased**.

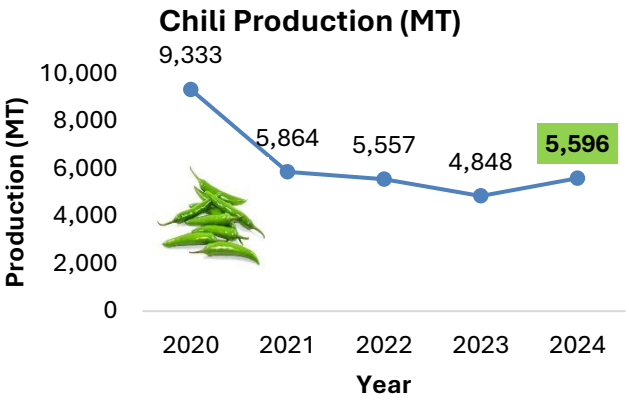
Similarly, in the vegetable sector, with the exception of tomato, asparagus, and cabbage, production of essential vegetables such as chili, cauliflower, beans, bulb onion, broccoli, and carrot increased. Notably, **chili** production **increased by 15%**, from 4,848.12 MT in 2023 to 5,596 MT in 2024, and **bean** production **increased by 16%**, from 1,532.92 MT to 1,784 MT.

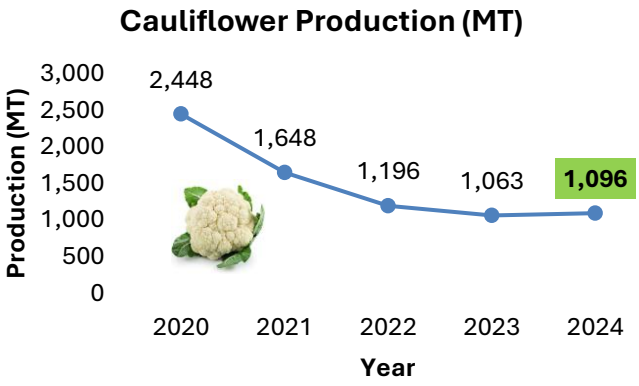


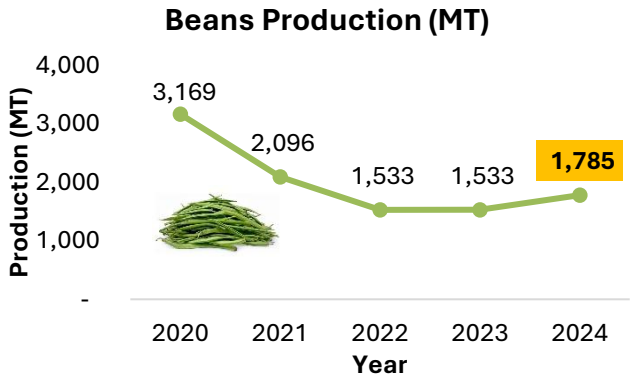


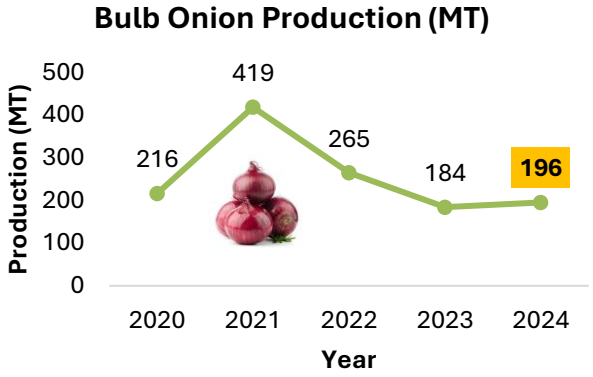


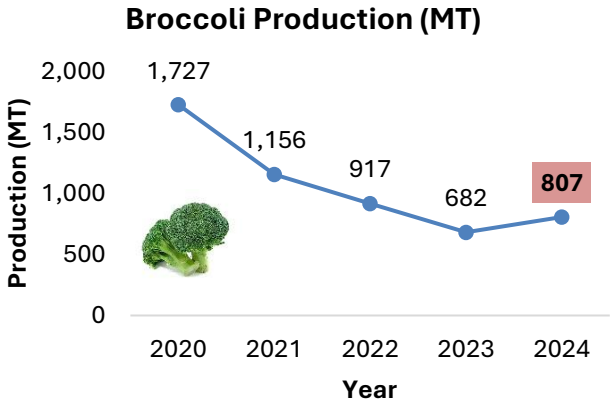


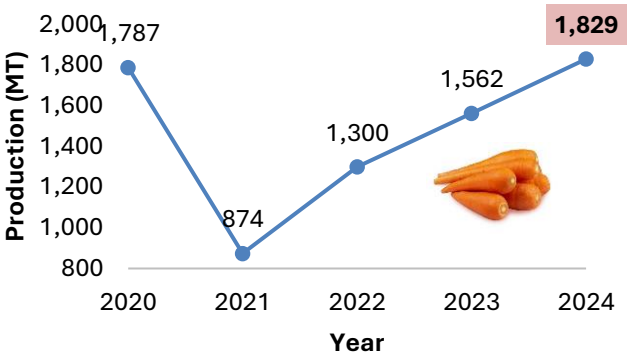

Chili Production (MT)
Production (MT)
10,000
8,000
6,000
4,000
2,000
0
9,333
5,864
5,557
4,848
5,596
2020
2021
2022
2023
2024
Year

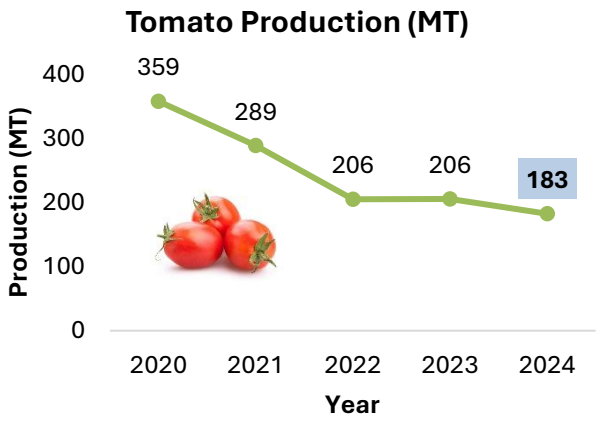

Cauliflower Production (MT)
Production (MT)
3,000
2,500
2,000
1,500
1,000
500
0
2,448
1,648
1,196
1,063
1,096
2020
2021
2022
2023
2024
Year

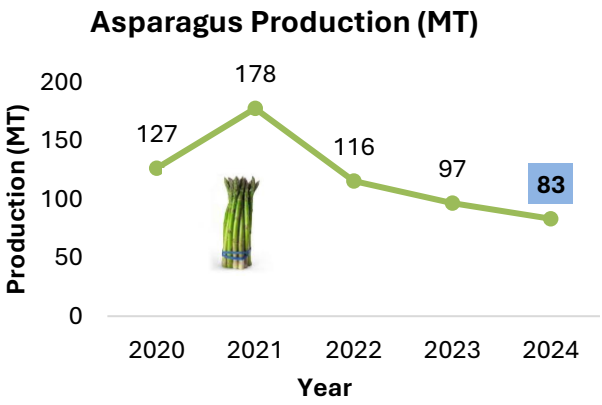

Beans Production (MT)
Production (MT)
4,000
3,000
2,000
1,000
-
3,169
2,096
1,533
1,533
1,785
2020
2021
2022
2023
2024
Year

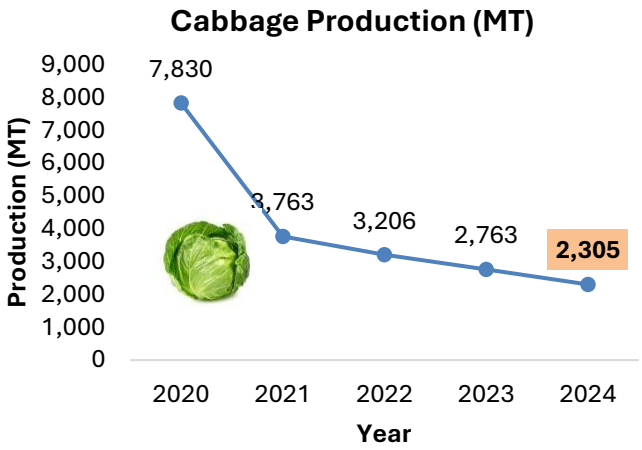

Bulb Onion Production (MT)
Production (MT)
500
400
300
200
100
0
216
419
265
184
196
2020
2021
2022
2023
2024
Year


Broccoli Production (MT)
Production (MT)
2,000
1,500
1,000
500
0
1,727
1,156
917
682
807
2020
2021
2022
2023
2024
Year

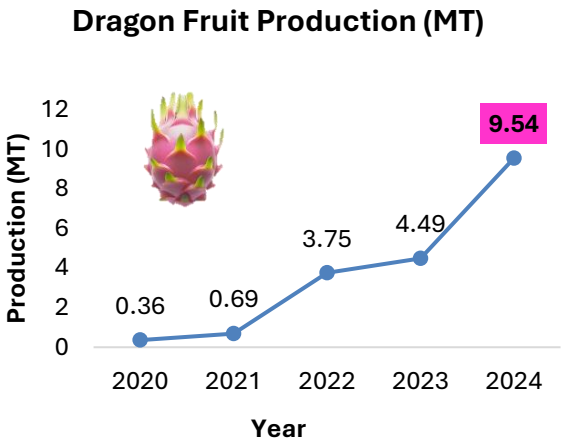

Carrot Production (MT)
Production (MT)
2,000
1,800
1,600
1,400
1,200
1,000
800
1,787
874
1,300
1,562
1,829
2020
2021
2022
2023
2024
Year

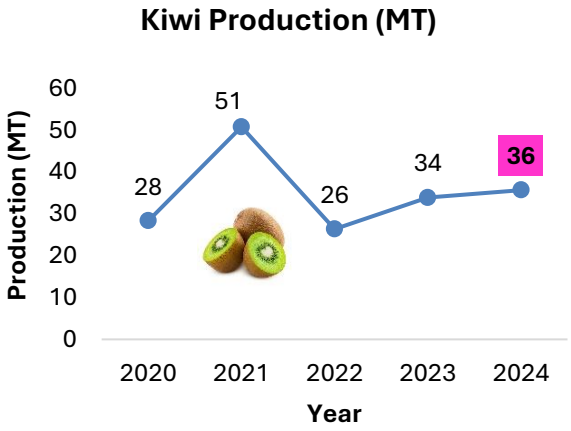

Tomato Production (MT)
Production (MT)
400
300
200
100
0
359
289
206
206
183
2020
2021
2022
2023
2024
Year

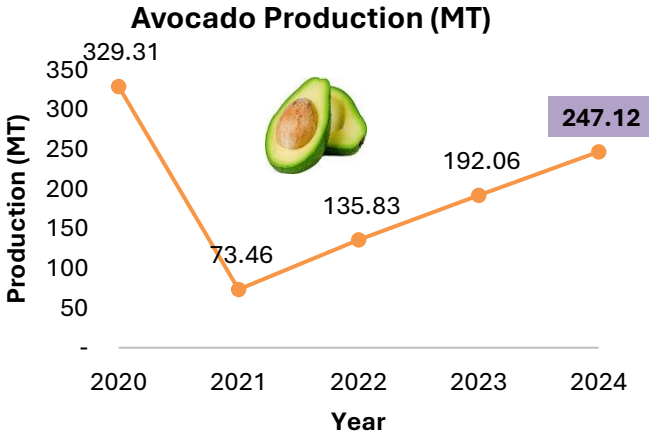

Asparagus Production (MT)
Production (MT)
200
150
100
50
0
127
178
116
97
83
2020
2021
2022
2023
2024
Year

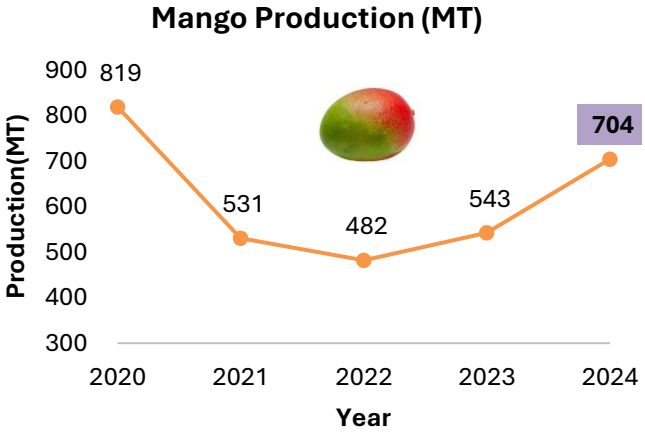


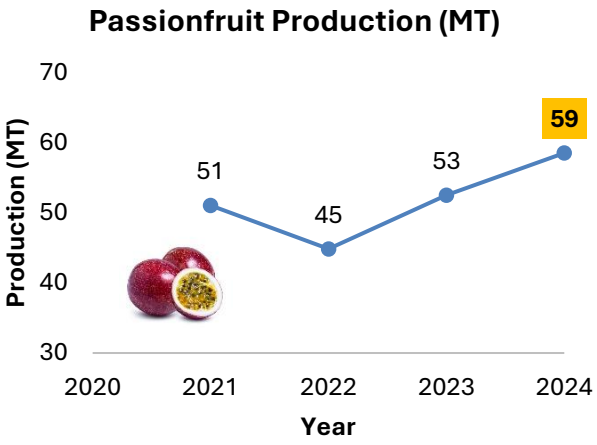
Fruit crops such as **dragon fruit, kiwi, avocado, mango, passion fruit, lemon and lime, walnut, strawberry, and persimmon** reported marginal increase, and for the **first time** some of the new fruit crops such as **almond, chestnut, pecan nut and cherry** features in the report due to the **Million Fruit Tree Plantation program**, gift of His **Majesty the King** to **the farmers**. **Almond** production was **4.57 MT**, **chestnut 0.71 MT**, **pecan nut 0.88 MT** and **cherry 0.22 MT**. In the coming years, more new high value fruits are expected to be reported.

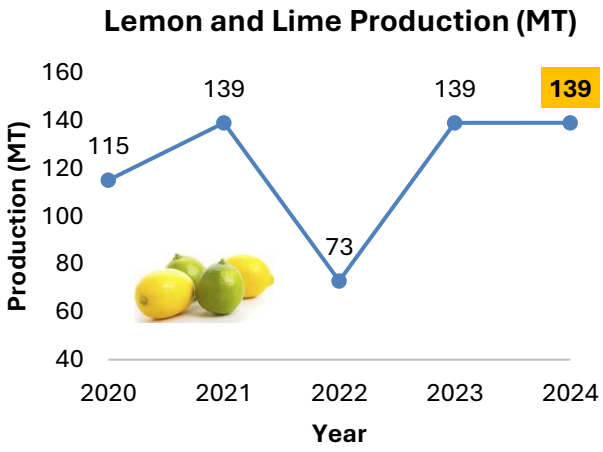


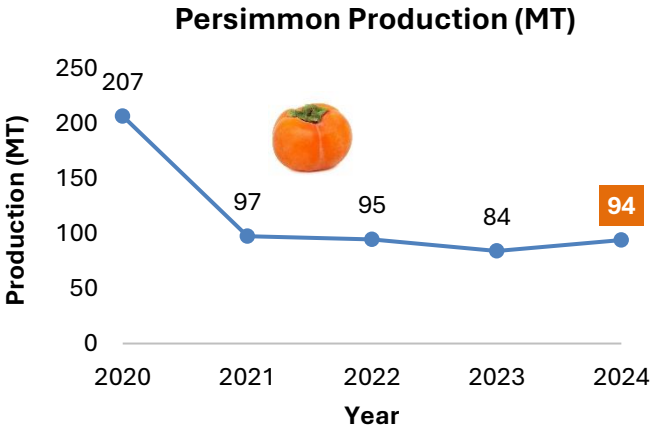


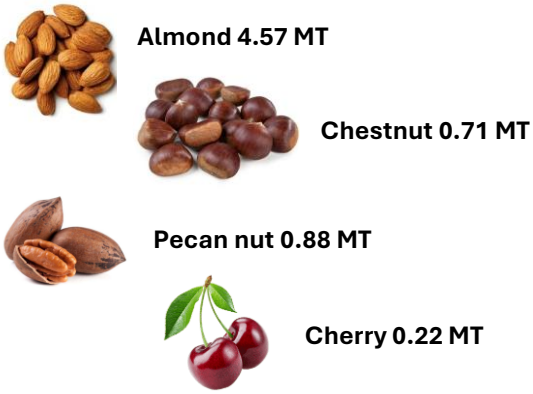












The overall improvement in production has been due to favorable climatic conditions in 2024, besides intervention from the government in the form of irrigation infrastructure, chain-link fencing, agriculture land development and provision of mini power-tiller.

However, production of apples and citrus fruits report a decline due to aging orchards, pests and diseases and shift to new high value fruits and nuts supplied through the Million Fruit Tree Plantation program. In addition, Tsirang, one of the major citrus-producing Dzongkhag, experienced an unusual hailstorm during the citrus flowering stage, resulting in an estimated reduction of about 160 MT in April 2024. Some reduction is also reported in oilseeds and legumes.

Ganoderma Production

Ganoderma mushroom cultivation was introduced in **Gasa** and **Punakha Dzongkhag** in 2024 by the National Mushroom Center with support from **Bhutan for Life (BFL) project**. Local communities were trained in cultivation techniques, including inoculation, incubation, and bed log maintenance.

Monthly monitoring and technical support were provided to farmers throughout the cultivation cycle. The first fruiting occurred between September and November 2024, indicating promising results in farmer fields. With support from DAMC, **Menjong Sorig Pharmaceuticals** procured **37.6 kg** of dried Ganoderma from **18 households** across Punakha and Gasa dzongkhag amounting to **Nu. 112,800**.

Table 11. Ganoderma mushroom cultivation in the JDNP area supported by BFL, Project

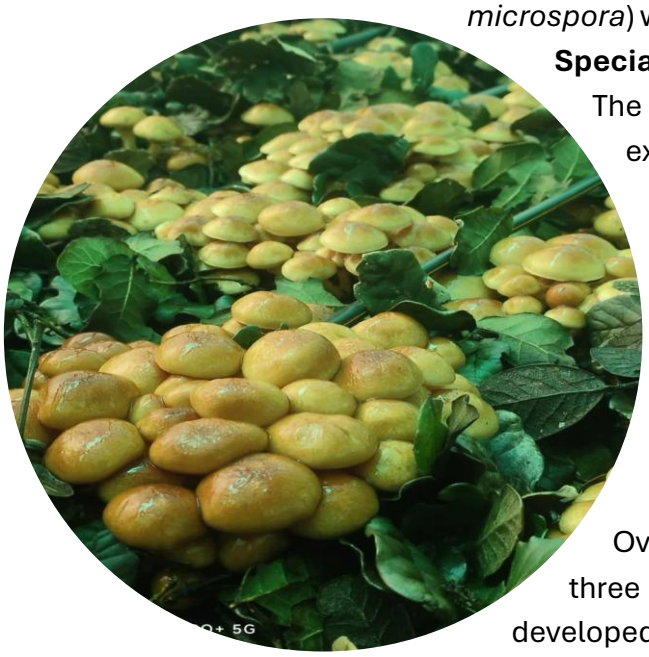
Dzongkhag	Households	Total Wood Disks	Year of cultivation
Punakha	8	21,000	2024
Gasa	10	16,500	2024
Punakha	-	1400	2025
Total	**18**	**38,900**	

Oyster and Shiitake mushroom Production

Mushroom cultivation in **Khotokha** began in 2023 with support from BFL support for both Oyster and Shiitake mushrooms. By 2024, the project had expanded to 36 Shiitake and 52 Oyster farming households. Continuous monitoring and technical support were provided until fruiting by the centre.

Promoting Nameko Mushroom

With support from **TANDI, FAO-funded project,** **Nameko** mushrooms (*Pholiota microspora*) was cultivated in **Tsirang, Chhukha, Paro, and Special Education Needs** (SEN) schools in Thimphu. The project provides training, materials, and expert guidance from Dr. Atsushi Kumata, focusing on sustainability and collaboration with local stakeholders. Public awareness and technical capacity were strengthened through events like Japan Week and a Training of Trainers (TOT) program, which trained 18 participants and engaged three farmer groups and one SEN school.

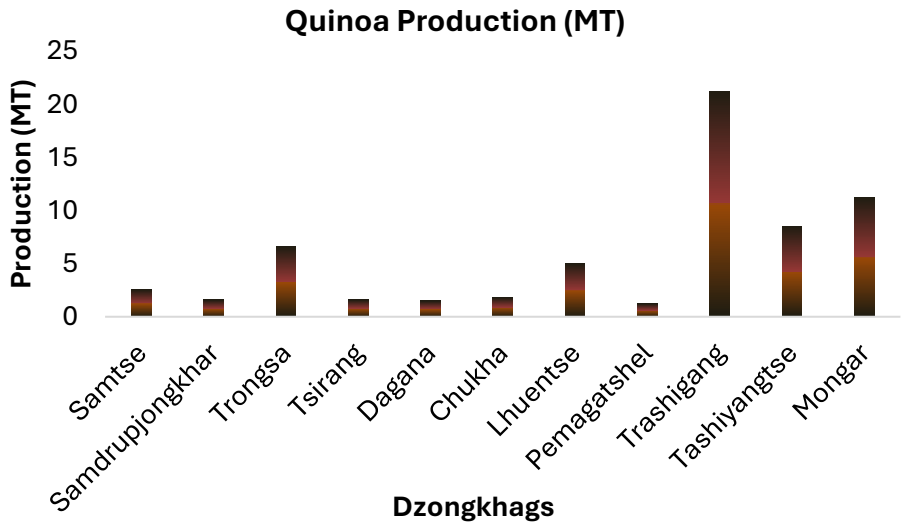


Over **18,000 logs** were inoculated in trials across three gewogs. A Package of Practices (PoP) was developed to guide growers. Additionally, a study tour to Japan in April 2025 helped NMC staff gain insights into advanced cultivation, marketing, and export strategies, highlighting Bhutan's potential in the Japanese organic market.

NMC provided training to over **250 youth, students, mushroom growers and farmers** on **cultivation** of Shiitake mushroom, Oyster mushroom, Hericium, Enoki, Cordyceps Militaris, King Oyster, Button and Nameko mushroom. A total of **3 spawn production labs** were established this year in Genekha, Haa, and Wangdue. Three interested youths were also supported with an internship program for a month by the centre.

Promotion of Quinoa through Flexible Voluntary Contribution

Recognizing quinoa's **high nutritional value**, efforts to revive and boost its cultivation took off with support from **FAO under the FVC project**. As part of this initiative, a total of **7 MT** of **quinoa seeds** were distributed across **14 dzongkhags**, benefiting **4,348 farmers**. This led to a production output of **63 MT**.



Market Creation through Price Guarantee Scheme

For strengthening **market access**, the quinoa was integrated into the national **Price Guarantee Scheme (PGS)**, ensuring price stability for producers. Through this initiative, the **Farm Machinery Corporation Limited** (FMCL) aggregated **11 MT of quinoa**, benefiting **92 farmers** from Trashigang and Trashiyangtse Dzongkhags, with expansion plans.

Dzongkhag	Household (no)	Quantity (MT)
Trashigang	58	6.9
Trashi Yangtse	34	4.7
Total	**92**	**11.6**

In addition, with collaboration with the **Department of Agricultural Marketing and Cooperatives (DAMC)**, promotional efforts aimed to **increase quinoa consumption**. Training sessions for institutional cooks from **Jigme Dorji Wangchuk National Referral Hospital (JDWNRH), Bartsham Central School, and Wongbama Central School** introduced practical applications of quinoa in daily meals. As part of a one-year trial, JDWNRH incorporated **3.6 MT of quinoa** into **its inpatient diet**, highlighting its nutritional benefits.

Organic Agriculture

Registration, inspection, certification and renewal of organic farms

At the National level, the total **new registered** and **certified areas** were **411 acres each**, while the total **households registered** and **certified** were **397 households**. The renewed registered and certified areas were **366 acres,** with **306 households**.

Capacity Building

The **BOS 02:2022** is aimed at strengthening the **organic regulation** and **certification** system in Bhutan. Training for organic farmers on this standard is required for certification. A total of **238 farmers** were trained on BOS 02:2022, Internal Control System, maintaining Farm Diary, Organic Management, covering four districts and nine Gewogs, largely in Eastern Bhutan.

The NCOA conducted an intensive training program on **organic broccoli and asparagus production** in **six western Dzongkhags**. The program aimed to **enhance** the **cultivation** and **productivity** of **high-value crops** under the 13th FYP. The training involved **176 farmers** from various gewogs, with DAO, Dzongkhag Organic Focal, and Gewog Extension Agents playing key roles.

The training focused on the BOS, ICS, and farm diaries maintenance for LOAS certification. The training also included practical sessions on the organic production of these two crops. Asparagus seedlings were also supplied to seven gewogs in Paro District covering 16.67 acres.

The NCOA conducted a TOT on **Organic Agriculture** from 18th to 20th December 2024 at the ARDC-Samtenling, **Gelephu Mindfulness City** (GMC). A total of **40 participants**, which included Gewog agriculture extension officials, Sanam Jabchorpas, and progressive farmers.

The training aimed to build the capacity of Extension Officials and other stakeholders in the latest trends in organic farming and prepare them for 100% conversion of GMC to organic farming.

Launching of the Bhutan Natural Mark (BNM)

The **21st Technical Working Group** meeting for the Organic programme approved the use and design of the **BNM for exporting Bhutanese food and agricultural products**. The mark, issued only for certified products under **the LOAS or Third-Party organic certification** by the **BFDA**, could open new export market opportunities.

Red (R) : 92 Cyan (C) : 40
Green (G) : 43 Magenta (M) : 76
Blue (B) : 0 Yellow (Y) : 98
Black (K) : 54
#5c2b00

Red (R) : 0 Cyan (C) : 76
Green (G) : 191 Magenta (M) : 0
Blue (B) : 98 Yellow (Y) : 84
Black (K) : 0
#00bf62

Red (R) : 10 Cyan (C) : 89
Green (G) : 114 Magenta (M) : 31
Blue (B) : 59 Yellow (Y) : 98
Black (K) : 20
#0a723b

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