Employment Patterns in Bhutan's Agrifood System[1]

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Abstract

Bhutan, a landlocked country with a unique development approach, faces an existential threat in its labor market as young people emigrate to find jobs elsewhere. As many Bhutanese remain active in activities linked to the agrifood system (AFS), transforming the AFS can contribute to more and better jobs as part of the wider structural transformation process. In this paper, we apply a new approach for assessing employment patterns across the different segments of the AFS. Typically, labor force statistics disaggregate employment by traditional economic sectors and equate agricultural employment with being active in primary production. However, this approach does not adequately capture the employment shifts related to a transforming AFS, as jobs relocate off the farm to industry or service activities that add value to primary agricultural produce. By identifying and categorizing industries and occupations linked to different AFS jobs in a cross-sectional panel of Bhutan's labor force surveys from 2018 to 2024, this paper applies an AFS lens to national employment statistics. We find that the AFS employs most economically active Bhutanese, but the traditional approach (47%) of assessing agricultural employment underestimates the actual employment in AFS (55%). While Bhutan's active labor force grows over time (3%), this growth is most pronounced in the non-AFS sector (7%) compared to the AFS sector (1%), implying that the share of labor force active in the AFS has declined from 60% to 50%. Within the AFS, labor remains highly concentrated in upstream production activities (86%) and the release of labor off the farm happens slowly. Employment in the mid (3%) and downstream (11%) segments remains small but growing faster, driven by new entrants entering processing, retail or food service activities. We find that incomes in the downstream segment of the agrifood sector are 85% higher than upstream jobs, and only slightly below the income earned in jobs outside the AFS. Thus, the income benefit to the jobs transformation can also be achieved within the AFS. Our findings have important implications for designing policies and interventions to strengthen the potential of the AFS to contribute to the creation of more and better jobs, including

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addressing barriers for agroindustry expansion, investment in value addition services, and youth skill development.

Keywords: Agrifood system, employment, structural transformation, job creation.

1. Introduction

The agrifood system (AFS) is a dynamic and complex network of interconnected actors and activities that provides employment to a large but declining share of the workforce. The AFS encompasses all activities and actors from farm to fork and its support ecosystem, and offers employment related to production, processing, distribution, and selling of raw produce, processed food, and related products in domestic or foreign markets.[2] Globally, the AFS constitutes one-sixth of the world economy, provides employment to almost 1.2 billion people, and directly supports the livelihood of farmers (Davis et al., 2023; Corong et al., 2024 ; Nico and Christiaensen, 2023; Yi et al., 2024). The AFS remains the main source of employment in lower-income countries and is positioned to continue to absorb more workers, even as the employment share within the economy will decrease. While primary production is largely on-farm, rural entrepreneurs and enterprises can be involved in off-farm activities such as processing, marketing, and services that add value to raw material. The AFS's fundamental objective is to ensure food and nutrition security of a growing and urbanizing global population, which is increasingly challenged by external shocks like climate change, economic volatility, geopolitical conflicts, and pest-disease outbreaks.

The AFS is central to a country's economic structural transformation as it provides employment and livelihoods to many people and has many spillover effects to other sectors. Structural transformation is the process where the share of agriculture in GDP and employment declines in favor of a rise in the modern industrial and service economy. If agricultural productivity can be improved through higher yields and greater efficiencies, labor and other resources can be released to more productive sectors off the farm, which is key to structural change. Empirical evidence has shown that structural transformation and poverty reduction have been the fastest when the agricultural sector grows to release labor and other inputs to other sectors (Christiaensen and Martin 2018). Higher agricultural productivity reduces crop prices, induces a shift of labor out of agriculture, which generates an income effect that augments the direct impact of productivity increases and leads to spillovers to the service sector.

In Bhutan, the structural transformation process is at an early stage and incomplete. Bhutan has experienced significant economic growth and socio-economic developments in the past decade, allowing the country to graduate into the lower-middle income country classification. Bhutan's economic growth has been mainly driven by capital-intensive hydropower and the tertiary sector, resulting in a pronounced shift in the composition of economic output away from primary production. However, this has not been matched by a commensurate reallocation of labor,

[2] Activities include primary production (crop production, animal rearing, fish rearing, forestry) to processing, distribution, retail, and consumption, including related sectors like inputs, finance, and logistics.

resulting in persistent concentration of employment in low-productivity activities, limited economic diversification, and weak spillovers to the rest of the economy (World Bank 2024, Vandercasteelen et al., 2025). After decades of decline, the contribution of the primary sector to GDP has grown and stagnated in the last decade to 16% and continues to absorb a disproportionate share of the labor force. Rather than releasing surplus labor off the farm and supporting downstream agro-processing and services, agriculture has largely acted as a residual employer and social buffer, with limited capacity to drive broader transformation as theory would suggest.

Bhutan's labor market is now faced with an existential threat of outmigration and youth unemployment. Bhutan's labor market is characterized by high labor force participation (64%) and overall employment rate of 97% but struggles with significant youth unemployment (19%). At the same time, it is estimated that 64,000 people have emigrated from Bhutan until 2024, representing 9% of the population (NAB, 2024). These labor market challenges are linked to an inability to generate enough decent jobs and equal employment opportunities. The stalled agricultural transition has contributed as younger workers are increasingly exiting agriculture without being absorbed into productive domestic employment, contributing to outward migration and reinforcing spatial disparities. As a result, the RGoB has made the creation of better and new jobs to retain youth and attract those that have emigrated a top development priority.

Within this context, the AFS can contribute to transformation and create more and better jobs in Bhutan. Bhutan's landscapes offer diverse natural resources, ecosystem services, and favorable environments for producing fruits, spices, livestock, and forest products, including the high-value medicinal cordyceps (Vandercasteelen et al., 2025). Bhutanese farmers are largely smallholders (1.4 ha/HH) who practice sustainable integrated and subsistence agricultural farming system (Katwal et. al., 2015). The integration of agriculture, water, forests, and other natural solutions helps to derive optimum benefits as well as minimize risk of farming enterprise while enhancing productivity of the farmland. As Bhutanese production systems rely on natural practices and low external input use, the AFS is well suited to produce high-value-low-volume commodities that can fetch better returns from niche markets. Bhutan's predominantly subsistence agricultural production system, is experiencing gradual transition in recent years with introduction of climate smart farming practices, commercial farming systems, and product development.

However, the current approach to disaggregating employment by the traditional economic sectors does not provide a comprehensive picture of the employment structure and entry point for job transformation in the AFS. The agricultural sector is typically equated with the primary sector, which, the International Labor Organization defines as 'the exploitation of vegetal and animal natural resources, comprising activities such as growing crops, raising and breeding animals, harvesting timber, and extracting other plants, animals, or animal products from farms or their natural habitats'. This definition, however, only looks at the upstream segment of the AFS, and particularly at production or harvesting activities. Analysis of labor force data therefore does not adequately capture the cross-sectoral nature of AFS and the growing importance of jobs off the farm but still active in agricultural value chains through activities related to transport, processing,

retail, and marketing. Part of the challenges relates to a lack of AFS jobs classification framework and the granular data that is needed, particularly in a low data capacity country as Bhutan.

In this paper, we apply an AFS lens to Bhutan's LFS to better understand the structure and evolution of employment along the AFS and its value chains. Using repeated cross-sections of the Bhutan LFS from 2018 to 2024, we classify employment as AFS-related or non-AFS using detailed industry (BSIC) and occupation (BSCO) codes, and we further map AFS jobs into upstream, midstream, and downstream segments consistent with an AFS value-chain framework. Because most LFS rounds do not record detailed descriptions of products or services that would allow unambiguous identification of AFS-related jobs within generic manufacturing and services occupations, our estimates use a conservative occupation-based approach and we quantify potential undercounting using the 2022 round, which contains richer occupational descriptions.

This new framework allows to better understand how AFS employment trends can contribute to Bhutan's jobs agenda. This new approach allows the paper to contribute to the existing literature by (i) properly identifying and measuring employment in on- and off-farm activities within the AFS; (ii) assess the structure and level of AFS employment across segments and dimensions of location, occupational types, employment nature, gender, and subsectors; (iii) identify how policies can improve the potential of the AFS to create better and more jobs; and (iv) contributing to the overall process of structural transformation and youth employment in Bhutan.

We find that AFS employment remains the dominant source of work in Bhutan and moving up the AFS value chain offers income benefits. Using the conventional practice of equating agriculture with primary production, Bhutan's LFS data shows that the share of employment in the primary sector was, on average, 47% and decreased from 54% to 43% between 2018 and 2024. Instead, when using the AFS perspective, the AFS, on average, employs 55% of the total working population, implying that equating agriculture employment with primary production underestimates AFS employment by 8 percentage points. Over time, the share of AFS employment in Bhutan's total working force declines as non-AFS employment grows faster, even as the absolute level of AFS employment changes relatively slowly (annual growth rate of 1%). Within the AFS, employment remains heavily concentrated in upstream activities (84%), with employment in mid- and downstream segments estimated at 5% and 11%, respectively. Employment in the upstream segment is declining by 1% annually, driven by primary production, and new entrants in the AFS are entering the mid- and downstream segments. Finally, we find that job quality—as proxied by labor income—improves higher up the AFS value chain: workers in downstream AFS activities earn substantially more per hour than upstream workers, and their hourly earnings are statistically similar to those outside the AFS. Thus, the income benefit to the jobs transformation arises within the sector.

These findings necessitate tailored policy responses to promote the relocation of labor within the AFS and contribute to an accelerated structural transformation process to create more and better jobs. The release of labor out of primary production can be accelerated by the

promotion of mechanization or protected agriculture, which reduce the amount of labor to achieve the same output. Complementing mechanization with yield-increasing technologies would allow to increase agricultural labor productivity and create better jobs, further creating space for labor to leave the sector and those that stay within the sector to specialize. As Bhutan's processing and agro-industry is nascent, addressing the underlying barriers linked to access to finance, quality of raw product, linking of agricultural research and agro-industrial needs, and compliance with trade requirements can allow to create more jobs. To expand the downstream segment, branding Bhutan as a source of green and clean produce and targeting niche market segments where consumers are willing to pay for a premium price will allow to create more value addition (better jobs) and venture into new products (new jobs). To facilitate the relocation of unskilled, mostly rural workers into the mid- and upstream, Bhutan will need to invest in rural skilling programs that build the capacity of value addition.

2. Conceptual Framework

Traditional models of economic growth posit the reallocation of employment and economic activities from low productivity to high productivity sectors (Lewis, 1954, Kuznets, 1957, Chenery, 1960). Lewis' (1954) two-sector model explains economic growth as transfer of resources, including surplus labour and capital, from the traditional agricultural to the modern industry sector. The traditional sector is characterized by subsistence-based activities (farming, hunting, fishing driven by customs and traditions), and typically involves small-scale operations, poor working conditions, low productivity, slow growth, low savings, limited investments, and low hours of work. In contrast, the modern sector focuses on technological advancement, better working conditions, higher productivity, rapid growth, high investment, better working hours, and higher savings. The driving force to structural transformation can be productivity growth in the modern sectors dominated by manufacturing and services, pulling resources from labour-intensive activities to skill-intensive ones, or productivity growth in the traditional sector, releasing labor off the farm.

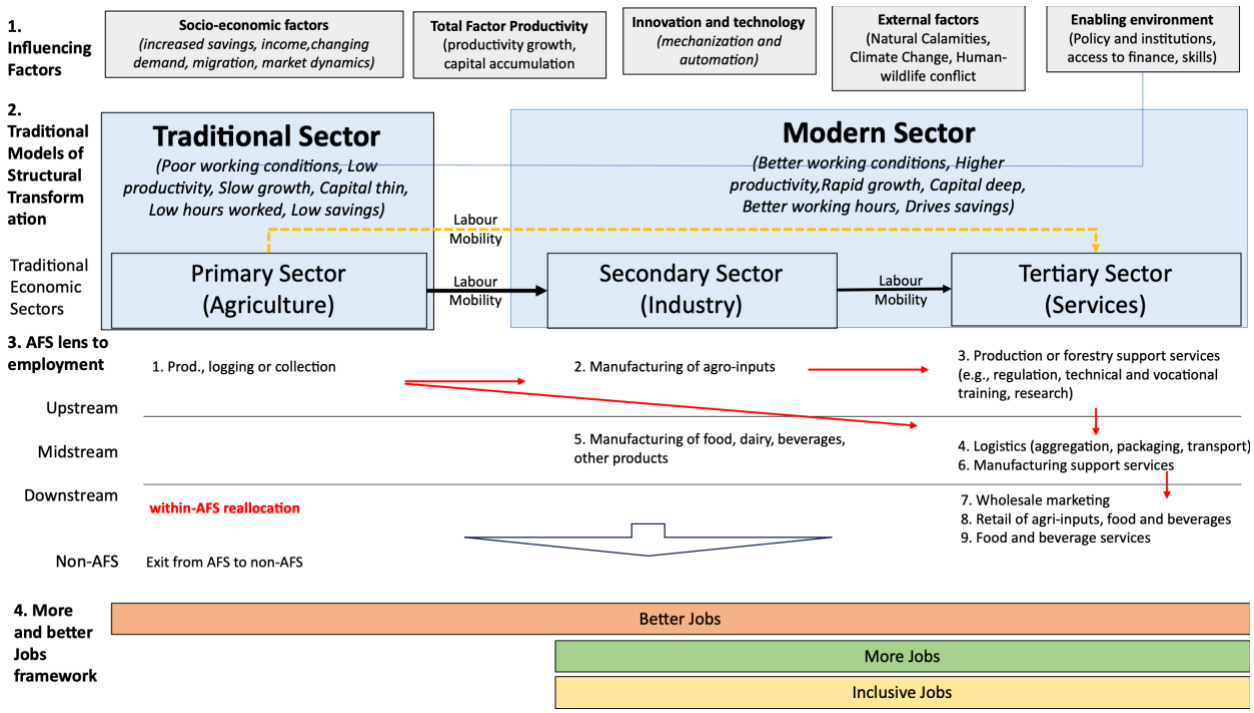
Empirical evidence documents a reallocation of employment from agriculture to low-productivity services which is bypassing the manufacturing sector. Subsequent three-sector frameworks consider economic growth as a transition from agriculture to manufacturing, and then ultimately from manufacturing to services (Kuznets, 1966). This economic transformation process includes a sectoral reallocation of labor from primary production to industry and service activities that add value, a spatial reallocation of workers to urban areas, a reorganization of the workforce into more organized structures, increasing the demand specialized skills and wage employment (Nico and Christiaensen, 2023). However, while earlier theories consider the sectoral transition as fundamental feature and central mechanism of economic growth, in recent years, the link between growth and industrialization has become less obvious, as steady growth is sustained in service-based economies (Gollin and Kaboski, 2023).

Agricultural growth has historically been at the centre of economic development as a driver of agricultural, rural and structural transformation (Davis et al., 2023). Today, policy makers look at the entire system around agricultural production and food consumption, and distinguish the system into on and off-farm segments. The on-farm segment focusing on primary agricultural includes labour intensive activities, such as crop cultivation, livestock production, fisheries, and mixed farming; and the off-farm segment includes non-agricultural activities in upstream (production input supplies-seed and fertilizer supply, agricultural machineries, credits and finance, research and development) and mid and downstream (aggregation, processing, transportation, storage, and retail-wholesale, food services, and handling food loss and waste) in the value chain (FAO, 2021; World Bank, 2022).

Sectoral employment is influenced by macroeconomic trends, labour market dynamics, and drivers of sectoral growth. Figure 1 shows the conceptual framework of the paper and suggests that agricultural job attractiveness and sustainability in Bhutan are a function of multiple interacting factors. The most significant influencing factors come from socio-demographic shifts related to demographic transitions, spatial reorganization, migration, labor market dynamics, and changing economic structures (Martins, 2019). In particular, as economies grow and urbanize, consumers' diet composition and preferences change, increasing the demand for processed, convenient, and purchased foods, thus changing the demand for labor across the AFS. In addition, external stresses of climate change, unpredictable weather, and natural calamities, which threatens farming viability, and uneven access to technologies and market instruments to mitigate impacts, determine the labor productivity in the agricultural sector. More recently, growing labor shortages, digital revolutions, anti-immigration sentiment, and anti-globalization shape the type of work in the AFS (Christiaensen et al. 2023). Public policies and institutions have an overriding influence on innovation and technology, investment, regulations and market development. Ultimately, this framework suggests a reinforcing cycle where productivity growth, innovation and technology, increased savings and capital accumulation can create resilience and drive positive outcomes for agricultural jobs (more and better jobs) and productivity, thus accelerating AFS transformation.

Recently, policy makers and development specialists have shifted from a narrow focus on economic growth to toward a broader agenda of creating more and better jobs—that is, jobs that raise productivity and earnings, strengthen inclusion, and improve working conditions. Jobs are increasingly positioned as the pathway to poverty reduction, increased prosperity and dignity, ensuring peace and stability, and female and youth empowerment (World Bank Group 2025). This emphasis reflects the recognition that in many developing countries most people are already working, but often in low-productivity, informal activities, or poor working conditions, and hence there is scope and urgency to improve labor productivity, job quality, and create jobs that offer sustainable and meaningful incomes. However, within the AFS, and especially upstream it is important to differentiate between desired or residual employment. In the Bhutanese context, it is likely that smallholder famers combine subsistence, semi-commercial, and seasonal off-farm activities, to reduce risks and smooth consumption.

Figure 1: Employment transition pathways and drivers



What is less documented is the jobs transition within the AFS within low- and middle-income countries. Structural transformation is often equated as labor exiting agriculture, but the labour reallocation within AFS, from primary production toward midstream and downstream segments that often pay better than farm work, is less well understood (Yi et al. 2025). While on-farm employment in primary production remains to dominate AFS employment, particularly in low- and middle-income countries, new jobs are created off the farm as economies grow (Nico and Christiaensen, 2023). While upstream activities remain rural in lower- and middle-income countries, off-farm AFS employment becomes more urban as industries want to concentrate close to consumption centres. With mostly traditional and low input production systems, employment on the farm is dominated by self and family employment, while the off-farm segments require more skills and offer wage employment. As agricultural labor productivity increases, agricultural value chains deepen, agricultural input and service activities develop, and demand for more processed food increases.

3. Data and Methodology

The paper uses repeated, cross-sectional data from LFS collected by the National Statistics Bureau (NSB) of Bhutan between 2018 and 2024. The LFS is a nationally representative survey aimed at collecting comprehensive information on labor market conditions, including employment, unemployment, and characteristics of the working population. Using a stratified two-stage sampling design, LFS is designed to produce estimates of labor force-related indicators at both national and domain levels. The LFS data was collected annually between 2018 and 2022, and quarterly for 2023 and 2024. The unit of observation of the LFS is at the individual household

member. Table *1* shows the total number of observations in the survey sample, the number of individuals that are considered economically active[3], and the number of economically active workers in the AFS sector (using the methodology explained below). Unfortunately, the LFS does not track the same individuals over time, so the analysis can describe changes in workforce over time but not observe individual job transitions.

Table 1. Sample used for analysis

	Number of individual workers in each LFS years						
Sample	2018	2019	2020	2021	2022	2023	2024
Total Survey Sample	37,113	35,365	35,936	40,830	40,762	11,398*	10626**
Economically Active	16,407	16,701	17,178	19,924	18,499	5,354	4973
Active in AFS sector	9,857	9,627	9,957	11,754	10,413	3,058	2832

Note: * data available for one quarter only in 2023. ** All four quarters combined and analysed collectively

The analysis used the following steps to filter and identify jobs that are in the AFS.

1. First, the analysis used the Bhutan Standard Industrial Classification (NSB 2020) to identify industries with economic activities that are related to the different functions of the AFS.[4] The BSIC became Bhutan's standard classification of economic activities, differentiating 21 sectors of economic activities (sections) and 419 economic activities (classes). Annex 1 lists the BSIC sections and divisions with economic activities assumed to be relevant to the AFS which cut across primary production, industry, and services. Before the BSIC was established in 2020, the LFS data recorded industry codes at the two-digit class level, therefore, the analysis identified industries using the first two digits of the industry codes which represent divisions and are consistent across LFS years.
2. Second, as not all economic activities in these relevant industries are actually related to the AFS, the analysis used the occupation of the workers to further identify whether their job relates to any value chain segment that constitute the AFS as shown in Figure 1. For this, the analysis used the 4-digit codes of the Bhutan Standard Classification of Occupations (BSCO, 2022, Version 1[5]) which indicate the occupation of the worker, according to the type of work performed.[6] Annex 1 shows the list of occupation codes that were considered to be related to the AFS, which again cut across primary production, industry, and services. Here we are conservative and only consider occupations that reference to AFS activities or subsector in the 4-digit code. This leaves out, for example, shopkeepers in retail shops, truck drivers, or public

[3] NSB defines economically active as individuals aged above 15 and engaged for at least one hour or more during last seven days in paid work or for family gain or profit or for own use or consumption).
[4] Note that the AFS also include forestry and wood-based activities, as they together constitute the renewable natural resources, a term commonly used in Bhutan.
[5] https://www.nsb.gov.bt/wp-content/uploads/dlm_uploads/2025/06/BSCO-2025-V2.pdf
[6] Note that from 2022 onwards, the LFS data contains more granular data at the 5-digit level which is absent in the earlier years of the LFS.

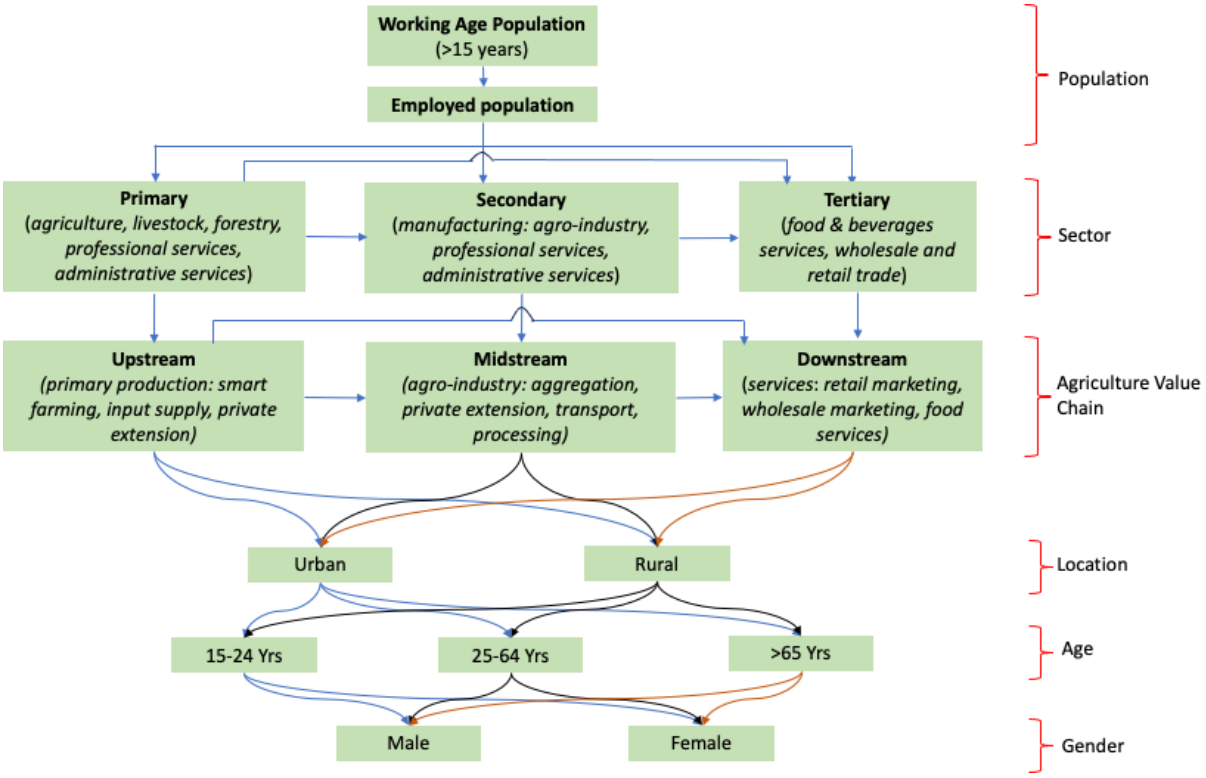
administration officers for which we don't know what type of products or subsector they engage with.

3. Thus, ideally, the analysis would look at the exact nature of the products and services provided within the occupation to identify whether the job is truly in the AFS. For example, the shopkeeper in wholesale or retail stores may be selling with crop, livestock, or food products. Similarly, a worker in the transport and logistics sections may be engaged in the transport of raw agricultural commodities such as crops or livestock products. Unfortunately, except for the year 2022, the LFS data does not contain a description of the type of good or services produced nor does the 4-digit BSCO code provide sufficient granularity to differentiate the main goods and products that workers are handling. However, using the LFS 2022, the analysis was able – through a detailed text search – to identify whether the occupation was handling any products or services linked the AFS. This allows us to identify jobs within the AFS but classified according to generic manufacturing and services segments and measure the underestimation economic activities in the AFS.
4. Third, for each economic active worker in the LFS, the information on the industry and occupation from the previous steps was combined to identify whether their job is part of the AFS. All jobs in primary production were directly considered AFS jobs. Next, all employment in an industry (step 1) and with occupation (step 2) relevant to the AFS were assigned as an AFS job. Lastly, some manual changes were made for service providers in the mid and upstream sector (in particular, those in the food service sector), for which the occupation code showed a clear link with the AFS but the industry was not AFS relevant. Then, we apply a correction to the total employment number in each year, AFS segment, or subgroups using the (inverse of) underestimation ratio of not having information on product and services from the 2022 data (step 3).
5. In addition to the variables linked to the industry and occupation codes, the analysis prepared characteristics of the individual laborer related to geography, gender, demographics, and occupation category and agency. These domain variables are used to produce group statistics based on location, age, education, and gender, as depicted in Figure 2.

Then, the analysis identified to which stage and segment of the AFS the AFS employment relates to. To do this, the BSCO codes were linked to the different stages of a AFS identified in the framework of Figure 2. In the case of Bhutan, 9 stages were identified: (1) on-farm production of crops, animal rearing, mixed farming, or forest products; (2) manufacturing and distribution of agro-inputs such as fertilizers, seeds, and machinery; (3) support and administrative services related to production, such as regulatory services, technical and vocational training, and research and development; (4) logistical services related to aggregation, packaging, or transport of raw products; (5) grading, processing, and packaging of value added products; (6) support and administrative services related to processing; (7) wholesale marketing of agricultural products, food, beverages, or wood products ; (8) retail marketing of food, beverage, or wood products; and (9) food and beverage service activities including jobs in restaurants, supermarkets, cafes, and informal vending. Note that the analysis does not consider textile-related activities to be part of

the AFS. Subsequently, stages 1 – 3 were classified as upstream, stages 4 – 6 midstream, and stages 7-9 downstream. Based on the BSCO codes, the project was also able to identify the subsector within the AFS, including crop, livestock, mixed farming, forestry, food and beverages, wood products, and unclassified (when the occupation does not clearly indicate the subsector, mostly for government officials, such as an inspector at BFDA which could be handling crop, livestock, or forestry products).

Figure 2: Analytical structure of classifying employment and producing group statistics



To produce nationally representative estimates, all statistics in this report were weighted using the sampling weights provided in the LFS dataset. The weighting process accounts for the complex survey design, which includes stratification, clustering, and unequal probabilities of selection as per LFS survey design. Survey weights provided in the LFS were applied to ensure national representativeness. All estimates were computed using the survey package in R to account for stratification based on geography and urban/rural division, clustering using the Primary Sampling Unit (PSUs), and sampling weights that reflect household and individual-level probabilities of selection. Since the LFS uses a multi-stage stratified sampling design, in which PSUs were constructed using Enumeration Areas (EAs), often constructed using combinations of district, gewog (village block) and chiwog (village) codes.[7] In 2023 and 2024, the NSB further

[7] However, some LFS datasets lacked all geographical variables to recreate the PSU, and a pseudo PSU was created using the weights variable. Two LFS datasets (2021 with data gaps and 2022) were used for checking whether the pseudo-PSU closely resembles the original appropriately constructed PSU in terms of observations as well as descriptive statistics generated.

adjusted sampling with adding age and gender strata to collect representative samples and increase the data collection frequency to quarterly.

This methodology has its limitations to comprehensively capture all AFS employment as the LFS is not designed to provide representative statistics at this granular level nor allows to track individual flows. As the LFS is designed to provide representative labor force statistics at national and subnational level, it cannot be nationally representative for employment at much lower disaggregated levels such as the value chain segment of the AFS. For example, employment in specialized services in urban areas is likely to be underrepresented compared to primary production in rural areas. Most years of the Bhutan LFS lacked granular information on occupation descriptions to validate the assignment of secondary and tertiary sectors to the AFS. Moreover, informal and seasonal nature of employment may be underreported or poorly understood, particularly among unpaid family workers and women. While the LFS surveys in 2020 and 2021 were conducted during the covid-pandemic, no information was collected on economic disruptions caused to perform a more granular assessment of potential covid-related trends. Finally, the cross-sectional nature of the LFS data allows us to describe annual changes in employment stocks across segments but not to track individual flows between different activities. The LFS data also does not contain direct measures of preferences (e.g., job satisfaction or preferences), so we cannot fully disentangle choice from necessity at the individual level.

4. Labour force statistics using the traditional approach

Bhutan's population grew between by 6% 2018 and 2024, from 734,374 to 784,043 people, or an annual growth rate of 1%. Due to lower fertility and mortality rates, the country's population will continue to grow at a slower rate (0.65% annual growth rate between 2017 and 2047) compared to previous decades (NSB, 2019). The demographics of Bhutan's population is expected to change over the years too, with the population segment of 15 years age falling from 26% to 17% while the segment of 65 years and above rising from 6% to 13 % by 2047. This will result in increase of working population above 70% by mid 2020s and maintaining the level until 2040, thus providing high demographic dividend. Moreover, with the rapid rate of urbanization, the share of urban population is projected to rise to 57% by 2047 (NSB, 2019). In Bhutan rural-urban migration is one of the largest (44%) category of internal migration, representing 19.8% of the total population in 2018 (NSB, 2018).

Among the working-age population, only 64% are active in the country's labor force (NSB, 2024). While population growth gradually increased during 2018-2024, the proportion of working and economically active population saw a faster growth of more than 20% during the same period. Although the overall unemployment has remained low, fluctuating between 3% in 2015 and 4% in 2024, the youth unemployment has been persistently high. The challenges and constraints to being employed is influenced by inadequate or mismatched education system (skill mismatch), lack of career guidance, gender stereotyping, and lack of adequate facilities and support for female employees (Alaref et al., 2024). Alaref et al. (2024) estimate that skill mismatch is the primary

reason for 46% of youth unemployment in Bhutan. The skill mismatch has also affected educated job-seekers because those employed are mostly in jobs requiring low or mid-skills. The high youth unemployment particularly among educated youth, is attributed to a mismatch of skills, limited private sector growth, and a preference for white collar jobs.

Primary production remains the economic sector that employs the largest share of the Bhutanese workforce. Table 2 disaggregates Bhutan's labor force participation by major economic sectors.[8] We find that the primary sector still dominates in terms of the number of active people employed in Bhutan. On average, between 2018 and 2024, 155,535 or 47% of Bhutan's active labor force was employed in primary production. Employment in the secondary and tertiary sector was, on average, 47,017 people (15%) and 122,042 (38%), respectively. In 2024, the primary and tertiary sector employed almost an equal amount of 43% and 42%, respectively, of the Bhutanese labor force. Over time, however, the share of active labor force in the primary sector has decreased from 163,417 people in 2018 (54%) to 157,740 people (43%), at an average rate of -1%. In contrast, employment in the secondary and tertiary sector grew by, on average, 7% and 8%, respectively, in the same period. Thus, between 2018 and 2024, people entering the labor force has been mostly employed in the secondary and tertiary sector.

Table 2: Disaggregating labor force participation by major economic sector

	Indicator	2018	2019	2020	2021	2022	2023	2024	Av.
Key Labor Force Survey Statistics									
Population	Absolute	734,374	741,672	748,931	756,129	763,249	770,276	777,224	755,979
	YoY GR		1%	1%	1%	1%	1%	1%	1%
Working Population	Absolute	496,550	481,821	488,336	489,732	484,965	581,321	598,680	517,344
	YoY GR		-3%	1%	0%	-1%	18%	3%	3%
Active Labor Force	Absolute	300,442	311,059	314,562	322,122	287,785	366,010	370,171	321,547
	YoY GR		3%	1%	2%	-11%	24%	1%	3%
Disaggregation by Economic Sector									
Primary	Absolute	163,417	160,425	158,759	160,166	126,606	161,631	157,740	155,535
	YoY GR		-2%	-1%	1%	-24%	24%	-2%	-1%
	Relative	54%	52%	50%	50%	44%	44%	43%	47%
Secondary	Absolute	38,049	46,656	44,997	47,966	41,948	52,334	57,164	47,017
	YoY GR		20%	-4%	6%	-13%	22%	9%	7%
	Relative	13%	15%	14%	15%	15%	14%	15%	15%
Tertiary	Absolute	98,976	103,979	110,806	113,990	119,230	152,045	155,267	122,042
	YoY GR		5%	6%	3%	4%	24%	2%	8%
	Relative	33%	33%	35%	35%	41%	42%	42%	38%

Note: YoY GR refers to year on year growth rates, relative is the share of the economic sector in the total labor force

[8] Traditional economic sectors are identified in the BSIC division codes as primary sector if division code is below 10, secondary sector if division code is between 11 and 43, and tertiary if between 44 and 99.

Despite being the largest employer in the AFS, labor productivity in the primary production segment remains low. Between 2000 and 2020, value added per worker in agriculture grew by about half, at an annual growth rate of almost 3%, which is significantly lower than labor productivity growth in industry and services (Vandercasteelen et al., 2025). In addition, will decreasing over time, the gap in labor productivity with other sectors remains large and is among the highest in the region. Growth in total factor productivity has recently become negative and cyclical, implying growing inefficiencies in converting inputs into outputs, and trapping farmers into a low-input, low-output equilibrium. Dizon et al. 2025 points to a binding set of constraints that reduce farm output for given labor input including, issues with water reliability and irrigation quality (especially for paddy), lack of mitigation mechanisms for droughts, rainfall risks or other natural disasters, and human–wildlife conflict, pests and disease

The labor market in Bhutan continues to be concentrated in rural areas and dominated by males. Between 2018 and 2024, on average 68% of the economically active working population resided in rural areas. Within the rural workforce, 68%, 11%, and 21% were active in the primary, secondary, and tertiary sector, respectively. In urban areas, 74% and 23% of the workforce are active in the service and industry sector, respectively. This indicates that most raw materials are moved to urban centers where manufacturing and services happen. However, the industry sector contracted by 2% in urban areas between 2018 and 2024, while in rural areas, it expanded by 18%. This may be because some manufacturing is happening closer to the source and due to the unavailability of land in urban areas. Males constitute, on average, 55% of the active labor force and their participation in the labor force (in absolute numbers) grew by 5%. Female labor participation, on the contrary, remained quite stable. Of the female labor force, 58% are active in the primary sector, compared to 42% for males. Males are relatively more active in services (18% compared to 7% for females) but show similar participation rates in the service sector.

5. Labor Force participation through the AFS lens

Analyzing Bhutan's LFS data with an value chain lens finds that 55% of the Bhutanese labor force is active in the AFS. When identifying the different primary, secondary, and tertiary activities within the AFS value chains – on and off the farm – the AFS employed on average 176,427 people in Bhutan between 2018 and 2024. This represents 55% of the active labor force, suggesting that the majority of Bhutanese are still engaged in the AFS. Moreover, the classification of jobs using the traditional classification results in an underestimation of 8 percentage points. In absolute numbers, the difference is, on average, 12% or over 20,000 workers. Moreover, this difference in absolute numbers grew over time from 9% in 2018 to 14% in 2024, and hence may lead to growing inconsistencies in the future.

The number of people working in the AFS has remained relatively stable over time but decreasing as a share over time. Between 2018 and 2024, the labor force in the AFS grew from 179,321 to 183,703 workers, with an average annual growth rate of 0.4 %. Employment in the AFS thus remains stable, with periodic increases and decreases. In relative terms, as more people enter

the labor market in the non-AFS jobs (the non-AFS segment saw an annual increase of 7%), employment in the AFS as a share of total employment showed a downward trend over time, from 60% in 2018 to 50% in 2024. Bhutan's employment shares and trends in the AFS are smaller to those observed in African countries (around 66%) and larger than the Asian average (50%) (FAO 2025).[9]

The AFS is the dominant sector for rural and female workers, but a faster growing urban AFS workforce suggests that employment is moving to urban AFS activities. On average, 71% of the rural workforce is active in the AFS while for urban workers this is 17%. Conversely, the share of rural and urban workers within the AFS is, on average, 90% and 10%, respectively. The number of rural workers in the AFS has not been growing over time while the number of urban workers is going up by 10%, suggesting that the employment within the AFS is slowly shifting to urban activities. As the AFS employs 65% and 45% of the total female and male labor force, respectively, employment in the AFS is relatively more important for females. Between 2018 and 2024, the average share of female and male workers within in the AFS was 54% and 46%, respectively. While female workers have dominated the AFS until 2022, since 2023, relatively more males tend work in the sector. This means that female participation in the AFS has decreased by one percent while that of males has increased by 1%. Annex 2 provides a gender disaggregated lens by value chain stage. It shows that within the AFS working force, males are relatively more engaged in production support services, logistical services, and manufacturing activities; while females are more active in processing support services, retail marketing, and food and beverage services. Over time, male participation in production support services (16%) and food and beverage services (26%) have grown over time, while female participation as grown strongest (20%) in retail activities.

Table 3: Disaggregating labor force participation by being economic active in the AFS [UPDATED]

	Indicator	2018	2019	2020	2021	2022	2023	2024	Av.
LFS statistics by economic activity in AFS (yes/no)									
Active in AFS	Absolute	179,321	176,938	175,889	179,831	146,447	192,863	183,703	176,427
	YoY GR		-1%	-1%	2%	-21%	28%	-5%	0.4%
	Relative	60%	57%	56%	56%	51%	53%	50%	55%
Active in non-AFS	Absolute	121,120	134,121	138,673	142,291	141,338	173,147	186,468	148,166
	YoY GR		10%	3%	3%	-1%	20%	7%	7%
	Relative	40%	43%	44%	44%	49%	47%	50%	45%
Disaggregation of AFS by Area and Geography subgroups									
Rural	Absolute	164,965	161,750	159,662	160,844	130,241	168,997	161,550	158,287
	YoY GR		-2%	-1%	1%	-21%	26%	-5%	-0.3%
	Share 1	77%	74%	72%	72%	69%	71%	66%	71%
	Share 2	93%	92%	91%	90%	89%	87%	88%	90%
Urban	Absolute	12,241	13,497	14,980	18,634	16,206	24,838	22,856	17,607
	YoY GR		10%	10%	22%	-14%	43%	-8%	10%
	Share 1	14%	15%	16%	19%	16%	19%	18%	17%

[9] https://www.fao.org/statistics/highlights-archive/highlights-detail/employment-indicators-2000-2023-%28july-2025-update%29/en

	Share 2	7%	8%	9%	10%	11%	13%	12%	10%
Female	Absolute	95,030	100,995	101,035	100,830	77,365	96,213	91,485	94,708
	YoY GR		6%	0%	0%	-26%	22%	-5%	-1%
	Share 1	69%	69%	66%	65%	62%	64%	63%	65%
	Share 2	53%	57%	57%	56%	53%	50%	50%	54%
Male	Absolute	84,290	75,932	74,841	78,993	69,082	96,659	92,226	81,717
	YoY GR		-10%	-1%	5%	-13%	34%	-5%	1%
	Share 1	51%	46%	46%	47%	42%	45%	41%	45%
	Share 2	47%	43%	43%	44%	47%	50%	50%	46%

Note: YoY GR refers to year on year growth rates, Share 1 refers to the share of AFS employment in subgroup total, Share 2 refers to the share of the Subgroup employment in total AFS employment

Primary production continues to dominate employment in AFS and has shed only few jobs over time. Table 4 shows the AFS employment by the segment and stages of AFS value chains, in absolute numbers and relative to the total AFS employment. Between 2018 and 2024, on average 86% of the AFS labor was employed in the upstream segment of the AFS, of which the majority was employed in production or collecting of AFS raw products. This share has declined from 91% to 80% between 2018 and 2024. The labor force in the upstream AFS has declined by 1%, capturing the slow decrease in primary production employment, which remained relatively stable over time (Table 2). This suggests that very few labor is being released from primary production to other stages of the AFS. Employment in agricultural input manufacturing is small, reflecting the limited use of chemicals in agricultural production, except for organic fertilizers. Production and forestry support services account for <1% of AFS labor force and this stage has been growing at an average annual rate of 11%.

The mid and downstream sectors of the AFS are growing at a steady pace, from a small base, as they absorb new entries into the AFS sector. The midstream segment of the AFS remains small as it employs only 3% of the AFS labor force. Most of the midstream jobs are in processing, which is growing at an annual rate of just 1%, indicating more recent activities in AFS manufacturing activities. Logistical and processing support services capture a marginal share of AFS employment. The upstream segment employed, on average, 11% of the AFS labor force and is growing at an annual average rate of 17%, driven by the increasing number of workers that enter the AFS and go into food service and retail marketing activities. Growth in the mid- and downstream sectors, however, is variable over time, and most likely related to the fact that the LFS was not designed to provide representative statistics at such granular level. Overall, as labor participation in upstream activities is stagnant or declining, employment growth is happening more in off-farm activities of the AFS. While there is no release of labor of the farm (yet), this structural transformation seems to be driven by new entries into the sector, particularly by younger people (see below).

Table 4: Disaggregating labor force participation by AFS segments and stages

	Stage	2018	2019	2020	2021	2022	2023	2024	Av.	Av. Share	Av YoY GR

Up-stream	1. Prod., logging or collection	161,552	158,240	156,399	157,241	124,443	157,326	152,222	152,489	85%	-1%
	2. Manuf. of agro-inputs	40	62	112	60	40	40	40	56	0%	0.0%
	3. Production support services	762	1,081	463	1,990	1,988	3,201	1,723	1,601	1%	14%
	Total upstream	162,355	159,383	156,974	159,292	126,471	160,568	153,986	154,147	86%	-1%
Mid-stream	4. Logistics	880	834	860	895	882	826	1,000	883	0%	2%
	5. Food and Beverage Manuf.	2,216	2,012	1,881	1,660	1,638	2,497	2,840	2,106	1%	4%
	6. Manuf. support services	1,426	1,302	1,486	1,891	1,969	2,376	3,719	2,024	1%	8%
	Total midstream	4,522	4,147	4,228	4,447	4,490	5,699	7,558	5,013	3%	9%
Down-stream	7. Wholesale marketing	1,172	665	1,285	1,463	773	3,574	3,716	1,807	1%	19%
	8. Retail marketing	5,184	3,352	7,465	3,385	4,903	16,604	10,128	7,289	4%	11%
	9.Food and beverage service activities	4,754	6,344	7,089	9,301	10,609	18,819	16,869	10,541	6%	21%
	Total downstream	11,110	10,361	15,839	14,148	16,285	38,998	30,714	19,636	11%	17%

*Note: yoy GR refers to year on year growth rates, CAGR is compounded annual growth rate. * refers to years with too many zeros to calculate an average*

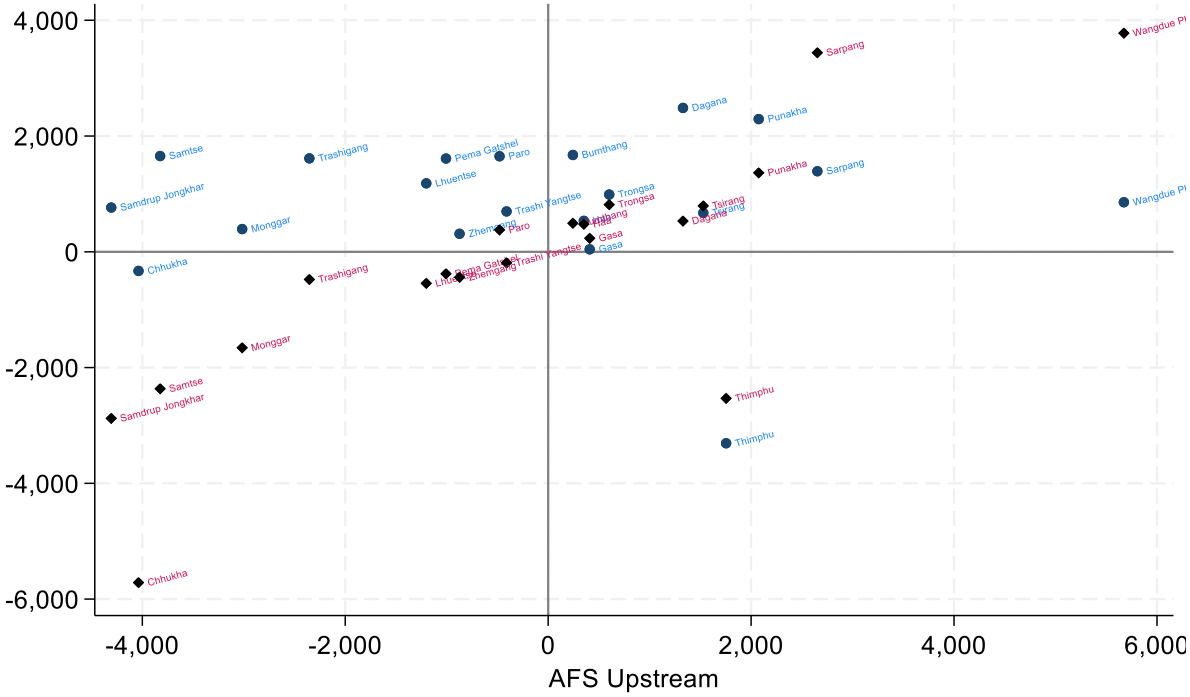
The AFS value chain in Bhutan is reported as unorganized, disintegrated, weakly linked, dominated by smallholder farmers (Sherpa, 2020 ; Bhujel and Reemer, 2024). Upstream, the AFS is challenged by a centrally-managed unreliable input supply system, low yields, high cost of production, and increasing vulnerability to climate change. The weak midstream in Bhutan is attributed to poor infrastructure for post-harvest, processing and food safety; rudimentary, traditional, small, and poor processing technologies; absence of producer coordination and organization, and regulatory hurdles like certification. Conventionally, it is a common practice for single player to manage the AFS supply chain resulting in isolated and un-coordinated value chain. Unorganized and poorly regulated AFS value chain may be driving high cost, low competitiveness, and significant food loss and waste, thus limiting sector growth, skill development, and employment. These AFS challenges curtails agriculture sector growth and require strategic interventions in terms of innovations to improve employment, income opportunities, and competitive advantages (Berdegue et al., 2023).

Employment dynamics across and outside the AFS shows substantial cross-district heterogeneity. Figure 3 shows the scatterplot of the change between (i) upstream AFS employment (x-axis) and (ii) combined mid- and upstream ('off-farm') employment (blue

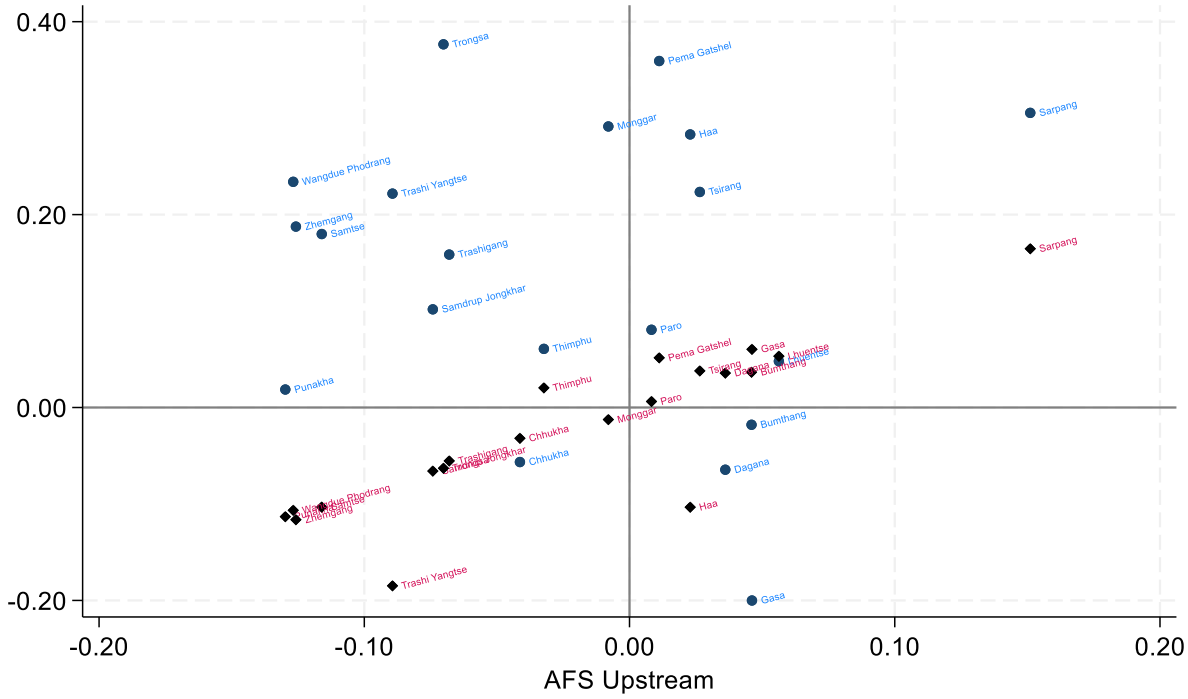
markers) and non-AFS employment (red markers) (y-axis) in absolute (top) and relative (bottom) numbers. Remember that the LFS data allow to examine composition shifts in annual employment stocks only. Traditional dual economy models of structural transformation would predict a release of labor out of primary production into the non-AFS sector. However, for about half of the districts, employment numbers in both the upstream AFS and non-AFS has increased over time, with Sarpang and Wangdue Phodrang as outliers. On the contrary, the other half, in the bottom left quadrant, saw a contraction in both sectors. These patterns, observed in absolute and relative employment changes, suggest that upstream and non-AFS tend to move in similar directions at the local level, most likely affected by local factors related to local labor market expansion or net out-migration. Looking at changes within the AFS (blue markers), we find that for several districts, including Samste, Samdruk Jonkghar and Trasigang, the decrease of upstream AFS employment is matched with an increase in mid or upstream AFS employment (top left quadrant). This could suggest that labor from primary production is relocating towards off-farm activities. Other districts, such as Sarpang or Bumthang, exhibit simultaneous increases across AFS (and non-AFS) employment, suggesting broad-based growth.

Figure 3: Scatterplot of changes in employment in upstream vs mid- and upstream and non-AFS

Panel 1: Change in upstream AFS (x-axis) versus change in mid and downstream AFS (y-axis)



Panel 2: Change in upstream AFS (x-axis) versus change in non-AFS (y-axis)



Note: change in employment is measured as the absolute difference between the average of 2024 and 2023 and the average of 2018 and 2019. The LFS data does not allow to track workers flow.

Increased specialization is happening within the production stage. Table 5 displays the AFS employment disaggregated by subsectors based on the type of AFS product produced. Among the sub-sectors that constitute the upstream segment of the AFS, most labor is engaged in mixed (49%) or crop (35%) farming with just 5% active in (specialized) livestock production activities. Interestingly, the share of AFS employment in mixed farming has dropped by an annual rate of 8%, while the crop and livestock sector have been growing annually by 4% and 10%, respectively. This may indicate that agricultural producers are slowly transitioning from mixed farming into more specialized farming of particularly crops. This could be related to the changing composition of agricultural output (value) in Bhutan, where staple production (typically part of an integrated farm) is replaced by spices, vegetables, and meat production; which typically involve a higher degree of specialization. In 2024, the crop sub-sector was recorded as the highest employer in AFS with 47%, followed by mixed farming at 30%, and food and beverages with 14%. Employment related to food and beverages, spread across mid- and downstream activities, employs 9% of the AFS work force, and showing the highest annual growth rate of 17%.

Table 5: Disaggregating labor force participation by AFS subsectors

Stage	2018	2019	2020	2021	2022	2023	2024	Av.	Av. Share	Av YoY GR
1. Crop	68,282	50,761	55,714	43,388	47,666	72,479	88,700	60,999	35%	4%
2. Livestock	5,999	8,023	7,544	7,755	8,251	12,947	10,698	8,745	5%	10%

3. Mixed farming	89,264	100,745	94,182	107,616	71,434	76,923	56,781	85,278	49%	-8%
4. NTFP	828	1,379	1,450	1,644	640	300	854	1,014	1%	1%
5. Food and beverages	9,296	11,242	12,572	14,600	16,006	28,405	25,616	16,820	10%	17%
6. Unclassified	1,719	971	1,552	2,902	2,449	5,917	4,330	2,834	2%	15%

*Note: yoy GR refers to year on year growth rates, CAGR is compounded annual growth rate. * refers to years with too many zeros to calculate an average*

The LFS data show an interesting anomaly in 2022. Between 2021 and 2022, Table 2 shows that the active labor force in Bhutan dropped by 11% (34,337 individuals), driven by a drop of 24% (33,560 individuals) and 13% (6,018 individuals) in primary and secondary sector employment, respectively, while the tertiary sector grew by 4% (5,241 individuals). Similarly, Table 3 and Table 5 shows a drop of AFS employment of 21% or 33,384 individuals, which was concentrated in rural areas (92%), among females (70%) and in mixed farming activities. Since the non-AFS employment remained stable, this drop does not represent a shift from AFS to non-AFS. Most interestingly, between 2023 and 2022, the working population and active labor force increased by 18% and 24%, respectively, contributing to a strong growth in Bhutan's labor force. All economic sectors and AFS segments, and particularly the downstream segment, note a growth that is aligned with the pre 2022 growth trend. All of this may suggest a temporary increase in economic inactive population in 2022, related to the impact of the COVID-19 pandemic (NSB, 2022), possibly related to females' greater engagement in home based, informal weaving production.

Education becomes more formal in mid and downstream employment. The left panel of Table 6 shows the education background of AFS related employment, grouped into four classes.[10] Most workers in the upstream segment (73%) have no formal education, consistent with household-based primary production and reliance on experience-based skills and traditional practices. Tertiary-educated workers are still a small group (1%) in the upstream segment, but expanding rapidly (20% YoY), likely reflecting growth in professional support roles (extension, veterinary, and regulatory services), particularly in the public sector. The education profile of workers is more mixed in the midstream segment: 32% of workers have no education, while 42% have secondary education. This may reflect different types of skills needed for midstream employment, such as driving and manual handling of logistics compared to basic technical and literacy skills for operating a processing unit. Downstream, 42% of AFS workers have secondary or tertiary education, and the number of people with such education is growing at the highest rate. Overall, the mid and downstream segment of the AFS is increasingly demanding workers with higher levels of education to perform more basic and advanced skills off the farm.

[10] Education responses in the LFS data were simplified into four broad categories. "ECCD" and "Primary" were grouped as Primary; "Lower secondary," "Middle secondary," and "Higher secondary" were grouped as Secondary; and "Certificate/Diploma," "Bachelor's degree," and "Master's degree and above" were grouped as Tertiary. Any remaining cases (including blank/missing responses) were classified as No education.

Own account and family workers dominate the AFS upstream segment, while wage employment is increasingly central the midstream segment. The middle panel of Table 6 shows the employment status of AFS related employment, grouped into four classes.[11] Unpaid family workers (53%) and own-account workers (45%) account for nearly all employment in the upstream segment. During 2018 to 2024, the proportion of these classes largely remained constant, except for the 2022 anomaly. This implies that the upstream segment is overwhelmingly household-based and informal, with most labor coming from household members and very few hiring of employees on a regular basis. In the midstream segment, wage employment (77%) dominates and is expanding at an annual rate of 6%, meaning that the manufacturing industry provides more formal and organized employment. It may also suggest the midstream segment is creating jobs at an increasing rate. Own-account work remains significant (17%) in the midstream, meaning that one fifth of the sector constitutes of self-employed operators. Downstream, half of AFS workers are own-account workers while another third is wage worker. This means that most workers in marketing or food services are mostly working for themselves, running a small business without regularly hiring laborers. Hence, the downstream segment of the AFS is characterized by entrepreneurship and informal livelihoods.

Table 6: LFS disaggregated by AFS segment, education, employment status, and agency

	Education				Employment Status				Agency			
Stream		Abs	Share	YoY Gr		Abs	Share	YoY Gr		Abs	Share	YoY Gr
Up	None	113	73%	-4%	Wage employee	3	2%	9%	Ag. farming	152	98%	-1%
	Primary	20	13%	3%	Employer	0.0	0%	-34%	Public sector	2	1%	14%
	Secondary	20	13%	9%	Own-account	69	45%	-1%	Private sector	1	0%	-4%
	Tertiary	2	1%	20%	Family worker	82	53%	-1%	Other	0.0	0%	0%
Mid	None	1	32%	10%	Wage employee	3	77%	6%	Ag. farming	0.2	4%	-48%
	Primary	1	18%	-5%	Employer	0.0	1%	0%	Public sector	1	28%	8%
	Secondary	2	42%	6%	Own-account	1	17%	1%	Private sector	2	63%	16%
	Tertiary	0.3	7%	8%	Family worker	0.2	5%	22%	Other	0.2	5%	0%
Down	None	5	29%	15%	Wage employee	6	33%	24%	Ag. farming	1	3%	3%
	Primary	2	14%	19%	Employer	0	3%	-12%	Public sector	1	7%	47%
	Secondary	9	49%	25%	Own-account	8	49%	18%	Private sector	15	89%	19%
	Tertiary	1	9%	18%	Family worker	3	15%	22%	Other	0.1	1%	

Note: Abs refers to average absolute number in thousand, Share is the share for each subcategory within the up, mid, or downstream total, and YoY Gr is the year on year growth in absolute numbers. Growth rates for small categories should be interpreted cautiously due to small base sizes.

While the upstream segment is employment heavy, the employment in the mid and downstream segments is more enterprise-led. The right panel of Table 6 groups organization

[11] Employment status categories in the LFS data were combined into four broad groups for analysis. "Regular paid employee," "casual paid employee," and "apprenticeship/internship" were grouped as wage employees; "employer" remained its own category; "own account (agri)" and "own account (non-agri)" were grouped as self-employed (own-account); and "family worker (agri)" and "family worker (non-agri)" were grouped as unpaid family workers.

type of AFS employment into four classes.[12] Workers classified as agricultural workers dominate the upstream sector (98%) with minimal private sector (1%) engagement, reflecting the absence of commercial farms and reliance on smallholders producing for own use with surplus being marketed. In contrast, the mid- (63%) and downstream (89%) workforce of the AFS is predominantly in private enterprises, which together employ 13% of the total AFS workforce. However, yearly growth rates in private sector employment are variable, influenced by seasonality of employment in the country (MoF, 2024), sector-specific trends, overall economic performance, and skills mismatch (Alaref et al. 2024). The public sector employs on average 1,738, 1,124, and 1,319 workers across up-, mid-, and downstream segments to provide important professional services, despite its marginal share (2%) of the total workforce.

AFS employment has an older age structure, with older workers concentrated in upstream production but employment growth increasingly driven by younger age cohorts. Table 7 displays the age structure of AFS employment. Workers aged above 55 still constitute, on average, 26% of the AFS, predominantly engaged in the upstream segment (95%). While the number of older upstream workers is declining slightly over time (about -2% YoY), upstream remains the main activity for all age cohorts in absolute terms. The concentration of elder workers in upstream primary production activities, which has implications for labor productivity, innovation, and succession. Workers within age cohorts 25-34, 35-44, and 45-55 employ the bulk of the AFS workforce (22%, 24%, and 21%, respectively). Workers in age cohorts 35-44 and 25-34 constitute two thirds of employment in the mid- and downstream segments, and their participation in the AFS is growing over time by 3% annually. Youths, considered as the age cohort 15 – 24, are still mainly engaged in upstream activities in absolute terms, but are relatively more represented downstream than older cohorts, suggesting that young workers are more attracted to downstream activities such as retail, wholesale, and food services than to farming. These patterns are consistent with youth perceptions that constraints to innovation, technology, skill development, and infrastructure reduce the attractiveness of upstream farming (FAO, 2024).

Table 7: Age structure of AFS employment by stages in the AFS value chain

		Abs	YoY Gr	Share in Segment	Share in total AFS	Share of cohort in AFS
Upstream	15-24	10,364	-2%	7%	6%	8%
	25-34	30,391	0%	21%	17%	22%
	35-44	35,728	1%	24%	20%	24%
	45-55	33,615	-2%	21%	19%	21%
	>55	44,293	-2%	27%	25%	26%
Midstream	15-24	708	0%	14%	0%	
	25-34	1,432	2%	33%	1%	
	35-44	1,104	15%	35%	1%	

[12] Agency type was simplified into four groups. “Agriculture farming” was kept as its own category. Several public institutions (“government agencies/other government agencies,” “civil service,” “SOE,” “public company,” and “armed forces”) were grouped as the public sector. “Private business” and “private company” were grouped as the private sector. “INGO & CSO” and “domestic worker” were combined into other.

	45-55	629	9%	13%	0%	
	>55	193	10%	6%	0%	
Downstream	15-24	2,429	13%	12%	1%	
	25-34	6,286	20%	36%	4%	
	35-44	4,638	24%	31%	3%	
	45-55	2,066	24%	15%	1%	
	>55	1,222	0%	7%	1%	

Note: Abs refers to absolute numbers, YoY GR refers to year on year growth rates, Share in Segment is the average share of the age cohort within the AFS segment, Share in total AFS is the share of this segment-age cell to the whole AFS workforce; and Share of cohort in AFS is the share of age cohort employed in AFS overall.

These findings are consistent with global patterns of shifting employment patterns within AFS in low and middle income countries (Nico and Christiaensen, 2023). As economies grow and diets shift toward more processed, convenient, and away-from-home foods, job creation increasingly occurs beyond the farm, with employment moving from primary production into downstream trading and food services in urban areas and, where conditions allow, into midstream processing and logistics. Also, within primary production, a shift occurs to livestock, fruit and vegetables production, reflecting changing consumption demands to more protein and nutrition rich foods. While youth employment is initially concentrated in primary production, as countries develop, youth stay disproportionately in the AFS but the shift to trading and service activities in the AFS. Food processing, however, employs the smallest number of AFS workers. Thus, the traditional narrative of labor exiting agriculture can be misleading, because workers can enter or relocate within the AFS into activities that often offer higher average remuneration than farm work. Jobs in the off-farm AFS segments are also more skill-intensive and more likely to be paid or wage workers, especially in the downstream segment, while a substantial share of own account workers remains.

Moving up the AFS is associated with higher labor income, suggesting that job quality gains can be achieved from employment shifts within the AFS. Table 8 shows the predicted means of monthly employment income, hours worked per week, and income per hour for primary employment after accounting for a set of covariates including worker characteristics (age, gender, education), AFS segment indicators, and year fixed effects, with standard errors clustered at the district level. Annex 3 has the detailed pooled OLS regression results using the repeated LFS datasets from 2018 – 2024. On average, a worker in the upstream AFS segment works 50 hours a week and earns Nu 288 per hour. The average of 50 hours of work in upstream production is larger than averages for lower- and middle-income countries (Nico and Christiaensen 2023). A worker within the AFS midstream segment works the same number of hours but is likely to earn about 25% more than workers in the upstream segment. For the downstream segment and non-AFS sector, the increase in hourly income is 46% and 66%, respectively, compared to upstream jobs.[13] Downstream workers earn more in nominal terms but also more likely to work more hours per week (about 13 hours all else equal), which is significantly larger than global averages, and may

[13] These associations should be interpreted descriptively rather than causally, as the LFS data are repeated cross-sections and do not track individual transitions across segments over time

be linked to lower labor productivity. Interestingly, the difference in hourly incomes between the downstream and non-AFS sector is relatively small (13%), especially given the inclusion of high-paying sectors like hydropower. This implies that part of the income gains from structural change can occur through reallocation within the AFS rather than only through exit from it. Moving up the AFS value chain and outside the AFS sector both have clear income benefits. The income benefit from within-AFS labor changes is less documented or assessed, as global evidence typically suggests that income benefits can only be gained from leaving the sector (Dolislager et al 2018, Mizik et al. 2025).

Table 8: Predicted means of monthly income, hours worked, and income per hour

Predicted means by segment	Monthly income	Hours worked	Income per hour
Upstream AFS	13,315	50	289
	686	0.7	14
Midstream AFS	17,679	50	361
	921	0.6	20
Downstream AFS	24,592	63	422
	1,004	0.8	16
Non-AFS	23,618	51	480
	784	0.3	14

Note: Predicted means are derived from Annex 3 regressions, holding covariates at sample means and including year fixed effects; standard errors clustered at the district level.

6. Conclusion and recommendations

AFS transformation is identified globally as an important driver for sustainable agricultural growth, achieving food and nutrition security, and contribution to structural transformation processes. Promoting AFS transformation is particularly important for landlocked Bhutan, where most labor is still associated to agricultural commodities, but young people are struggling to find good jobs. The AFS offers the potential for better and more jobs in activities that add value to raw agricultural products by promoting product differentiating, processing into niche products, introducing digital innovations, or improved branding and labelling. However, understanding the role the AFS can play in transforming labor markets requires a different approach to equating agricultural jobs to employment in the primary sector. The paper, therefore, applies a AFS lens to employment structure and trends in Bhutan.

Employment in the different value chains of the AFS remains the major employer in Bhutan. This analysis provides a more comprehensive picture of employment in the AFS and estimates novel evidence on employment across AFS segments. When disaggregating national LFS data by traditional economic sectors, primary production employed on average 47% of the Bhutanese labor force between 2018 and 2024. This would suggest that while employment in the primary sector is still large, the non-agricultural sector has become major source of employment. When disaggregating the LFS data with a AFS lens, however, we find that 55% of the Bhutanese

labor force remains employed in the AFS. The underestimation in the importance of employment in agriculture-related value chains when using the traditional approach compared to the AFS approach is on average 8 percentage points, but growing over time. As more people enter the Bhutanese labor market, the national labor force is growing by an average rate of 3%. The growth in jobs outside the AFS (7%) is larger than in the AFS (1%), suggesting that new entries enter into non-AFS jobs. Moreover, as the number of AFS jobs in absolute terms remains stable over time, suggesting that little movement is happening from AFS to non-AFS jobs.

While upstream activities dominate AFS employment, jobs in the mid- and especially downstream segment of the AFS are growing. Consistent with the framework of Figure 1, the results show that a shift in employment within the AFS and limited exit to non-AFS activities. Within the AFS, upstream activities account, on average, for 86% of the AFS jobs, and decreasing by one percent per year only. The absolute number of upstream jobs remains stable and is dominated by low-education own-account and family work. We do observe more employment in the crop sector over time while mixed farming is declining over time, which could indicate that more specialization is happening within production. Conversely, midstream and downstream activities provide on average 3% and 11% of the AFS labor, respectively, but are growing at rates of 11% and 15%, respectively. Thus, while the upstream segment of the AFS has not yet released labor to go to other segments of the AFS or leave the AFS altogether, the new entrants into the AFS are active in mid and downstream activities. We observe the largest growth in retail and wholesale marketing activities and (more recently) in food services and manufacturing. These jobs tend to require more skills but also earn hourly incomes that are on average 90% more than jobs in the upstream segment. This suggests that there is an income benefit from a reallocation of labor from up- to downstream within the AFS without laborers leaving the AFS altogether.

The findings debunk some of the myths around the agricultural sector in Bhutan. First, meaningful jobs upgrading and earnings can happen within the AFS through reallocation from rural, upstream production activities to urban, downstream employment. Second, youth are not necessarily abandoning agriculture: while still predominantly active in primary production, they are relatively more present in downstream activities, suggesting that youths are repositioning themselves in the AFS, rather than exiting altogether. Third, man and women are equally engaged in the wider AFS, but focusing on different activities (e.g., females on retail and males on processing), and under different employment conditions. Fourth, while our paper cannot differentiate between desired or residual employment in AFS, upstream jobs are dominated by low levels of formal education, unpaid family and own-account work, and older workers, while midstream and downstream AFS jobs are more likely to be private-enterprise and wage-employment intensive and to require higher skills.

These findings point to four types of policy recommendations on how to create more and better jobs in the AFS.

Upstream: increases in labor productivity will help create the bulk of better jobs through higher incomes on the farm while releasing labor off the farm. The upstream segment, characterized by low formal education, high unpaid family/own-account shares, concentration of older work force, and absence of private enterprises indicates low capital deepening, limited mechanization, and slow diffusion of innovation. Increasing labor productivity on the farm will require continued support in providing public goods (e.g., irrigation infrastructure) and promoting on-farm investment in labor-saving, yield increasing inputs (e.g., mechanization). While these recommendations are well understood, the central question is how the MoAL can provide optimal incentives and governance for productive investments. For example, instead of promoting the purchase of individual power tillers through cost-sharing arrangements (at 50%), subsidizing the rental fee of shared machinery services operated by youth groups could both reduce drudgery and create local service jobs. In addition, the agricultural extension system will need to promote a package of climate-smart practices and water management to reduce risk and stabilize yields.

In addition, as the analysis also indicates early signs of growing specialization towards crop and dairy production, the MoAL will need to develop dedicated programs to foster the scale and commercialization of specialized, smallholder-led production systems. Bhutan has a competitive advantage in producing low volume, high-value products and cannot compete with imported basic food products from India (Vandercasteelen et al., 2025). Public investments need to be reoriented to strengthen standardization, certification, and traceability services that ensure production systems are capable to participate in global value chains and comply with the quality and safety requirements in niche markets. It may also mean the professionalization of aggregators or farmer marketing groups who can specialize in aggregation and transport services, and in the case of dairy, also engage in processing activities. This can help in promoting shifts labor from low-return production to higher-return marketed surplus and off-farm activities. The World Bank Group, through its AgriConnect initiative, is helping client countries to move smallholder farmers into higher paying jobs off the farm.

Midstream: Addressing the underlying barriers to agro-industry development can create more (paid) and better-quality jobs. Although growing from a small base, wage employment in the agro-industry segment of the AFS is much smaller compared to other countries (e.g., Bangladesh). This provides an opportunity for Bhutan to identify and promote domestic and foreign investment in niche segments in the agro-processing industry – such as organic or natural juices, fruit-based oils and extracts, or naturally fermented yak cheese – that create new industry jobs. This will also create the demand for complementary services to collect, aggregate, and transport raw material, thus creating additional service jobs in the midstream AFS segment. However, in order to attract investments, Bhutan will need to address the underlying barriers to more agribusiness development, which include lack of access to tailored finance for working capital, low quality and consistency of raw products, aligning agricultural research and development to industrial needs, and compliance with food safety requirements. For example,

while Bhutan is renowned for its tasty and pesticide free citrus, processing the dominant table variety is not economically viable to compete with cheap imports. Instead, agricultural policy should promote the introduction of new varieties or targeting different segments of regional or global markets (see below).

<u>Downstream</u>: Creating an enabling environment for Bhutanese enterprises and youth to innovate and compete in niche markets. The downstream segment of the AFS is fastest growing segment of the AFS, and this is where Bhutanese youths are more engaged in. However, as value added in food manufacturing and services by dominant CSI enterprises remains low, there is ample room to improve the value added to raw materials. This is visible in the fact that Bhutan exports raw materials of mediocre quality while importing more expensive, value-added goods. The downstream segment of the AFS should focus on branding Bhutan as a source of green and clean food products, building a unique reputation for the country's unique development approach, and targeting niche market segments where consumers are willing to pay for a premium price. This requires significant investment by the government in enterprise development programs for agrifood retail beyond start up support, which include more sophisticated business development skills such as bookkeeping and accounting, digital skills, price discovery, better planning for export and inventory management. In addition to investment in soft skills, developing an agro-industry will require public investment in logistical infrastructure and services such as commodity clusters, in-field grading and cleaning equipment, and agro-industry hubs or parks.

<u>Inclusion</u>: creating better and more jobs across the AFS will require significant upgrading of skills and capacities across the workforce. While youths within the AFS are still mostly employed upstream, their relative presence and growth in mid and downstream sector is accelerating over time. The more technical activities in the AFS mid- and downstream segments may attract rural youths, who may be less attracted to the labor-intense drudgery work of farming and are more tech savvy. As the mid and downstream segments are increasingly demanding for literacy, education, and skills, young people will need access to education and skills systems (TVET, short courses, apprenticeships) for the mid and upstream segment to become engines of growth. The government should therefore invest in human capital through targeted short-cycle skilling programs training for machine operators, quality control, warehouse/logistics, drivers; formal apprenticeships with private processors/logistics firms, and strengthening TVET aligned to industrial needs.

References

1. Aita Kumar Bhujel, Thies Reemer. 2024. Brokering from the Farm to the Shop | Improving Connections Between Formal and Informal Actors in the Dairy Value Chain in Bhutan. Wageningen University & Research, The Netherlands
2. Alaref, Jumana; Etang Ndip, Alvin; Dorji, Cheku; and Martinoty, Laurine. 2025. Migration Dynamics in Bhutan: Recent Trends, Drivers, and Implications. Washington, DC: World Bank.
3. Chenery, H. B. (1960). Patterns of industrial growth. American Economic Review, 50(4), 624–654. [jstor.org], [scirp.org]
4. Christiaensen, Luc, Zachariah Rutledge, and J. Edward Taylor. "The future of work in agri-food." Food policy 99 (2021): 101963.
5. Christiaensen, L. and Martin, W., 2018. Agriculture, structural transformation and poverty reduction: Eight new insights. World Development, 109, pp.413-416.
6. Davis, B., Mane, E., Gurbuzer, L.Y., Caivano, G., Piedrahita, N., Schneider, K., Azhar, N., Benali, M., Chaudhary, N., Rivera, R., Ambikapathi, R. and Winters, P. 2023. Estimating global and country-level employment in agrifood systems. FAO Statistics Working Paper Series, No. 23-34. Rome, FAO.
7. M Dolislager, T Reardon, A Arslan, L Fox, S Liverpool-Tassie, C Sauer, D Tschirley. 2018. Livelihood portfolios of youth and adults: A gender-differentiated and spatial approach to agrifood system employment in developing regions. Background paper for the Rural Development Report 2019. International Fund for Agricultural Development, Rome (2018)
8. Dizon, F., Imtiaz, M.S. and Yu, J., 2025. Identifying the impact of water constraints on agricultural productivity in hillside contexts. Agricultural Economics, 56(1), pp.92-107.
9. E. Corong, M. Gautam, W. Martin, R. Vos, 2024. Measuring employment and job quality in agrifood systems: a comprehensive approach. CGIAR Rethinking Food Markets Technical Paper, International Food Policy Research Institute, Washington D.C.
10. FAO, 2024. Aspirations of Young People for the Agrifood Sector in Bhutan. https://www.fao.org/bhutan/news/detail/aspirations-of-young-people-for-the-agrifood-sector-in-bhutan/en#:~:text=Farming%20is%20often%20viewed%20as,the%20UN%20Youth%20Strategy%202030.
11. Gollin, D., & Kaboski, J. P. (2023). New views of structural transformation: Insights from recent literature. Oxford Development Studies, 51(4), 339–361. https://doi.org/10.1080/13600818.2023.2280748
12. Julion Berdegue, Caroline Trivelli, and Rob Vos, 2023. Agrifood Systems Employment-Innovations, policies, and knowledge gaps, CGIAR Initiative on Rethinking Food Markets, Initiative Brief 1. December 2023. https://cgspace.cgiar.org/server/api/core/bitstreams/4993cffd-331e-4032-aa56-0e1c5e58d234/content#:~:text=Background,card/en/c/cc4337en
13. Kuznets, S. (1957). Quantitative aspects of the economic growth of nations: II. Industrial distribution of national product and labor force. Economic Development and Cultural Change, 5(Supplement), 1–111.
14. Katwal T, Dorji S, Dorji R, Tshering L, Ghimiray M, Chhetri G, et al. Community perspectives on the on-farm diversity of six major cereals and climate change in Bhutan. Agriculture. 2015;5(1):2–16. https://doi.org/10.3390/agriculture5010002.
15. Lewis, W. A., 1954. Economic development with unlimited supplies of labour. The Manchester School, Volume 22. Pp 139-191
16. Mizik, T., Nagy, J., Molnár, E.M. et al. Challenges of employment in the agrifood sector of developing countries—a systematic literature review. Humanit Soc Sci Commun 12, 62 (2025). https://doi.org/10.1057/s41599-024-04308-3
17. Martins, P. M. G. (2019). Structural change: Pace, patterns and determinants. Review of Development Economics, 23(1), 1–32. https://doi.org/10.1111/rode.12555
18. MoF, 2024. Macroeconomic Situation Report 4th Quarter Update: FY 2023-24. Department of Macro-Fiscal and Development Finance September 2024, Ministry of Finance, Royal Government of Bhutan
19. NAB, 2024. Prime Minister Presents the State of the Nation Report to the joint sitting of Parliament. National Assembly of Bhutan, 4 July, 2024. https://nab.gov.bt/post/prime-minister-presents-the-state-of-the-nation-report-to-the-joint-sitting-of-parliament
20. Nico, Gianluigi, and Luc Christiaensen. Jobs, food and greening: Exploring implications of the green transition for jobs in the agri-food system. Washington, DC, USA: World Bank, 2023.

21. NSB [National Statistics Bureau]. 2019. Population Projections Bhutan, 2017–2047. Thimphu, Bhutan: Royal Government of Bhutan.
22. NSB, 2018. Rural-urban migration and urbanization in Bhutan, National Statistical Bureau, Thimphu, Bhutan.
23. NSB, 2020. Bhutan Standard Industrial ClassificatIon of All Economic Activities Version – 1, National Statistics Bureau, Thimphu
24. NSB, 2022. Bhutan living standard survey report. National Statistical Bureau, Thimphu.
25. NSB, 2022. Bhutan Standard Classification of Occupations, BSCO - 2022 Version 2. National Statistics Bureau, Royal Government of Bhutan
26. NSB, 2024. Labor Force Survey Report, Bhutan, Thimphu, Bhutan
27. Reardon, Thomas, Lenis Saweda O. Liverpool-Tasie, and Bart Minten. "Quiet Revolution by SMEs in the midstream of value chains in developing regions: wholesale markets, wholesalers, logistics, and processing." Food Security 13, no. 6 (2021): 1577-1594.
28. Sherpa, Dawa. (2020). DAIRY CO-OPERATIVES IN BHUTAN Understanding Potentials towards Co-operative Chain Development partial fulfilment of the requirements for the Masters Degree on Agriculture Production Chain Management with specialization on Livestock Chains. 10.13140/RG.2.2.21962.80323.
29. Vandercasteelen, Joachim; Gill, Joshua; Gurung, Tayan Raj. 2025. Bhutan Agricultural Spending and Incentive Review : A Strategic Assessment of Public Expenditure and Market Incentives in Bhutan's Agrifood System (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/099718202252629027
30. World Bank, 2024 Bhutan Country Economic Memorandum : Maximizing Bhutan's Potential for Economic Diversification and Structural Transformation (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/099090324133081117.
31. World Bank, 2025. Jobs: The Path to Prosperity
32. Yi, J., Jiang, S., Tran, D. et al. Agrifood value chain employment and compensation shift with structural transformation. Nat Food 6, 868–880 (2025). https://doi.org/10.1038/s43016-025-01225-9

Annexes

Annex 1:

Table: BSIC sections and divisions relevant to AFS

BSIC Section	BSIC Division
A. Agriculture, forestry and fishing	01 to 03
C. Manufacturing	10 to 17, 20, 21, 28, 31, 32
G. Wholesale and retail trade	46 to 47
I. Accommodation and Food service activities (food and beverage service)	56
M. Professional, scientific and technical services	69 to 75
N. Administrative and support services	77 to 82
O. Public administration and defense	84
T. Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	98

Table: Relevant Occupations at Unit-level of the BSOC 2022

BSCO Unit	included	Description	Value chain category
1311	Yes	Agricultural and Forestry Production Managers	
1312	Yes	Aquaculture and Fisheries Production Managers	
1321	Yes	Manufacturing Managers	
1324	Yes	Supply, Distribution, and Related Managers	
1412	Yes	Restaurant Managers	
1420	Yes	Retail and Wholesale Trade Managers - same	
2132	Yes	Farming, Forestry and Fisheries Advisers	
2163	Yes	Product and Garment Designers	
2250	Yes	Veterinarians	
3142	Yes	Agricultural Technicians	
3143	Yes	Forestry Technicians	
3240	Yes	Veterinary Technicians and Assistants	
3322	Yes	Commercial Sales Executives	
3434	Yes	Chefs	
4322	Yes	Production Clerks	
5120	Yes	Cooks	
5131	Yes	Waiters	
5132	Yes	Bartenders and Baristas	
5211	Yes	Stall and Market Salespersons	
5212	Yes	Street Food Salespersons	
5246	Yes	Food Service Counter Attendants	
6111	Yes	Field Crop and Vegetable Growers	
6112	Yes	Tree and Shrub Crop Growers	
6113	Yes	Gardeners, Horticultural and Nursery Growers	
6114	Yes	Mixed Crop Growers	
6121	Yes	Livestock and Dairy Producers	
6122	Yes	Poultry Producers	
6123	Yes	Apiarists and Sericulturists	

6129	Yes	Animal Producers Not Elsewhere Classified	
6130	Yes	Mixed Crop and Animal Producers	
6210	Yes	Forestry and Related Workers	
6221	Yes	Aquaculture Workers	
6310	Yes	Subsistence Crop Farmers	
6320	Yes	Subsistence Livestock Farmers	
6330	Yes	Subsistence Mixed Crop and Livestock Farmers	
6340	Yes	Subsistence Fishers, Hunters, Trappers and Gatherers	
7233	Yes	Agricultural and Industrial Machinery Mechanics and Repairers	
7317	Yes	Handicraft Workers in Wood, Basketry and Related Materials	
7318	Yes	Handicraft Workers in Textile, Leather and Related Materials	
7511	Yes	Butchers, Fishmongers and Related Food Preparers	
7512	Yes	Bakers, Pastry-cooks and Confectionery Makers	
7513	Yes	Dairy Products Makers	
7514	Yes	Fruits, Vegetables and Related Preservers	
7515	Yes	Food and Beverage Tasters and Graders	
7516	Yes	Tobacco Preparers and Tobacco Products Makers	
7521	Yes	Wood Treaters	
7522	Yes	Cabinet-makers and Related Workers	
7523	Yes	Woodworking Machine Tool Setters and Operators	
8152	Yes	Weaving and Knitting Machine Operators	
8155	Yes	Fur and Leather Preparing Machine Operators	
8160	Yes	Food and Related Products Machine Operators	
8171	Yes	Pulp and Papermaking Plant Operators	
8172	Yes	Wood Processing Plant Operators	
8341	Yes	Mobile Farm and Forestry Plant Operators	
9211	Yes	Crop Farm Labourers	
9212	Yes	Livestock Farm Labourers	
9213	Yes	Mixed Crop and Livestock Farm Labourers	
9214	Yes	Garden and Horticultural Labourers	
9215	Yes	Forestry Labourers	
9216	Yes	Fishery and Aquaculture Labourers	
9411	Yes	Fast Food Preparers	
9412	Yes	Kitchen Helpers	
9624	Yes	Water and Firewood Collectors	

Annex 2

Annex 3: Regression result of pooled OLS on monthly income, hours worked, and income per hour

Regression coefficients	Monthly income	Hours worked	Income per hour
Age Groups (base=15 - 20)			
25-34	0.282***	0.303	74.69***
	(8.79)	(1.14)	(4.97)
35-44	0.420***	0.681*	137.4***
	(10.12)	(2.33)	(8.01)
45-54	0.458***	0.452	187.0***
	(9.01)	(1.06)	(8.65)
55-64	0.334***	-1.272*	197.7***
	(5.67)	(-2.41)	(5.71)
Gender (base=female)			
Male	0.263***	1.606***	54.87***
	(12.00)	(5.82)	(5.39)
Education (base=none)			
Primary	-0.00503	1.029***	30.36**

	(-0.29)	(3.94)	(3.54)
Secondary	0.218***	-0.503	109.2***
	(7.83)	(-1.75)	(7.96)
Tertiary	0.752***	-3.985***	452.7***
	(25.14)	(-8.38)	(25.81)
AFS segment (base=upstream)			
Midstream	0.394***	0.439	72.60**
	(6.86)	(0.55)	(3.58)
Downstream	0.691***	13.37***	133.6***
	(11.41)	(16.42)	(7.69)
Non-AFS	0.781***	1.206*	192.0***
	(15.60)	(2.17)	(13.39)
Constant	8.179***	49.85***	-56.74**
	(91.53)	(42.38)	(-3.06)
Observations	9893	10982	9901