Employment patterns in Bhutan's agrifood system

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1. Abstract

Bhutan, a landlocked country with a unique development approach, is facing an existential threat in its labor market as young people are emigration to find better jobs. In this paper, we apply a new approach for assessing employment patterns across the different segments of the agrifood system (AFS), Bhutan's main employer. Typically, labor force surveys disaggregate employment by traditional economic sectors and equate agricultural employment with being active in primary production. However, this approach does not adequately capture how employment shifts as the AFS transforms, where jobs are relocated away from the farm towards industry or service activities that added value to primary production. By analyzing industry codes and job descriptions in a panel of Bhutan's labor force data from 2018 to 2024, this paper applies an AFS lens to national employment statistics. We find that most Bhutanese (52%) are employed in the AFS. While Bhutan's active labor force is growing over time, those active in the AFS remain stable in absolute terms, resulting in a declining share of employment in AFS. Within the AFS, labor remains highly concentrated in upstream production activities and the release of labor towards other AFS segments or outside the AFS remains slow. The share of AFS jobs in the upstream AFS segment is growing (fast) over time, driven by new entries in the AFS going into agricultural retail activities. At the same time, just 1% of agrifood jobs are in the AFS midstream segment, and employment in the processing industry is growing over time. We find that incomes in the downstream segment of the agrifood sector are 85% higher compared to upstream jobs, but not significantly different from the income earned in jobs outside the agrifood sector. Thus, the income benefit to the jobs transformation arises within the sector. These findings required tailored policy responses that address barriers for agroindustry expansion while facilitating more investment in value addition services.

2. Introduction

The agrifood system (AFS) is a dynamic and complex network of interconnected actors and activities in producing, processing, distribution, and consuming raw produce, processed food, and related products. Globally, the AFS constitutes one-sixth of the world economy, provides the largest source of employment, and directly supports the livelihood of farmers (Corong

et al., 2024 ; Yi et al., 2024). The AFS's fundamental mission 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. To mitigate and adapt to the emerging challenges, many governments across the world are seeking to transform the AFS using innovation and technology, sustainable and regenerative production practices, transparent and inclusive value chains to drive better production, better nutrition, better environment and better life for all.

AFS employment refers to jobs across the entire value chain that connects the producers, aggregators, and processors of different food and agricultural commodities with their ultimate end consumer in domestic or foreign markets. 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. AFS is globally providing employment for over 1 billion people to produce, process and trade the produces. 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 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 at the benefit 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 has been the fastest when 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 labour 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 still. 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 has become the dominant sector in terms of contribution to GDP. Although, long-trend show employment shifting from primary to the tertiary sector, primary and tertiary sector remain dominant sectors (NSB, 2024). After decades of decline, the contribution of the primary sector to GDP has grown and stagnated in the last decade to 16%. Similarly, the sector employs about 44% of the active labour force in Bhutan and the absolute number of employees has not changed much over time. Thus, the structural transformation process has not pulled away labour or resources out of the agricultural sector as theory would suggest.

Bhutan's labor market is now faced with an existential treat of outmigration and youth unemployment. Bhutan's labor market is characterized by high labour force participation (63.9%) and overall employment rate of 96.5% but struggles with significant youth unemployment (19%). At the same time, it is estimated that 64,000 people have emigrated 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. 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.

Bhutan's AFS can contribute to transformation to contribute to more and better jobs in Bhutan. Bhutan's landscapes offer diverse natural resources, ecosystem services, and favourable environments for producing fruits, spices, livestock, and forest products, including the high-value medicinal cordyceps (World Bank, 2024). 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 fit to produce high-value-low-volume commodities that can fetch better returns from niche markets. Predominantly a 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 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 a new framework of classifying AFS jobs to better understand how AFS employment trends can contribute to Bhutan's jobs agenda. First, we apply a conceptual framework that defines the different stages of AFS value chains and distinguishes between the upstream, midstream, or downstream segments. Second, we use the sector, industry, and occupation codes in a panel of the Bhutan Labor Force Survey (LFS, 2018 – 2024) to classify whether jobs are within the AFS or not and at which stage and segment. This new approach allows the paper to contribute to the existing literature by proper assessing the structure and level of

employment in the AFS and identify how policies can improve the potential of the AFS to create better and more jobs and thereby contributing to the overall process of structural transformation and youth employment in Bhutan.

We find that AFS jobs remain concentrated in production but that there is an income benefit from moving up the AFS value chain. Using the traditional classification approach, Bhutan's LFS data shows that the share of employment in the primary sector was on average 47.6% and decreased from 54% to 42% between 2018 and 2024. Instead, when using an AFS perspective, the average share of the total working population employed in the AFS is 52%, implying that the traditional approach of equating agriculture employment with primary production underestimates employment in the AFS by 4 percentage points. AFS employment in absolute terms is on a downward trend, but this decline in absolute terms is small (average growth rate of -2%), not linear, and driven by people entering the labor market being absorbed into the service sector. The large majority of AFS jobs is still in primary production, but this share has reduced between 2018 and 2025 from 96% to 89%. Conversely, while jobs in the AFS related to industry activities has been stagnant at 1%, the share of service-related jobs has increased from 3% to 10% in the same period. We also find that incomes in the downstream segment of the agrifood sector are 90% higher compared to upstream jobs, but not significantly different from the income earned in jobs outside the agrifood sector. 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 in a 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.

3. Conceptual Framework

The employment structure of a sector is influenced by the macro-level economic trends factored by industry-specific factors, labor market dynamics, and government policies. The changing socio-economic conditions also have influence on job quality and movement of

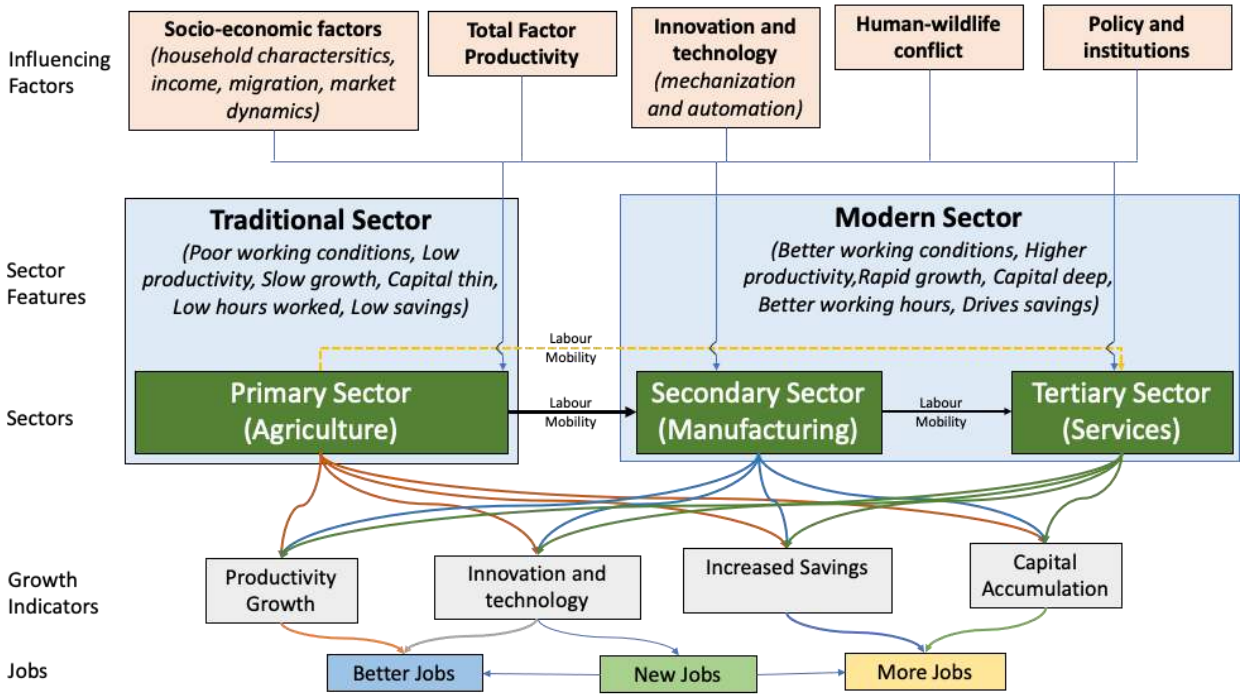
workforce between sectors. Structural transformation envision growth as arising from the movement of the economy from a low-productivity sector to a high productivity sector with capital accumulation (Lewis, 1954). The driving force to structural transformation is the change of productivity in the modern sectors dominated by manufacturing and services. It is also characterized by the movement of workforce from labour-intensive activities to skill-intensive ones. Structural transformation is essential to achieve greater diversity of the economic structure for resilient economy (UNIDO, 2012[1]). Traditional sector is characterized by subsistence-based activities (farming, hunting, fishing driven by customs and traditions). It typically involves small-scale operations, poor working conditions, low productivity, slow growth, low savings, limited investments, and low hours of work. In contrast modern sector are characterized by strong focus on technological advancement, data integration, better working conditions, higher productivity, rapid growth, high investment, better working hours, and higher savings. These two basic differences, push-pull the work force.

While conventionally the structural transformation imply economy shift from low-productivity agriculture to higher value-added and productivity manufacturing and then to services, with an increase share of higher skilled work. ILO (2024[2]) reports that many countries have experienced, the reallocation of employment from agriculture to low-productivity services by passing the manufacturing sector. In case of Bhutan, considering the priority to service sector (health, education, and tourism), the shift may be justified. However, as the Economic Roadmap and 13th FYP categorized agriculture, hydropower and tourism as three priority sectors, the development efforts aim at generating more and better jobs by enhancing innovation, productivity growth, savings and capital accumulation (Figure 1).

[1] https://downloads.unido.org/ot/51/00/5100707/Haraguchi_PPS_PRS_ICD_INT_2012_BRICS.pdf

[2] https://www.ilo.org/resource/article/centrality-structural-transformation#:~:text=Comprehensive%20employment%20policy%20frameworks%20are,decent%20and%20productive%20employment%20opportunities.

Figure 1: Conceptual framework of the study



4. Data and Methodology

The paper uses data from LFS conducted by the National Statistics Bureau (NSB) of Bhutan between 2018 and 2024. The LFS is a nationally representative household-based survey aimed at collecting comprehensive information on labour 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 labour 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, but for the purpose of our analysis, statistics are aggregated to the household level or relevant group statistics as explained below.

Table 1. Sample used for analysis

	Number of households in each Labour Force Survey years						
Sample	2018	2019	2020	2021	2022	2023	2024
Survey sample	8,855	8,770	8,932	10,076	10,506	3,008*	8,932**
RNR-sector sample	2,425	3,913	5,133	5,729	5,218	1,430	2,574
Sample used for analysis	2,288	3,636	4,974	5,602	5,509	1,418	2,471

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

The analysis started with identifying jobs are in the AFS using two steps. First, the analysis used the industry codes from the Bhutan Standard Industrial Classification (NSB 2020) to identify industries with activities related to the AFS. The AFS 'relevant' industries consist of: (1) administrative and support services; (2) agriculture, forestry and fishing; (3) food and beverage service; (4) manufacturing; (5) producing activities of households for own use; (6) professional and scientific services; (7) public administration; and (8) wholesale and retail trade. One data issue relates to the granularity of the industry code, as before the publication of the BSIC, the LFS data reported industry codes at four digits. The analysis addressed this issue by carrying out the classification using the first two digits of the industry codes which are consistent across years. Practically, BSIC codes starting with 77 to 82, 01 to 03, 56, 10 to 33, 98, 69 to 75, 84 and 46 to 47. Second, as not all of the activities in these industries are related to the AFS, the analysis used the occupation code to further identify which jobs are part of any segment of the value chains that constitute the AFS as shown in Figure 1. The analysis used the first digit of the occupation code starting with 1, 2, 3, 4, 5, 6, 7 8 as per the job classifications in Bhutan Standard Classification of Occupations (BSCO, 2022, Version 1[3]). As a result of step 1 and 2, any industry or occupation within a relevant industry that is not related to the AFS was assigned as non-AFS.

Table 2: Definition of AFS stages as per the value chain segment and traditional economic sector

		Traditional Economic Sector			
		Primary	Secondary	Tertiary	
Value chain	Upstream	2. Production of mixed farming, animals, crops, forest products	1. Manufacturing of agro-inputs	3. Production support services (e.g., regulation, technical and vocational training, research)	
	Midstream		5. Processing of food, dairy, beverages, textile, wood-based products	4. Logistics (aggregation, packaging, transport) 6. Processing support services	
	Downstream			7. Wholesale marketing and 8. Retail of agri-inputs, food and beverages,	

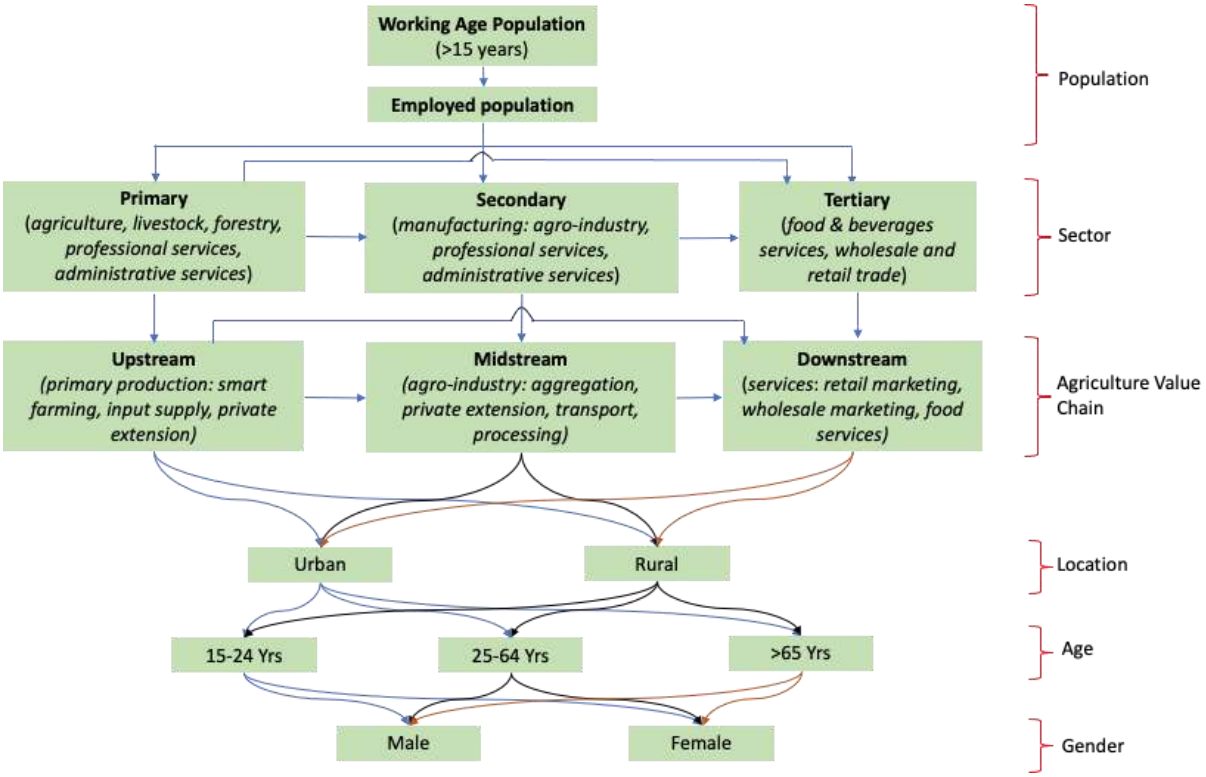
Then, the analysis identified to which stage and segment of the AFS the AFS employment relates to. To do this, the occupation codes of the BSCO 2022 were linked to the different stages of a AFS identified in the framework of Table 2. Table 2 includes the series of interconnected activities that bring food from production to consumption, creating diverse employment opportunities at each stage. In the case of Bhutan, 8 stages were identified: (1) manufacturing and distribution of agro-inputs such as fertilizers, seeds, and machinery (2) on-farm production of crops, animal rearing, mixed farming, or forest products; (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,

[3] https://www.nsb.gov.bt/wp-content/uploads/dlm_uploads/2025/06/BSCO-2025-V2.pdf

food, beverages, etc. ; and (8) retail marketing including jobs in restaurants, supermarkets, cafes, and informal vending. Subsequently, stages 1 – 3 were classified as upstream, stages 4 – 6 midstream, and stages 7 and 8 downstream.

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.

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.[4] In 2023 and 2024, the NSB further 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. 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. Only in 2022 did the LFS have detailed information in the occupation category to apply a text search and distinguish jobs in the secondary and tertiary sector that are related to AFS. As a result, the analysis extrapolated the 2022 assumptions to other years. Moreover, informal and seasonal nature of employment may be underreported or poorly understood, particularly among unpaid family workers and women. Finally, 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.

5. 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 56.8% by 2047 (NSB, 2019). In Bhutan rural-urban migration is one of the largest (43.8%) category of internal migration, representing 19.8% of the total population in 2018 (NSB, 2018).

Among the working-age population, only 63.9% are active constituting the country's labour 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. The challenges and constraints to being employed is influenced by

[4] 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.

inadequate or mismatched education system (skill mismatch), lack of career guidance, gender stereotyping, and lack of adequate facilities and support for female employees (World Bank, 2024). Alaref et al. (2024) estimate that skill mismatch is the primary reason for 46% of youth unemployment in Bhutan. Skill mismatch also affected educated job-seekers because those employed are mostly in jobs requiring low or mid skills.

Table 3 disaggregates Bhutan's labor force participation by major economic sectors. 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, 153,497 or 48% of Bhutan's active labor force was employed in primary production. Employment in the secondary and tertiary sector was, on average, 44,186 people (14%) and 123,863 (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 162,239 people in 2018 (54%) to 153,818 people (42%), at an average rate of -1%. In contrast, employment in the secondary and tertiary sector grew by, on average, 7% 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 3: Disaggregating labor force participation by major economic sector

		2018	2019	2020	2021	2022	2023	2024	Average
Primary	Absolute	162,239	159,032	157,015	158,511	125,160	158,707	153,818	153,497
	Absolute yoy GR		-2%	-1%	1%	-24%	24%	-3%	-1%
	Relative		54%	52%	50%	49%	44%	44%	42%
	Relative yoy GR		-2%	-1%	1%	-24%	24%	-3%	-1%
Secondary	Absolute	34,542	43,550	42,438	45,559	39,414	49,724	54,077	44,186
	Absolute yoy GR		23%	-3%	7%	-14%	23%	8%	7%
	Relative		12%	14%	14%	14%	14%	14%	15%
	Relative yoy GR		23%	-3%	7%	-14%	23%	8%	7%
Tertiary	Absolute	102,130	106,034	112,634	116,196	120,252	152,552	157,246	123,863
	Absolute yoy GR		4%	6%	3%	3%	24%	3%	7%
	Relative		34%	34%	36%	36%	42%	42%	43%
	Relative yoy GR		4%	6%	3%	3%	24%	3%	7%
Total	Absolute	298,911	308,616	312,087	320,266	284,826	360,983	365,141	321,547
	Absolute yoy GR		3%	1%	3%	-12%	24%	1%	3%

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

In terms of geography, 86% of the labor force was concentrated in rural areas between 2018 and 2024, of which 91% was active in primary production. This indicates that very limited value addition and marketing happen in the rural areas. of the 13% of the labor force that is located in urban areas, over two-thirds was active in the service sector, while 8% was active in the service sector. This further indicates that most raw materials are moved to urban centers where value additions happen for marketing. Females constitute 55% of Bhutan's labor force, and 79% and

20% of them work in the primary and tertiary sector, respectively. Males thus represent the minority of Bhutan's labor force, and are even more concentrated in primary production (83%).

The labour market in Bhutan continue to experience youth unemployment and gender disparities. Although the overall employment has remained low, fluctuating between 2.5% in 2015 and 3.5% in 2024, the youth unemployment has been persistently high. It reached 27% in 2022 before decreasing to 14% in 2024, with a prediction to increase to 17% in 2025 (The Bhutanese, 2025[5]). 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.

6. Labour Force participation through the RNR lens

Analyzing Bhutan's LFS data with an RNR lens provides a more nuanced view of employment in the agrifood sector. When adding up the primary, secondary, and tertiary activities related to agricultural value chains – on and off the farm – the AFS employed on average 165,322 people in Bhutan between 2018 and 2024. This represents 52% 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 7% or 4 percentage points. While small, this underestimation grew over time from 2% in 2018 to 5% in 2025, and hence may lead to growing inconsistencies in the future.

In absolute terms, the number of people working in the AFS has remained relatively stable over time. Between 2018 and 2024, the labor force in the AFS grew from 168,540 to 171,934 people, but with periodic increases and decreases. In relative terms, as more people enter the labor market in the non-AFS jobs, employment in the AFS as a share of total employment showed a downward trend over time, from 56% in 2018 to 47% in 2024.

Table 4 shows the employment by segment and stages of the AFS, relative to the total employment. Between 2018 and 2024, on average 93% of the AFS labor was employed in the upstream segment of the AFS, of which the majority was employed in primary production activities. The labor force in the upstream AFS has declined by 1% as the absolute labor force in primary production remained stable over time. This suggests that very few labor is being released from primary production to other stages of the AFS. Employment in manufacturing of inputs or production services 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. The midstream segment of the AFS employs just 1% of the AFS labor force but is growing at an annual rate of 8%. Most of the midstream jobs are in processing. The upstream segment employed on average 6% of the AFS labor force and has a growth rate of 16%, driven by the increasing number of people that enter the AFS and go into retail marketing activities.

[5] https://thebhutanese.bt/strategies-on-youth-unemployment/

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

Segment	Stage	2018	2019	2020	2021	2022	2023	2024	Average	Average YoY GR	CAGR
Up-stream	1. Manufacturing of agro-inputs	85	79	182	94	23	310	212	141	15%	16%
	2. Production	161,287	157,851	156,066	156,284	124,533	157,071	152,300	152,199	-1%	-1%
	3. Production support services	28	27	83	44	0	0	22	29	*	-4%
	Total upstream	161,400	157,957	156,331	156,422	124,556	157,381	152,534	152,369	-1%	-1%
Mid-stream	4. Logistics	125	311	696	781	19	14	111	294	-2%	-2%
	5. Processing	1,296	2,105	1,607	2,004	1,572	2,759	2,142	1,926	8%	9%
	6. Processing support services	19	0	0	13	9	34	108	26	*	34%
	Total midstream	1,440	2,416	2,303	2,798	1,600	2,807	2,361	2,246	8%	9%
Down-stream	7. Wholesale marketing	0	0	0	31	344	585	1,050	287	*	*
	8. Retail marketing	5,290	5,570	10,235	8,136	9,040	15,600	14,967	9,834	17%	19%
	Total downstream	0	0	0	31	344	585	1,050	287	18%	20%
AFS	Total	168,541	166,230	169,066	168,083	136,038	177,365	172,028	165,336	0%	0%

*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).

The LFS data show an interesting anomaly. In 2022, both the upstream segment experienced a major decline in employment by 21% and 13.5%, respectively. This drop has been related to the impact of COVID-19 pandemic and a decline of participation of female labour force (NSB, 2022),

possibly related to their greater engagement in home based, informal weaving production. However, employment in both sectors bounced back in 2023. In recent years, employment in industries and services continue to gradually grow, while employment in primary production is showing downward trend.

Increased specialization is happening within the production stage. Among the sub-sectors that constitute the upstream segment of the AFS, most labor is engaged in mixed farming (56%) followed by crop (37%), and livestock (5%); while forestry just engages 1.6% of the total employed population in AFS. From 2018 to 2024, there has been a steady decline in the jobs in mixed farming with a rapid decline in 2022 (36%). Commensurately, during the same period, employment in crop and livestock sub-sectors increased by 74%, and 77%, respectively. In 2024, the crop sub-sector was recorded as the highest employer in AFS with 56%, followed by mixed farming at 36%, livestock at 6%, and forestry with 2%. 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.

Own account and family workers dominate the AFS. Table 5 shows the employment categories of AFS related employment are prevalent in nine different agencies. Among them agriculture farming dominates employment with 92%, followed by private sector at 7.15% and the rest employing less than 1% each. In 2022, employment in agriculture farming dipped by 21% and slightly recovered. In contrast. private sector employment showed increase from 2019 to 2023 although it is decline again by 0.7% in 2024. Such fluctuations are influenced by seasonality of employment in the country (MoF, 2024), sector-specific trends, overall economic performance, and skills mismatch (World Bank, 2024). AFS workforce are dominantly 'family workers (agri)' and 'own account (agri)' averaging 54% and 45%, respectively, which are concentrated in the upstream segment. During 2018 to 2025, the proportion of workers employed in these two categories have consistently remained the same, except for the 2022 anomaly. All other seven employment status together represent only 1.71% of the employment in AFS sector. These features characterize Bhutanese AFS sector as household run operations producing for own use with surplus being marketed, and limited hired employment. As explained by NSB (2024), the contributing family worker is defined as a household member who is engaged in a family business or farming activity without any payment. More labor is being hired in the mid and downstream sector.

Table 5: LFS disaggregated by employment agencies, AFS segment, and gender

Employment Agency	Upstream	Midstream	Downstream	Male	Female
Casual paid employee	0.6%	13.0%	3.7%	0.7%	0.5%
Employer	0.1%	1.5%	5.5%	0.2%	0.3%
Family worker(AGRI)	53.7%	7.8%	0.2%	60.5%	66.4%
Family worker(Non-AGRI)	0.2%	10.0%	20.8%	0.9%	1.3%

Own account(AGRI)	44.8%	10.4%	2.0%	34.7%	26.6%
Own account(Non-AGRI)	0.3%	13.6%	49.6%	1.7%	3.4%
Piece paid worker	0.1%	2.8%	0.3%	0.1%	0.1%
Regular paid employee	0.4%	41.1%	17.9%	1.1%	1.5%

Note: for each column, the percentages refer to the share of the employment status in the total employment within the subgroup

Laborers aged between 25 and 44 constitute two thirds of the AFS labor force. Employment in the AFS is thus slowly aging, following the global trend of an aging AFS labor force. It is notable in Figure 3 that a large number of laborers aged >65 years continue to work in AFS, primarily in production activities. The age cohorts 15 to 19, 20 to 24 years, and 25 to 29 represent the smallest cohorts in the AFS. However, these cohorts have a relatively larger share of laborers who are active in mid and upstream segments. This suggests that Bhutanese youths are attracted to downstream activities related to retailing and wholesaling, while elder workers continue to concentrate in downstream primary production activities where there is limited innovation and lower productivity. Youths are vocal to mention that agricultural innovation in the country is restrained by lack of advance technologies, science-based solutions, insufficient training, inadequate infrastructure and logistic supports which disconnects skills from practice and deters youth from farming (FAO, 2024).

Figure 3: Age structure of AFS employment by stages in the AFS value chain

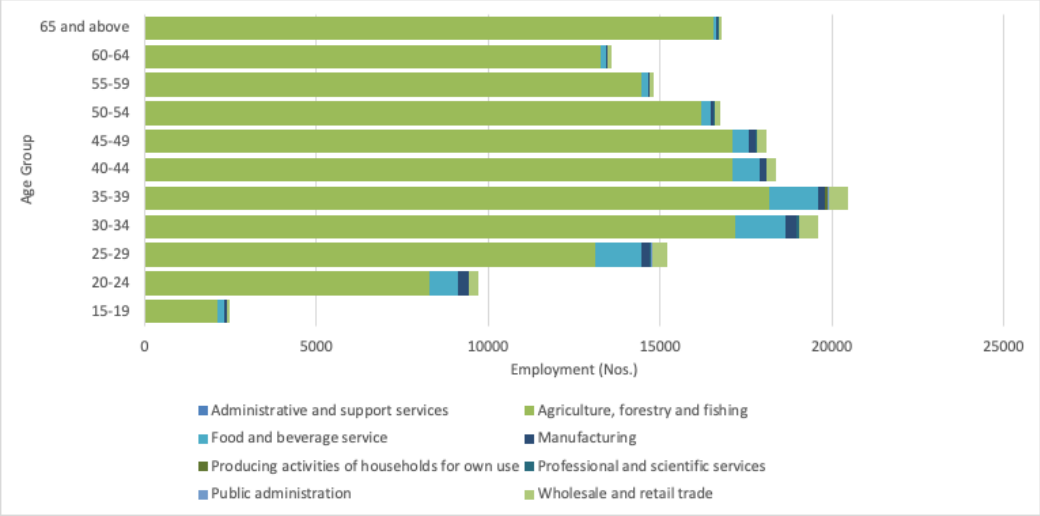


Table 6 shows the regression results of a pooled OLS of monthly employment income (natural logarithm), hours worked, and income per hour for a labor's primary employment on a set of dependent variables including age cohort, gender, education, and the segment of the AFS (where non-AFS is the reference category). Figure 4 shows the predicted means of hourly income for the different segment of the AFS and the non-AFS. The dataset is the panel of LFS datasets from 2018 – 2024 and year fixed effects are included and standard errors clustered at the district level. On average, a worker outside of the AFS earned Nu 514 per hour. A worker within the agricultural sector in the downstream segment is likely to earn about 4% less, but this difference is statistically

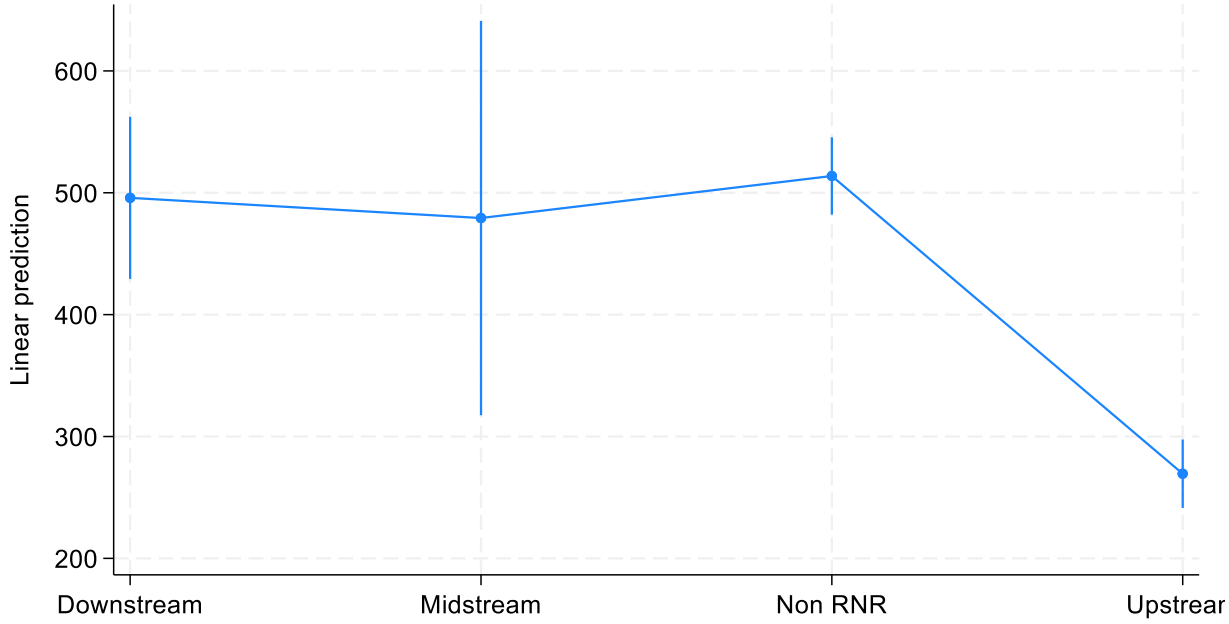
not significant. Downstream workers earn more in nominal terms but also more likely to work more hours per week (about 13 hours all else equal). Similarly, workers in the midstream segment earn 7% less per hour, but the difference is not significant. In contrast, workers in the upstream segment of the AFS earn 90% less than a worker in the non-RNR sector for working a similar number of hours. Moving up the AFS value chain and outside the AFS sector both have clear income benefits. The former 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 6: 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)			
20-24	0.194***	-0.325	44.85***
	(7.70)	(-0.42)	(3.79)
25-29	0.392***	-0.571	118.2***
	(9.63)	(-0.84)	(5.91)
30-34	0.500***	-0.651	180.2***
	(11.65)	(-0.87)	(6.83)
35-39	0.597***	-0.497	217.4***
	(12.20)	(-0.69)	(8.29)
40-44	0.669***	-0.537	291.8***
	(13.13)	(-0.76)	(6.55)
45-49	0.687***	-0.729	307.2***
	(11.13)	(-0.92)	(7.66)
50-54	0.686***	-1.276	317.5***
	(10.50)	(-1.57)	(7.86)
55-59	0.640***	-1.556	355.0***
	(9.64)	(-1.50)	(5.83)
60-64	0.481***	-1.708	247.6***
	(5.91)	(-1.93)	(5.23)
65 and above	0.371***	-4.729***	273.2***
	(4.32)	(-5.37)	(4.19)
Gender (base=female)			
Male	0.240***	2.192***	55.74***
	(15.16)	(8.99)	(5.07)
Education (base=none)			
Bachelors degree	0.539***	-3.865***	251.5***
	(18.82)	(-7.32)	(9.19)
Higher secondary	0.340***	-2.677***	136.9**
	(17.45)	(-4.72)	(3.29)
Lower secondary	0.0952**	-0.667	-13.91
	(3.66)	(-1.77)	(-0.37)
Master's degree and above	0.0139	0.143	-55.05
	(0.43)	(0.35)	(-1.72)
Middle secondary	0.285***	-1.059**	172.5***
	(15.63)	(-2.84)	(7.47)
Monastic education	0.0618	-0.561	-8.164
	(1.91)	(-1.21)	(-0.20)
Non-formal education	-0.116***	1.103*	-70.22*
	(-5.11)	(2.54)	(-2.53)
Primary	-0.191***	1.319*	-173.0***
	(-7.94)	(2.65)	(-5.61)
Grade 10	-0.227***	1.824*	-126.8***
	(-5.92)	(2.27)	(-5.52)
Grade 11	-0.110*	2.139**	-87.58*

	(-2.61)	(3.35)	(-2.71)
AFS segment (base=non-AFS)			
Downstream	0.0438	14.01***	-17.93
	(1.25)	(16.76)	(-0.54)
Midstream	-0.321***	0.686	-34.52
	(-5.03)	(0.90)	(-0.49)
Upstream	-0.893***	-0.524	-244.3***
	(-16.60)	(-0.81)	(-16.78)
Constant	8.769***	51.19***	138.8***
	(159.97)	(42.13)	(5.26)
Observations	18093	21693	18098

Figure 4: Predicted means of hourly income for the different segments of the AFS



7. 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 assocaited to agricultural commodities, but young people are struggling to find good jobs. AFS offer 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, 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.

The paper finds that looking across segments of the agricultural-related value chains provides a more nuanced and accurate view of how different employment constitute the AFS and evolves over time. When disaggregating national LFS data by traditional economic sectors, primary production employed on average 48% of the Bhutanese labor force between 2018 and 2024. This would suggest that while employment in the primary sector is still large, and the non-agricultural sector has become major source of employment. When disaggregating the LFS data with a AFS lens, however, we find that 52% of the Bhutanese labor force was 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 4%, 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 (stagnant) AFS (0%), 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. Within the AFS, upstream activities accounted on average for 93% of the AFS jobs, but this share has been declining from 96% to 89% between 2018 and 2024 as the absolute number of upstream jobs remained more or less stable. 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 1% and 6% of the AFS labor, respectively, but are growing at rates of 14% and 18% 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 (more recent) wholesale marketing activities. These jobs tend to earn hourly incomes that are on average 90% more than jobs in the upstream segment but are not statistically different from the hourly income earned outside the AFS. 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.

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. First, the introduction of new technologies that improve labor productivity can initiate the release of labor from the currently dominant production stage of upstream AFS segment. Such technologies include mechanization or protected agriculture to increase the scale of production while reducing manual labor. At the same time, complementing mechanization with yield increasing technologies such as modern seeds or fertilizer can increase total output per worker, thus reducing the number of labour needed to achieve the same output to meet a growing demand. Moreover, there are some signs of specialization happening in production, which would be an important driver for increased scale and commercialization in a smallholder-based, integrated

farming systems. Providing access to knowledge, R&D, and certification services can promote the diversification towards higher value commodities such as spices or fruits. To facilitate the relocation of labor out of production activities, the government should provide social protection or safety nets if farmers temporary loose income.

Second, polices addressing the underlying barriers to agro-industry development can create more jobs in the AFS midstream segment. Although growing from a small base, 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, 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).

Finally, Bhutan should create an enabling environment for Bhutanese 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 agricultural labor productivity 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. As Bhutan's competitive advantage is in producing low volume, high value products; the downstream segment of the AFS should focus on branding Bhutan as a source of green and clean produce, 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 digital tools and marketing information that allow for linking production with demand, price discovery, better planning for export. As niche markets are demanding in terms of quality and safety, Bhutan will need to invest significantly in the national food safety and Sanitary and Phytosanitary compliance system that ensures standardization, certification, and traceability.

Creating better and more jobs across the AFS will require significant upgrading of skills and capacities. The mid- and downstream activities may attract rural youths, who may be less attracted to the labor-intense drudgery work of farming and are more tech savvy. 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. In any case, rural youth, aggregators, or farmer group members might lack the skills to perform such industry

or related service activities. The government should therefore invest in human capital through targeted skilling programs, improving education quality and access, promoting digital literacy, and strengthening TVET aligned to industrial needs. 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.

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