

# CURRENT SITUATION OF APPROACHING AND APPLYING SCIENCE AND TECHNOLOGY IN AGRICULTURAL PRODUCTION OF FAMILY FARMS IN NORTHERN CENTRAL AND NORTHERN MOUNTAINOUS PROVINCES IN THE PERIOD 2015-2022

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## Abstract

The development of cold-water aquatic species (such as salmon, sturgeon), traditional fish farming, and the promotion of aquaculture in reservoirs, hydropower plants, and along riverbanks associated with the conservation and development of valuable resources have been key strategies. One of the pivotal solutions is to enhance research capabilities, technology transfer, and scientific applications. The advancement of high technology, digital technology, and information technology throughout the entire value chain, synchronized with other sectors, is essential to establish a smart agricultural production system, efficiently utilizing resources and labor, enhancing added value, competitiveness, and sustainable development of the industry (Government 2021b).

**Keywords:** Application, Agricultural Production, Family Farms.

## 1. INTRODUCTION

Vietnam is a developing country where agriculture plays a crucial role in the economy. In the context of the rapid advancement of information technology, international economic integration, and increasing demands for high-quality agricultural products, coupled with the processes of industrialization and modernization, the agricultural land area has been shrinking. Additionally, climate change and diseases pose significant challenges to agricultural production. Government Resolution No. 01 of 2021 emphasizes the need to restructure the agricultural sector in alignment with regional development and rural economic improvement while ensuring the livelihoods of farmers. This resolution also calls for promoting large-scale agricultural production in response to market demand, enhancing value-added, and fostering sustainable development through the application of advanced technologies and an integrated value chain. It encourages the development of green agriculture, organic farming, high-tech agriculture, and climate-resilient agriculture (Government, 2021a). To achieve these goals, science and technology play a pivotal role in restructuring the agricultural sector and transitioning to a new growth model. The application of science and technology in agricultural production is the foundation for agricultural development. There are three central tasks in the restructuring of agriculture in the coming years: restructuring by product group, including national key products, provincial key products, and local specialty products; restructuring by sector, including crop cultivation, livestock farming, aquaculture, forestry, and medicinal plants; and restructuring by region, covering the northern midlands and

mountainous areas, the Red River Delta, the northern central region, the south-central coast, the Central Highlands, the Southeast, and the Mekong Delta (Government, 2021b). In the northern central and northern mountainous regions of Northern Vietnam, where the economy heavily relies on agriculture, family farms constitute 99.91% of agricultural producers. The number of cooperative groups has increased by 34%, and enterprises have increased by 121.09% compared to 2016, despite a slight decrease in the number of households. This indicates a relatively high level of participation in agricultural production (General Statistics Office, 2021). With the existing potential and advantages of the region, along with numerous programs promoting agricultural development and the application of science and technology in production, significant transformations have occurred in agricultural production in many localities. These transformations have been made possible through the contributions of the scientific community, the involvement of businesses, close guidance from local authorities, and the participation of farmers in applying science and technology to production. Examples include Son La (high-quality vegetable and fruit production, premium lychee, and salmon and sturgeon farming), Thai Nguyen (tea production with 91,000 tea-growing households), Bac Giang (livestock farming, poultry, vegetables, and fruit trees), and Lao Cai (development of new rice varieties LC25, LC212, LC270 with high yields and quality, smart irrigation and climate-adaptive rice farming in two districts Yen Dinh and Thieu Hoa, covering a total area of 120 hectares). These efforts have increased productivity, improved product quality, and enhanced competitiveness in domestic and international markets. Some products have even been exported to international markets such as the United States, Japan, China, and the UAE (Bac Giang lychee, premium lychee with red flesh, Son La; tea from Thai Nguyen). However, many models and products developed through these initiatives are still relatively small-scale and face challenges in scaling up or meeting market requirements. Several projects and models have not realized their full potential and impact, and they often cease when the project or support program ends. Difficulties in scaling up after the project and the termination of support programs continue to be challenges. The central task in the agricultural restructuring of the northern central and northern mountainous regions in the 2021-2025 period is the development of key crop production areas with advantages such as fruit trees, tea, medicinal plants, specialty rice, corn, cassava, vegetables, and flowers. It also emphasizes the promotion of livestock farming, with a focus on grass-fed cattle (buffalo, cattle, goats, horses) in conjunction with grass-growing regions, as well as pigs and poultry. Breeding and developing high-value indigenous species are prioritized. The protection and development of natural forests, protective forests, and special-use forests are emphasized to maintain water sources, soil protection, especially in areas prone to erosion. The development of plantation forests for production, non-timber forest products on a large scale, is linked to the development of the wood processing and forest product industry.

## 2. RESEARCH CONTENT AND METHODOLOGY

This article utilizes secondary data sources from the period 2015-2022 provided by the General Statistics Office, the Department of Agriculture and Rural Development, and employs in-depth interviews and descriptive statistical methods to analyze the current status of accessing and applying science and technology in agricultural production by family farms in the provinces of Northern Central and Northern Mountainous Vietnam during the 2015-2022 period. This research

was conducted in six representative provinces: Bac Giang, Ha Giang, Hoa Binh, Lao Cai, Son La, and Thai Nguyen.

## 2.1. Current Status of Accessing and Applying Science and Technology in Agricultural Production by Family Farms in the Northern Central and Northern Mountainous Provinces of Vietnam during 2015-2022

### i) Production Resources

The total agricultural and aquaculture land area in the entire region was approximately 8 million hectares in 2021. Dien Bien, Ha Giang, and Lai Chau were the top three provinces with the highest agricultural and aquaculture land areas, with 883,473.3 hectares, 677,197.8 hectares, and 638,615.8 hectares, respectively (Table 1). However, agricultural land accounted for less than 30% of the total agricultural and aquaculture land area. The majority of land was allocated to forestry production (71%). Aquaculture covered a negligible area, approximately 4,000 hectares, accounting for 0.05% of the total area (Table 1). With the increasing population, industrialization, urbanization, and climate change, there is growing pressure on the agricultural sector to meet the demand for food, both locally and for processing and export of agricultural commodities.

**Table 1: Agricultural Land Area and Structure in the Northern Midlands and Mountainous Provinces in 2021**

Region	Land for agricultural production		Forestry land		Aquaculture surface land		Other farmland		Amount Area (Ha)
	Area (Ha)	Structure (%)	Area (Ha)	Structure (%)	Area (Ha)	Structure (%)	Area (Ha)	Structure (%)	
Ha Giang	201268.3	29.72	472808.8	69.82	2652.7	0.39	468	0.07	677197.8
Cao Bang	109985	17.66	512328	82.25	527	0.08	79	0.01	622919
Bac Kan	44343	9.65	413362	89.95	1698	0.37	151	0.03	459554
Tuyen Quang	98205.4	18.1	440734.1	81.21	3545	0.65	208.1	0.04	542692.6
Lao Cai	134161	24.95	399525	74.3	3648	0.68	415	0.08	537749
Yen Bai	121474	19.67	492756	79.77	3304	0.53	179	0.03	617713
Taiyuan	109760	36.35	187032	61.94	4702	1.56	439	0.15	301933
Lạng Sơn	114563	15.9	603977	83.83	1865	0.26	86	0.01	720491
Bac Giang	145971.3	48.61	145679.7	48.52	8349.2	2.78	260	0.09	300260.2
Phu Tho	117950.4	40.02	167476.5	56.83	8747.9	2.97	532	0.18	294706.8
Dien Bien	472301.7	53.46	408400.5	46.23	2623.9	0.3	147.2	0.02	883473.3
Lai Chau	115646.7	18.11	521896.8	81.72	1002.9	0.16	69.4	0.01	638615.8
Son La	408470.7	38.38	652051.1	61.27	3407.8	0.32	342	0.03	1064272
Peace	92420.1	23.61	296506.3	75.75	1862.6	0.48	638.4	0.16	391427.4
<b>Region-wide</b>	<b>2286521</b>	<b>28.39</b>	<b>5714534</b>	<b>70.96</b>	<b>47936</b>	<b>0.6</b>	<b>4014.1</b>	<b>0.05</b>	<b>8053005</b>

Source: Statistical Yearbook

Agricultural production is primarily carried out by households and farms. According to statistical data, the total number of households engaged in agricultural production in the entire region was approximately 2.5 million households in 2021 (Table 2). The region had 2,493 farms in 2021, accounting for about 13% of the total number of farms nationwide. Among them, the provinces with the highest number of farms were Thai Nguyen, Bac Giang, Son La, and Tuyen Quang.

**Table 2: Number of Households and Farms Engaged in Agricultural Production in the Northern Central and Northern Mountainous Provinces, 2021**

Quota	Number of households engaged in agricultural production	The proportion of households with agricultural production	Number of farms	Number of agricultural workers (000 people)	Average productive land area/Agricultural labor (ha)	Average area of productive land per agricultural household (ha)
Ha Giang	151271	78.54	24	403.2	0.5	1.33
Cao Bang	112837	81.22	-	254.8	0.43	0.97
Bac Kan	70392	84.38	-	152.1	0.29	0.63
Tuyen Quang	174202	81.51	373	360.1	0.27	0.56
Lao Cai	131291	73.87	144	328.3	0.41	1.02
Yen Bai	171812	79.06	21	373.1	0.33	0.71
Taiyuan	227261	61.95	753	523.2	0.21	0.48
Lang Son	155251	77.53	10	326.2	0.35	0.74
Bac Giang	365320	75.52	427	713.2	0.2	0.4
Phu Tho	302613	73.84	290	633.2	0.19	0.39
Dien Bien	113912	83.84	6	289.2	1.63	4.15
Lai Chau	87736	85.77	11	223.1	0.52	1.32
Son La	241521	82.23	250	583.1	0.7	1.69
Peace	166351	73.66	184	387.9	0.24	0.56
<b>Region-wide</b>	<b>2471770</b>	<b>-</b>	<b>2493</b>	<b>5550.7</b>	<b>0.41</b>	<b>0.93</b>

Source: General Statistics Office (2023)

Over 70% of households in the region are engaged in agricultural production, which is also their main source of livelihood. Provinces in the higher mountainous areas, such as Bac Kan, Lai Chau, Dien Bien, and Son La, have a higher dependence on agriculture for their livelihoods. The average agricultural land area per agricultural worker was approximately 0.41 hectares in 2021, which is relatively high compared to the national average. However, much of the agricultural land in the region is sloping terrain, resulting in lower land productivity compared to the delta regions in the country.

According to the report from the Ministry of Agriculture and Rural Development, the total labor force in the agriculture-forestry-fishery sector in the entire region was approximately 4.3 million people in 2011. However, it has decreased rapidly to just over 3.4 million people in 2020, a decrease of about 20%. This decline can be attributed to various factors such as industrialization, urbanization, and migration. The agricultural sector still accounts for the majority of the labor force, approximately 95% in 2020, although there is a decreasing trend. The forestry and fishery sectors saw an increase of approximately 200% and 42.6%, respectively, during the 2011-2020 period. However, the scale of labor in these two sectors remains small, with just over 120,000 and 29,000 workers, respectively, in the entire region in 2020, and they have very small proportions, accounting for 3.6% and 0.8%, respectively, in 2020. Due to the limited area for aquaculture in the mountainous and midland regions, the number of workers in the fishery sector is not high. Compared to the overall labor structure of the country, the distribution of labor in the agriculture-forestry-fishery sectors in the northern midlands and mountainous region leans heavily towards agriculture and forestry. In 2020, the labor force in agriculture, forestry, and fishery nationwide accounted for 89.62%, 1.78%, and 8.8%, respectively.

**Table 3: Labor Force in the Agriculture, Forestry, and Fishery Sectors in the Northern Midlands and Mountainous Regions, 2011-2020 (Thousands of Workers)**

Industry	2011		2016		2020		Comparison 2020/2011	Comparison 2020/2011
	Amount	Structure	Amount	Structure	Amount	Structure	(1000 people)	(%)
	(1000 people)	(%)	(1000 people)	(%)	(1000 people)	(%)		
Agriculture	4,234	98.7	4,005.80	97.8	3,276.50	95.6	-957.5	-22.6
Forestry	35.2	0.8	67.4	1.6	122.7	3.6	87.5	248.6
Fisheries	20.4	0.5	24.3	0.6	29.1	0.8	8.7	42.6
Sum	4,290	100	4,097.50	100	3,428.30	100	-861.7	-20.1

Source: Ministry of Agriculture and Rural Development (2023)

Report on the Northern Midlands and Mountainous Region Training Conference

**Table 4: General Information on Surveyed Households (by Province)**

Quota	Units of calculation	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
1. Total number of surveyed households	household	160	160	200	200	200	120	1040
2. Type of production								
- Household	%	98.13	96.88	96.50	98.50	97.50	95.00	97.21
- Farm	%	1.88	3.13	3.50	1.50	2.50	5.00	2.79
3. Age of the interviewee	age	46.08	44.52	42.37	44.91	46.74	48.03	45.25
4. Gender								
- Male	%	63.13	57.50	48.50	58.50	54.00	65.83	57.12
- Female	%	36.88	42.50	51.50	41.50	46.00	34.17	42.88
5. Demographic number	person	4.69	4.95	4.51	4.82	4.47	4.76	4.68
6. Number of family employees	person	2.89	3.18	2.94	2.90	2.81	2.64	2.90
7. Ethnicity								
- Kinh	%	28.13	31.25	89.50	48.00	55.50	97.50	57.50
- Dao	%	14.38	33.75	3.50	0.00	0.00	0.00	8.08
- Muong	%	0.00	0.00	0.00	0.00	41.50	0.00	7.98
- Thai	%	0.00	0.00	0.00	21.50	0.00	0.00	4.13
- Mong	%	0.00	0.00	0.00	26.50	0.00	0.00	5.10
- Tay	%	49.38	21.88	2.00	0.00	0.00	0.00	11.35
- Different	%	8.13	13.13	5.00	4.00	3.00	2.50	5.87
8. Source of income of households								
-Agriculture	%	75.67	62.28	69.62	78.34	73.47	64.21	70.75
- Non-agricultural and other	%	24.33	37.72	30.38	21.66	26.53	35.79	29.25

Source: Calculations based on survey data (2022)

The total number of surveyed households is 1,040, of which 97.2% are production households and nearly 3% are farms. The average age of the interviewees is 45.3 years, which is quite common. More than half of the interviewees are male (57%), while the remaining (43%) are female.



Approximately 57.5% of the interviewees belong to the Kinh ethnic group, while the rest belong to ethnic groups such as Dao, Tay, Mong, and muong. Thai Nguyen and Bac Giang are the two provinces with the fewest ethnic minority interviewees. Regarding household income, over 70% of households believe that the main source of income for their household is from agricultural production, while the rest engage in non-agricultural activities and wage labor. This indicates that agriculture is still the primary livelihood for these households. On average, each farming household has about 5 people and 3 family laborers. Information about farms: According to data from the farm survey conducted by the General Statistics Office, the average age of farm owners is around 50, with nearly 90% being male. In Son La, about 1/3 of farm owners are female. On average, each farm has about 4 laborers, and approximately only 1/4 of the laborers are trained (lowest in Ha Giang and Son La provinces). More than half of the farms use only family labor, while the rest hire laborers, with an average of 4 laborers per farm.

**Table 5: Basic Information on Farming in Some Provinces in the Northern Midlands and Mountainous Regions**

Indicators	Units	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
<b>1. Number of farms</b>	Number	463	34	183	98	209	381	1368
<b>2. Age of farm owners</b>	Age	49.97	50.94	49.94	49.31	49.24	48.18	49.33
<b>3. Gender of farm owners</b>								
- Male	%	96.11	100.00	88.52	85.71	64.59	90.03	87.94
- Female	%	3.89		11.48	14.29	35.41	9.97	12.06
<b>4. Total farm labor force</b>	People	3.51	6.56	4.30	2.97	4.59	3.72	3.88
- Untrained labor force	People	2.82	5.84	2.78	2.36	3.84	2.58	2.96
- Trained labor force	People	0.70	0.72	1.52	0.61	0.75	1.14	0.92
<b>5. Percentage of farms hiring labor</b>	%	28.94	94.12	42.08	20.41	91.87	44.62	45.69
- Average number of hired laborers	People	4.13	5.75	5.69	2.50	2.40	2.85	3.47

Source: Calculations from survey data (2022)

**Table 6: Land for Production of Surveyed Households**

Indicators	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
Rice Land	1087.1	1318.4	1088.2	915.4	1191.9	1031.5	1103.6
Vegetable Land	14.9	762.1	991.8	768.7	53.0	66.8	476.0
Fruit Land	564.9	733.6	2541.9	1991.4	1318.0	146.9	1341.9
Tea Plantation	164.8	0.0	0.0	0.0	1141.9	1249.4	389.1
Livestock Land	185.8	336.3	518.5	546.9	101.4	157.3	322.8
Aquaculture Area	108.5	127.4	1684.1	1369.0	1413.8	94.9	906.3
Production Forest Land	2273.7	2022.7	51.4	514.9	1518.5	0.0	1061.9
Medicinal Plant Land	852.4	706.8	0.0	0.0	0.0	0.0	239.9
Other Agricultural Land	183.6	121.1	101.9	970.0	141.9	78.2	289.3
Total Agricultural Production Land	5435.7	6128.2	6977.6	7076.2	6880.2	2825.0	6130.8

Source: Calculations from survey data (2022)

Regarding production land, on average, households with paddy fields have approximately 1,000m<sup>2</sup> (0.1ha) of land, generally sufficient to produce cereals for the household in a year. The average vegetable land area per household is nearly 500m<sup>2</sup>, with the highest in Bac Giang, Son La, and Lao Cai, where these households are engaged in commercial vegetable production. The lowest vegetable land area per household is in Ha Giang (15m<sup>2</sup>), which is basically insufficient to provide enough green vegetables for the household.

For fruit trees, households on average have about 1,342m<sup>2</sup> of land, with the highest in Bac Giang and Son La, due to the focus on fruit tree cultivation in these two provinces. In the case of tea, the average tea plantation area per household is highest in Thai Nguyen, at around 1,250m<sup>2</sup> per household.

Livestock land has the smallest area, with an average of just over 300m<sup>2</sup> per household. The highest livestock land areas are in Bac Giang and Son La (over 500m<sup>2</sup>) due to these households having hilly land for raising poultry or grasslands for raising cattle.

Households engaged in aquaculture in Bac Giang, Son La, and Hoa Binh have the largest areas, averaging around 1,400m<sup>2</sup> per household. Some households have invested in aquaculture for commercial purposes, but most still practice subsistence farming. In some cases, households have ponds and only catch fish once a year when needed, while others use nets as needed, which does not contribute significantly to commercial production.

Ha Giang and Lao Cai are provinces where households have larger areas of forest land, exceeding 0.2ha per household. The survey of households engaged in medicinal plant cultivation in Ha Giang and Lao Cai showed that, on average, each household cultivating medicinal plants has more than 700m<sup>2</sup> of land. The total land area for agricultural and forestry production of households averages 6,131m<sup>2</sup>, with the highest in Hoa Binh and the lowest in Thai Nguyen.

In addition to the production land of household farms, farmers also rent or lease additional land for production, although not extensively. Most of the households renting additional land are relatively well-off, with capital for investment in agriculture and the application of science and technology in production. Some households practice consolidation and exchange of land to expand their businesses. Some households borrow land from relatives who have switched to other professions or are working away and not using the land.

About 6% of households rent land for livestock farming, mainly renting some areas for raising pigs and poultry (Bac Giang, Son La). On average, these livestock-raising households rent about 4,000m<sup>2</sup> of land to build animal sheds and invest in livestock farming, with the rented area being more than 10 times the livestock-raising area of the households. These households are truly investing and applying science and technology in livestock farming. Some build closed sheds to ensure disease safety for pigs and poultry and invest in paddocks for poultry (chickens).

Approximately 5% of households rent land for vegetable cultivation, as in Lao Cai, Bac Giang, and Son La. These are households that rent additional land (mostly like other households) to

expand their areas. There are two cases: (i) to be able to apply scientific and technical methods, such as installing an automatic irrigation system or building greenhouses, and (ii) Some households have very small vegetable land areas and rent additional land to improve their household income. Many of these households have elderly members and rely on labor-intensive production because they lack the capacity to change their professions. In some districts of Bac Giang, due to the presence of many industrial zones and proximity to the province's industrial clusters, young people work in companies or high-income service businesses. Similarly, due to small and fragmented farmlands, many households no longer engage in agriculture and leave their fields unused or rent them out at low prices.

Similarly, about 2% of households rent land for fruit tree cultivation (Bac Giang, Son La, Hoa Binh), mainly planting deciduous fruit trees (such as oranges, pomelos, mangoes, and litchis). The average rented land area is 5,660m<sup>2</sup>, quite large and more than four times the area of fruit tree cultivation by the households. These are also households that truly invest in agricultural production, plant fruit trees, and apply some scientific and technological achievements, such as Good Agricultural Practices (GAP), organic farming (lychee and pomelo), and new high-yield, high-quality varieties such as custard apples, litchis, mangoes, and oranges (varieties grown throughout the year).

## ii) Agricultural Production Activities of Households

In the survey sample, nearly 90% of households engage in rice cultivation to maintain a stable source of food for their families. Livestock farming (commodities) is an income-generating activity for over 75% of the total surveyed households, with the main types of livestock being pigs, poultry, and cattle. About 30% of surveyed households have fruit trees, and over 30% have vegetable cultivation. Overall, agricultural production plays a crucial role in the livelihoods of these households.

**Table 7: Household Production Activities**

*Unit: % of households in the total sample*

Indicators	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
Rice Cultivation	91.9	86.9	92.0	86.5	90.0	77.5	88.1
Vegetable Cultivation	11.9	49.4	44.5	36.0	21.5	18.3	31.2
Fruit Tree Cultivation	32.5	35.6	34.5	29.5	31.0	24.2	31.5
Tea Cultivation	16.3	0.0	0.0	0.0	20.0	33.3	10.2
Livestock Farming	82.5	66.9	86.5	94.5	47.5	72.5	75.3
Aquaculture	16.9	18.1	37.0	32.5	34.5	10.8	26.6
Forestry	54.4	58.1	7.0	36.5	41.5	0.0	33.7
Medicinal Plant Cultivation	25.0	25.0	0.0	0.0	0.0	0.0	7.7

*Source: Calculated from survey data (2022)*

Machinery and equipment for production on farms: According to the survey data from the General Statistics Office, about 11% of farms in the northern midland and mountainous provinces have automobiles for production purposes. This proportion is highest in Thai Nguyen



and Lao Cai. Approximately 15% of farms have tractors/plows for cultivation. Other machinery with engines such as water pumps, generators, grass cutters, soil tillers, harvesters, etc., are also used, but more commonly in farms involved in crop cultivation. Among them, 41% of farms use machinery with electric engines, and 28.8% use machinery with gasoline/diesel engines. Nearly 63% of farms have motorized pesticide sprayers, and 71% have power generators for agricultural, forestry, and aquaculture production, primarily for farms engaged in livestock farming and aquaculture. As for other machinery such as seeders, fertilizer spreaders, and combine harvesters, only a few farms use them.

**Table 8: Machinery and Equipment Serving Farm Production**

*Unit: % of farms*

Indicators	Bac Giang	Ha Giang	Hoa Binh	Lao Cai	Son La	Thai Nguyen	General
Automobiles for production	9.72	5.88	12.57	12.24	11.48	12.86	11.33
Tractors/plows	11.45	8.82	7.65	7.14	50.72	4.99	14.77
Electric engines (electric motorcycles)	65.66	8.82	18.58	34.69	14.83	40.94	41.08
Gasoline/diesel engines	38.88	8.82	64.48	21.43	19.62	8.14	28.80
Motorized boats, dinghies with engines for agricultural, forestry, and aquaculture production (excluding fishing boats)	2.16	0.00	0.55	2.04	0.48	0.52	1.17
Motorized pesticide sprayers	61.77	85.29	39.89	48.98	91.87	59.32	62.43
Power generators for agricultural, forestry, and aquaculture production	63.07	5.88	44.81	37.76	91.87	93.96	70.39
Water pumps for agricultural, forestry, and aquaculture production	88.34	29.41	94.54	82.65	97.13	95.80	90.72
Seeders, fertilizer spreaders	0.22	0.00	0.00	1.02	0.48	0.26	0.29
Planters	0.22	0.00	0.00	0.00	0.00	0.00	0.07
Combine harvesters	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other harvesting machines (row crop pickers, handheld harvesters)	0.00	0.00	1.64	0.00	0.00	0.26	0.29
Motorized rice threshers	0.00	0.00	0.00	1.02	0.00	0.00	0.07
Drying ovens, machines for drying agricultural, forestry, and aquaculture products	1.08	2.94	0.00	2.04	0.00	2.36	1.24
Machinery for processing grains (milling, polishing, sorting)	2.81	0.00	1.09	29.59	0.48	2.36	3.95
Machinery for processing livestock feed (grinding, mixing, etc.)	14.25	0.00	7.10	45.92	87.08	14.96	26.54
Machinery for processing aquafeed (grinding, mixing, etc.)	9.50	0.00	1.64	4.08	1.44	2.36	4.61
Aeration machines, water agitators used in aquaculture	29.81	2.94	1.09	13.27	0.00	3.15	12.13
Poultry egg incubators	4.54	2.94	1.09	1.02	0.00	4.99	3.22
Cattle milkers	0.00	0.00	0.55	0.00	90.43	0.00	13.89

*Source: General Statistics Office (2022)*

Regarding preservation and processing, only 1.2% of farms have machines for drying agricultural, forestry, and aquaculture products, and 4% have machinery for processing grains (milling, polishing). For producing households, there are almost no households with these types of machinery. This indicates that most agricultural products are consumed in their raw form, resulting in lower added value and higher risks due to the perishable nature of the products.

In livestock production, more than 1/4 of farms have machinery for processing livestock feed, and in aquaculture, 4.6% of households have machinery for processing aquafeed. Over 10% of farms have aeration machines and water agitators for aquaculture. Approximately 3% of farms invest in poultry egg incubators.

On average, the total revenue of each farm in some provinces in the Central Highlands and Northern Mountains reaches over 5 billion VND, with the highest in Thai Nguyen, Hoa Binh, and Bac Giang provinces, and the lowest in Ha Giang province.

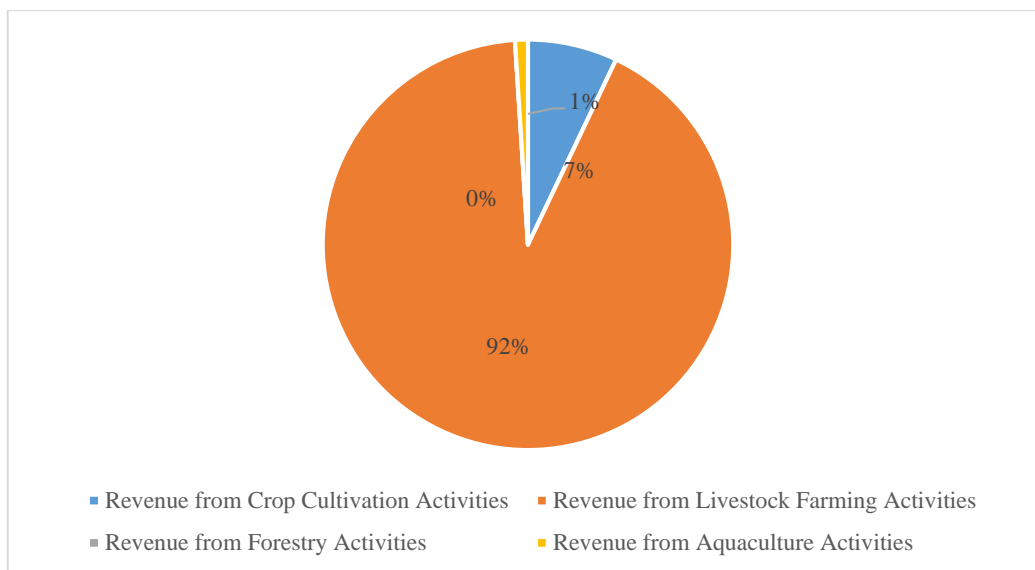
**Table 9: Farm Revenue**

(Unit: million VND)

Source: General Statistics Office (2022)

Indicators	Bac Giang	Ha Giang	Hoa Binh	Lao Cai	Son La	Thai Nguyen	General
Total Revenue	5452.20	2301.89	5516.22	3950.39	3362.20	6436.91	5229.83
Revenue from Crop Cultivation Activities	333.51	1592.11	952.74	56.96	463.38	47.34	367.96
Revenue from Livestock Farming Activities	4924.05	689.12	4464.71	3753.55	2898.37	6356.32	4762.92
Revenue from Forestry Activities	43.66	0.04	52.35	19.28	0.15	9.37	25.79
Revenue from Aquaculture Activities	150.98	20.62	46.42	120.60	0.30	23.88	73.16

In general, the primary source of income for the farms is livestock farming, accounting for 91% of the total revenue of the farms. Crop cultivation activities contribute only about 7% of the total revenue.



**Figure 1: Structure of Revenue Sources for Farms in the Northern Midlands and Mountainous Regions**

### iii) Demand for the Application of Science and Technology

The demand for applying science and technology in agricultural production needs to originate from the interest and understanding of farmers regarding production technologies. According to survey data, approximately two-thirds of farmers express interest in new standards and technologies related to the primary crops or livestock they cultivate. These farmers are typically younger or middle-aged, and they consider agricultural activities to be the primary source of income for their households. Older agricultural laborers tend to be less interested in new standards or technologies related to agricultural production.

The majority of households are aware of 1-2 standards or technologies related to their primary agricultural activities, such as vegetable cultivation, fruit tree planting, animal husbandry, or aquaculture. These may include standards like VietGAP, organic farming practices, and certain technological applications in cultivation, animal husbandry, and aquaculture, such as water-saving irrigation systems, organic fertilizers, biopesticides, automatic feeding systems, and integrated fish farming. Some households are knowledgeable about 3-4 standards or technologies in their primary agricultural activities.

Farmers in Bac Giang, Son La, and Hoa Binh provinces appear to have a greater interest in agricultural technologies, with over 10% of respondents indicating familiarity with more than 4 standards or technologies in the cultivation and husbandry practices of their primary crops or livestock.

In addition to technologies related to their primary crops or livestock, farmers also express interest in technologies for other crops or livestock that they do not produce or produce in smaller quantities.

**Table 10: Interest and Awareness of Farmers Regarding New Standards and Technologies in Agricultural Production (by Province)**

*Unit: % of households*

Indicators	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
1. Total surveyed households (Households)	160	160	200	200	200	120	1040
2. Number of households interested in new organizations and individuals	54.38	63.75	68.50	58.50	64.50	69.17	62.98
3. Number of households that can name organizations or individuals in the field of agricultural production							
1-2 organizations/individuals	68.97	68.63	62.04	64.10	58.91	56.63	63.05
3-4 organizations/individuals	21.84	22.55	24.82	25.64	30.23	32.53	26.26
More than 4 organizations/individuals	9.20	8.82	13.14	10.26	10.85	10.84	10.69
4. Number of households aware of other organizations or individuals in agricultural production							
1-2 organizations/individuals	74.38	65.63	52.50	69.00	65.00	50.83	63.27
3-4 organizations/individuals	17.50	23.75	31.50	21.50	23.50	33.33	24.90
More than 4 organizations/individuals	8.13	10.63	16.00	9.50	11.50	15.83	11.83

*Source: Calculated from survey data (2022)*

Among the main types of crops surveyed, the proportion of households interested in new standards and technologies in production is highest for vegetables and fruit trees, and lowest for forestry crops. This is entirely reasonable since vegetables and fruit trees are two cash crops and a regular source of income for households. Households engaged in vegetable and fruit tree cultivation also have more knowledge about the standards and technologies related to their crops. In rice production, over 80% of households show interest in production processes and technologies, primarily VietGAP, organic farming, SRI (System of Rice Intensification), and the use of organic fertilizers and biopesticides. In livestock farming, households raising pigs and poultry also have more knowledge and interest in technologies and standards related to animal husbandry. This is reasonable because pig and poultry farming has a fast capital turnover, making it susceptible to market fluctuations and disease outbreaks. Furthermore, there are many new technical advancements and technologies applied in this sector. Around 70% of households engaged in aquaculture express interest in new standards and technologies, primarily focusing on new breeds, care processes, disease prevention, and the application of machinery in fishponds. Approximately 75% of households engaged in forestry express interest in new technologies and techniques in forestry production, especially new breeds. Some are beginning to show interest in sustainable forestry standards (FSC). However, there are not many technical innovations introduced in forestry production, primarily consisting of new acacia breeds and some non-timber forest product extraction models. Around 70% of households engaged in aquaculture express interest in standards and technologies used in aquaculture, primarily focusing on new breeds, cage farming techniques, and some biological technologies in fish farming.

**Table 11: Interest and Knowledge of Farmers Regarding New Standards and Technologies in Agricultural Production (by Product)**

Unit: % of households

Indicators	Food crops	Fruit trees	Vegetable crops	Medicinal plants	Tea	Forestry	Breeding cattle and buffaloes	Pig breeding	Poultry farming	Aquaculture	All
1. Total surveyed households (households)	120	120	120	80	80	120	80	120	80	120	1040
2. Number of households interested in new organizations and individuals	30.83	81.67	91.67	41.25	73.75	7.50	53.75	90.83	91.25	70.00	62.98
3. Number of households that can name organizations and individuals in the field of agricultural production											
• 1-2 organizations/individuals	81.08	68.37	41.82	75.76	69.49	77.78	62.79	52.29	57.53	84.52	63.05
• 3-4 organizations/individuals	13.51	13.27	34.55	18.18	25.42	22.22	30.23	39.45	32.88	15.48	26.26
• More than 4 organizations/individuals	5.41	18.37	23.64	6.06	5.08	0.00	6.98	8.26	9.59	0.00	10.69
4. Number of households aware of other organizations and individuals in agricultural production											
• 1-2 organizations/individuals	89.17	55.00	21.67	82.50	72.50	97.50	67.50	39.17	23.75	81.67	63.27
• 3-4 organizations/individuals	8.33	23.33	44.17	12.50	21.25	2.50	23.75	45.00	57.50	15.83	24.90
• More than 4 organizations/individuals	2.50	21.67	34.17	5.00	6.25	0.00	8.75	15.83	18.75	2.50	11.83

Source: Calculated from survey data (2022)



**Table 12: Interest and awareness of farmers regarding standards and new technologies in agricultural production (by product)**

*Unit of measurement: % of households*

Indicators	Crop cultivation		livestock farming		Aquaculture	General
	Short-day plants (rice, vegetables)	Long-day plants	Livestock (cattle, pigs)	Poultry		
1. Total number of surveyed households.	240	400	200	80	120	1040
2. Number of households interested in new organizations and individuals.	61.25	49.75	76.00	91.25	70.00	62.98
3. Percentage of households that can name organizations or individuals in the field of production:						
• 1-2 organizations/individuals.	51.70	70.35	55.26	57.53	84.52	63.05
• 3-4 organizations/individuals.	29.25	18.09	36.84	32.88	15.48	26.26
• More than 4 organizations/individuals.	19.05	11.56	7.89	9.59	0.00	10.69
4. Percentage of households aware of other individuals involved in agricultural production:						
• 1-2 organizations/individuals.	55.42	76.75	50.50	23.75	81.67	63.27
• 3-4 organizations/individuals.	26.25	14.50	36.50	57.50	15.83	24.90
• More than 4 organizations/individuals.	18.33	8.75	13.00	18.75	2.50	11.83

*Source: Calculated from survey data (2022)*

When asked about the needs and plans of households regarding the application of science and technology in agricultural production, it is somewhat surprising that approximately 40% of households stated that they would continue with traditional methods and techniques without adopting new technologies. This is particularly prevalent in provinces such as Ha Giang, Lao Cai, and Thai Nguyen. Meanwhile, about 1/3 of households intend to maintain their current scale and apply existing technologies, while around 26% plan to expand their scale and adopt new agricultural production technologies and standards. This trend is more common in provinces like Bac Giang and Hoa Binh. Nearly 50% of households express the need to apply additional processes and technologies in agricultural production, with the lowest percentage observed in Ha Giang province (37%).

Regarding their plans to apply science and technology in production, over 55% of households engaged in growing medicinal herbs, tea, forestry, and vegetable crops mentioned that they are not prepared to adopt science and technology. The majority of these households operate at a small scale, relying on labor-intensive practices or lacking the resources to expand their

production. Approximately 60% of households stated that they either plan to maintain their current scale of applying science and technology in production or intend to scale up. Among them, many households engaged in fruit tree cultivation and the raising of cattle, pigs, and poultry are willing to embrace new science and technology in their production.

**Table 13: Needs and intentions regarding the application of science and technology in agricultural production by households (by province)**

Unit: %

Indicators	Ha Giang	Lao Cai	Bac Giang	Son La	Hoa Binh	Thai Nguyen	General
1. Total surveyed households	160	160	200	200	200	120	1040
2. Household plans							
- Do not apply science and technology	54.38	45.63	29.50	40.50	35.50	44.17	40.77
- Maintain current scale of application	26.25	30.00	33.50	36.00	36.50	35.00	33.08
- Increase scale of application	19.38	24.38	37.00	23.50	28.00	20.83	26.15
3. Demand for additional adoption of Agricultural Practices/Technologies/New varieties							
- Yes	36.88	43.13	51.50	43.50	46.50	50.83	45.38
- No	63.13	56.88	48.50	56.50	53.50	49.17	54.62

Source: Calculated from survey data (2022)

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