



# Characterizing smallholder poultry production in Vietnam: Evidence from a baseline survey

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June 2023

CGIAR
INITIATIVE ON
Sustainable Animal Productivity

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ILRI thanks all donors and organizations which globally supports its work through their contributions to the CGIAR Trust Fund

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Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover photo— Thong Tran/NIAS

ISBN:92-9146-755-3

Citation: Birhanu, M.Y., Don, N.V., Hoang, H., Esatu, W., Kassie, G.T., Dinh, N.C., Le Quyen, N.T., Thong, T.T., Son, P.V., Cuc, N.T.K. and Dessie, T. 2023. *Characterizing smallholder poultry production in Vietnam. Evidence from a baseline survey*. ILRI Research Report 116. Nairobi, Kenya: ILRI.

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# Acknowledgements

The authors acknowledge the National Institute of Animal Science (NIAS) of Vietnam for implementing the baseline survey. We mainly thank Ngo Thi Kim Cuc for her leadership in the project activities and Nguyen Viet Don for coordinating and supervising the data collection activity. We want to thank International Livestock Research Institute (ILRI) research methods group, mainly Harrison Njamba, for digitizing the data collection tool in ODK and providing training on ODK based data collection. Our gratitude is also extended to the smallholder farmers for their hospitality and passion displayed during the interview and to the enumerators involved in the data collection.

This research was partly funded by the Australian Centre for International Agricultural Research (ACIAR) (Project number LS/2019/142) under the auspices of ILRI. The findings and conclusions presented in the report are those of the authors and do not necessarily reflect the positions or policies of the ACIAR.

# Abbreviations and acronyms

| | |
|---|---|
| ACIAR | Australian Centre for International Agricultural Research |
| AsCGG | Asian Chicken Genetic Gains |
| GSO | General Statistical Office |
| ILRI | International Livestock Research Institute |
| NIAS | National Institute of Animal Science |
| ODK | Open Data Kit |
| RII | Relative Importance Index |
| VND | Vietnamese Đông |

# Executive summary

Smallholder poultry production in Vietnam plays a significant role in the livelihood of rural and peri-urban households, mainly by producing animal derived protein and generating income to support other livelihood activities. However, production and productivity of the sector remain low due to multiple constraints along the value chain. The main constraints include the limited genetic potential of indigenous/local breeds, inadequate access to locally adapted and farmer preferred improved breeds, limited access to best cost feeds and health services, poor marketing infrastructures and facilities, limited extension and advisory services, and other policy related constraints. Addressing these challenges entails integrated efforts from governmental and non-governmental organizations, including international research and development agencies and donors that support smallholder agriculture. As part of this effort, the Australian Centre for International Agricultural Research (ACIAR) supported the International Livestock Research Institute (ILRI) in implementing a project titled "Asian Chicken Genetic Gains (AsCGG). A platform to explore, test and deliver improved chickens for improved livelihood outcomes in Southeast Asia". The project was planned to be implemented in three countries, namely Cambodia, Myanmar and Vietnam. In collaboration with the National Institute of Animal Science (NIAS) of Vietnam, it is implemented in selected rural and peri-urban areas of three provinces representing respective subregions, namely, Ha Nam, Hoa Binh and Quang Binh. The project started with a comprehensive literature review followed by this baseline survey to define and characterize smallholder chicken production, marketing and consumption practices.

The baseline survey adopted multistage sampling approaches, including purposive selecting subregions, provinces, districts and communes/villages. Subregions and provinces were selected based on predefined criteria, including chicken population, number of chickens keeping households, the number of chickens reared in the households, the per cent contribution of chickens to household income and diets, per cent of market share captured by smallholder producers, availability of feed for a growing chicken industry and finally, a diversity of agro-ecological zones. From each village/commune, households with at least two years of chicken keeping experience were randomly selected to participate in the face-to-face interview. We interviewed each household using a structured questionnaire on the Open Data Kit (ODK) system.

This report presents the main findings of the survey, including household characteristics and household livelihood activities; incomes of producers; type of chicken breeds and the production objectives; breed preference for and attributes of good chicken; chicken management practices; access to training, extension and credit; and the marketing and consumption of poultry products.

- Poultry production is one of the major livestock production activities for smallholder farmers in Vietnam. Among the poultry species, chickens are the most common species kept by smallholder farmers.
- Poultry production is among the three most important livelihood activities in all sample provinces. Income from selling eggs and meat contributes significantly to overall household income.
- Chicken production accounts for 42.9% (± 37.05) of livestock income and 10.5% (± 13.5) of total household income. The overall income contribution to resource poor households is significantly higher than that of resource rich

households. This demonstrates the vital role of poultry production in reducing poverty and diversifying household livelihoods.

- About 97.7% of the sample households keep local chicken breeds and only 1.7% and 0.6% keep improved local and exotic/crossbred chickens. Despite long years of experience in chicken production, very few, 1.15% of the sample households, who do not keep improved breeds, had previous experience in improved breed based production. This could be associated with limited access to locally adapted and improved breeds, farmers' preference, and other factors such as limited access to finance for complementary inputs purchase.
- On average, households keep 43.42 (± 21) chickens. Hens account for the largest proportion (49.83%) of the flock, followed by cocks (28.4%). This demonstrates the primary interest of households in reproduction activities.
- Meat consumption (99.7%), egg consumption (89.17%) and meat sale (65.8%) are the three main chicken production objectives reported by smallholder poultry farmers. Although many households participated in egg marketing, egg selling is not reported as among the primary production objectives, mainly due to the low egg productivity of existing breeds kept by households.
- The highest proportion of the sample respondents, 97.72%, reported that they prefer local chicken breeds and only 2.28% said they prefer improved local and crossbred chicken. A better taste of meat (81.87%), less illness (61.4%), good physical appearance (beautiful) (53.22%) and better egg test (52.02%) are important reasons for choosing local breeds. However, most of the sample respondents had no experience in crossbred/exotic chicken breed based production and this preference might change after experiencing the comparative advantages of improved breeds. Most of them, 99.72% of the sample respondents, are willing to test new chicken breeds.
- Most households (93.16%) practice breed selection in their current flock and consider brooding or hatching ability (76%), egg productivity (60%), scavenging ability (58%) and body or feather colour (58%) as selection criteria for the hen. Similarly, for cocks, they consider comb shape (86%), body size (85%), growth rate (83%) and body/feather colour (80%) as important characteristics for selection.
- Irrespective of the experience of breed selection, households consider egg productivity, egg taste, physical appearance and the production of chicks with high survival rates as the most important attributes of hens. Likewise, having a large body size and weight for meat, tasty meat and a good physical appearance are important attributes of cocks. This suggests the need to consider such attributes when identifying and testing locally adapted improved breeds for different locations.
- The production and productivity of local breeds remain low. On average, local breed hens produce 12.4 eggs per clutch at 12.8 days/clutch. On average, they have 5 clutches per year, producing 60.5 (± 10.1) eggs annually.
- Most smallholder producers provide chicken houses, supplementary feed and water to the chickens. Over 97.72 and 96.87% of the sample households use chicken house (coop/hut) at night in the dry and wet seasons. Households do not use any housing during the day or adopt a free ranging system; only 0.5% use chicken houses or baskets during the day.
- All households, 99.15%, provide additional feed to chickens in all months or throughout the year. They provide grains, vegetables, commercial feed (e.g. wheat bran, oilseed by-products, mash) and kitchen waste. Over 95.8% of the sample farmers provide grains, while 31.9, 25.29 and 14.66% of the sample provide vegetable, kitchen waste and commercial feed. About 98.3% of the sample respondents used a feed from their farm and only 13.5% used purchased feed.
- On average, 67.53% of farmers provided routine medical treatment or vaccination to chickens in the last 12 months. Private health service providers (i.e. paraveterinary, shop, company) (66.6%), local healers (23.6%) and government extension (18.6%) are the main providers of routine vaccination or treatment. Newcastle disease (63.5%), bird flu (41.67%) and chicken cholera (29.6%) are the three most common diseases vaccine/routine treatments administered.
- Households allocate time for different poultry production and marketing management activities. Of the total time allocated to poultry management, 35% of the time is used for feeding, including feeding collection and preparation, followed by watering birds (17%), and cleaning the birds' shed or shelter (16%). The average time allocated for disease prevention and treatment is very small (2%).

- Although men have important roles in poultry production, women contribute more to production and marketing activities. Women contribute most of the time (73.05%) allocated to poultry production and marketing activities, suggesting targeting women in poultry research and development activities.
- The proportion of households participating in training and extension activities is low. Only 36.18% of the sample households participated in training and extension activities in the last 12 months. Government extension services provide almost all training and extension activities.
- Most smallholder farmers own smart phones. A higher level of household head literacy (7.4± 2.6) and ownership and use of smart mobile phones (71.5%) indicate possible opportunities to provide digital extension, training and advisory services to smallholder poultry producers.
- Most households belong to social/welfare and community development groups focusing on social functions and networking. None belong to savings and credit groups, agricultural producer groups, livestock (including chicken) producer groups, agricultural marketing groups, livestock marketing groups and livestock producer groups.
- Although 74.3% of households have access to credit, only 16% used credit in the previous 12 months, which can be associated with a lack of tailored financial products and services for smallholder producers. This suggests the development of context specific financial products and services and associated delivery business models.
- Most households consume eggs and meat produced from their own farms. In three months, they consumed an average of 4.68 (± 3.26) chickens and 3.10 (± 2.82) ducks from their farms. Very few proportions come from purchased sources. Similarly, households consumed 36.16 (± 16.68) chicken eggs in three months and the average consumption of duck eggs is low.
- Most households participate in the marketing of poultry products. On average, 62.11% of the households participated in egg sales during the previous three months, while 86.32% participated in live chicken or meat sales during the last 12 months. This may indicate the important role poultry production plays in income generation.

The above evidence from the baseline survey indicates the vital role of smallholder poultry production in households' livelihood activities, including income generation and supply of high quality and cheap protein sources. However, the sector's low productivity could be associated with the limited genetic potential of the local breeds mainly used by farmers, limited access to locally adapted and high producing breeds, high disease incidence, inadequate management, and limited access to services and supports. These require introducing context specific integrated innovation packages that may include locally adapted and farmer preferred improved breeds; best-cost feed packages; context specific health services and delivery models; tailored financial products, services, and delivery models; digital extension, advisory and training services; access to market information, facilities, and infrastructures; and enhanced collective actions.

# 1 Introduction

Smallholder poultry production is essential to the livelihood of rural and peri-urban households in Vietnam. About 70% of households in Vietnam are involved in poultry production. Among poultry species, chickens and ducks are the primary birds kept by smallholder households (Birhanu et al. 2021b). Poultry production supplies eggs and meat for consumption, generates income and supports other livelihood activities. Beyond consumption and income generation, households use birds for ritual and other social purposes. Despite its significant contribution to household livelihood, the sector is constrained by various production and marketing challenges, including low productivity of breeds, limited access to inputs and services, disease and high mortality, seasonal demands and price fluctuation. Most smallholder households keep indigenous or local breeds with low production and productivity. For instance, local hens lay few eggs annually and are usually used for natural incubation/reproduction. The growth performance of local/indigenous chickens is generally low and reaches maturity late compared to improved or commercial line breeds.

The smallholder poultry production sector is also affected by other production constraints, such as predatory attacks, high incidence of diseases, limited access to feed, inadequate management, limited capacity of producers and inadequate access to training (Birhanu et al. 2021b). Marketing challenges constrain the sector, including inadequate access to market infrastructure, limited institutional support, unstable markets and price fluctuations and inadequate product standards and classification systems. Improving the productivity of the sector requires adopting integrated approaches that include enhancing the genetic potential of existing breeds, introducing locally adapted improved breeds, access to best cost feeds and health services, improved market facilities, building the capacity of farmers and other value chain actors and targeted advisory and support services.

Considering the multiple challenges mentioned above, the International Livestock Research Institute (ILRI) designed a project called Asian Chicken Genetics Gain (AsCGG) and has been implementing it in Cambodia and Vietnam since 2020. This project aims to test and avail high producing, farmer preferred poultry genotypes to increase smallholder chicken productivity as a way out of poverty. This would improve food security and reduce poverty among smallholder farmers and rural communities, improving gender equity and empowerment of women and girls, fostering more inclusive poultry market chains and engaging the private sector where possible. As part of this project, a baseline survey was conducted to characterize current smallholder chicken production systems and document smallholder poultry farmers' breeding objectives and knowledge, attitudes and practices.

The baseline survey was conducted in 2021 and explored existing smallholder chicken production systems, chicken productivity, husbandry practices, farmers' trait preference, flock dynamics, marketing and consumption of poultry products and the contribution of poultry production to the livelihood of households. We adopted a multistage sample selection approach that includes the selection of subregions, provinces, districts and communes. Subregions, provinces, districts and communes are purposively selected based on pre-identified selection criteria, including the number of chickens, the number of smallholder households rearing chickens, the number of chickens reared in the household, the percentage contribution of chickens to household income or nutrition, the percentage market share captured by smallholder poultry producers, the availability of feed resources for a growing chicken industry and diversity between

sub-nationals. Households are randomly selected, considering at least two years of experience in chicken production. We interviewed 351 households with a structured questionnaire using the Open Data Kit (ODK) system.

This report presents the survey's main findings, including household characteristics, land and livestock ownership, poultry production practices, chicken management, breed selection and trait preference, marketing practices, allocation of household labour and consumption of poultry products. The report is organized into four sections. Following this introduction, the second section highlights the methods adopted. The third section presents the main results and finally, the conclusions and implications are presented in the fourth section.

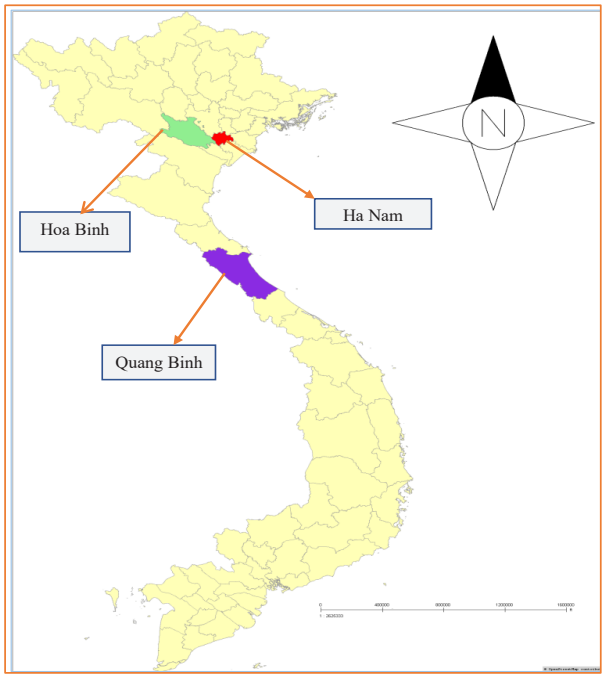
# 2 Sampling, data collection and analysis

## 2.1 Sampling and sample selection

We adopted multistage sampling approaches to select sample respondents. Three subregions, i.e. Northwest, Red River Delta and North Central Coast, were purposively selected and in each subregion, we selected one province (Ha Nam, Hoa Binh, Quang Binh) (Figure 1). Subregions and provinces were selected based on predefined criteria, including a high number of chickens in the area, the number of smallholder households rearing chickens, the number of chickens reared in the household, the per cent contribution of chickens to household income and diets, the percentage of market share captured by smallholder producers, availability of feed for a growing chicken industry and finally, a diversity of agro-ecological zones. Secondary data on the above indicators were collected from the provincial Department of Agriculture and Rural Development.

We selected three rural districts using the same criteria. Duyen Tien in Ha Nam, Kim Boi in Hoa Binh and Tuyen Hoa in Quang Binh. From each district, we selected two communes, where the sample respondents were randomly selected. From the selected provinces and districts, households with at least two years of chicken keeping experience were randomly selected to participate in a face-to-face interview from the list of households obtained from the Department of Agriculture and Rural Development.

Figure 1. Map of AsCGG study areas in Vietnam.



## 2.2 Data collection

As indicated above, the main purpose of this baseline survey was to generate evidence on the characteristics of smallholder poultry producers in rural areas, existing poultry production and marketing practices, traits and breed preferences of farmers, chicken productivity, chicken management, labour allocation for chicken activities, training and extension, poultry products and other food consumption and household livelihood activities. Based on the expected data generated and the survey objectives, a structured questionnaire was developed and digitized in the ODK data collection system. After testing the data collection tools, five days of training were given to enumerators through virtual platforms due to the COVID-19 restrictions. The training focused on understanding the project's objectives, discussing each questionnaire module and understanding the ODK system to collect data using tablets and interviewing techniques. The training also had practical sessions, where the enumerators practised filling out the questionnaire using their tablets. These trained enumerators then collected the data.

## 2.3 Data analysis

The data collected using the ODK system were exported to Stata® for data management and analysis. Data were cleaned using appropriate procedures and indicators were generated from each questionnaire section. Data analysis was carried out mainly using descriptive statistics, including univariate or bivariate and multivariate analysis, to understand the association and relationships of two or more indicators. We used a combination of tabulation and graphical description techniques to present the main findings, including a discussion of the results.

# 3 Results and discussion

## 3.1 Household characteristics

The sample households had an average of 4 family sizes with a minimum of 1 and a maximum of 8 persons (Table 1). The average family size in Hoa Binh province is higher than in Ha Nam and Quang Binh. The average age of the heads of the households was 54.9 (± 10.2), the highest being in Ha Nam and the lowest in Quang Binh. Almost all household heads (99.43%) are literate, with schooling years greater than one. Household heads spent, on average, 7.4 (± 2.6) years in formal schooling. The average number of school years seems similar across provinces. Farmers' literacy and better education have multiple advantages, including enhancing decision-making about technology adoption, access to inputs and services and improving farmer efficiency and productivity (Vu et al. 2019; Ninh 2020).

Table 1. Summary of household characteristics

| | Variables | Mean (SD) | Min | Max | No. |
|---|---|---|---|---|---|
| Ha Nam | Household size | 3.7 (1.5) | 1 | 7 | 117 |
| | Age of head of household | 59.2 (7.9) | 39 | 76 | 117 |
| | Education of head of household | 7.4 (2.3) | 2 | 12 | 117 |
| Hoa Binh | Household size | 4.7 (1.3) | 2 | 7 | 118 |
| | Age of head of household | 53.2 (10.2) | 29 | 80 | 118 |
| | Education of head of household | 7.6 (2.6) | 2 | 12 | 118 |
| Quang Binh | Household size | 4.3 (1.5) | 1 | 8 | 114 |
| | Age of head of household | 52.2 (10.9) | 30 | 82 | 114 |
| | Education of head of household | 7.3 (2.8) | 0 | 12 | 114 |
| Total | Household size | 4.2 (1.5) | 1 | 8 | 349 |
| | Age of head of household | 54.9 (10.2) | 29 | 82 | 349 |
| | Education of head of household | 7.4 (2.6) | 0 | 12 | 349 |

Note: SD denotes standard deviation.

## 3.2 Livestock and land ownership

Livestock production is among the main sources of livelihood activities for rural households in Vietnam. Smallholder households keep cattle, pigs, ducks and chickens (Table 2). Chicken seems to be the most common livestock species that could mainly be associated with sampling approaches. On average, the sample households had 43.42 (± 21.0) chickens. The households in Ha Nam had the highest number of chickens, while the households in Quang Binh had the lowest. The

overall chicken holding is lower than the national average (54.11) (GSO 2021). However, the average holding in each province is significantly higher than other livestock holdings, including ducks. The high number of chickens owned by the sample households shows the role that chicken production can play among rural households in each region. The average number of cattle, sheep and goats in the sample households was minimal. Only 26.78% of the sample respondents have cattle and the proportion of respondents with sheep and goats is almost none. The highest average number of cattle was reported in Quang Binh province. Following chickens, pigs are the main livestock species maintained by smallholder producers (54.42%), especially in the Ha Nam and Hoa Binh provinces. Compared to others, most of the producers in Hoa Binh keep ducks. Most smallholder farmers had small land sizes. The average land holding was 0.55 ha, the highest in Hoa Binh and the lowest in Quang Binh. The small land size held by the sample respondents may indicate the limited ability of smallholder producers to engage in enhanced crop production and other livestock production activities than poultry production activities that require more extensive land holdings.

Table 2. Average number of livestock and land sizes owned by households

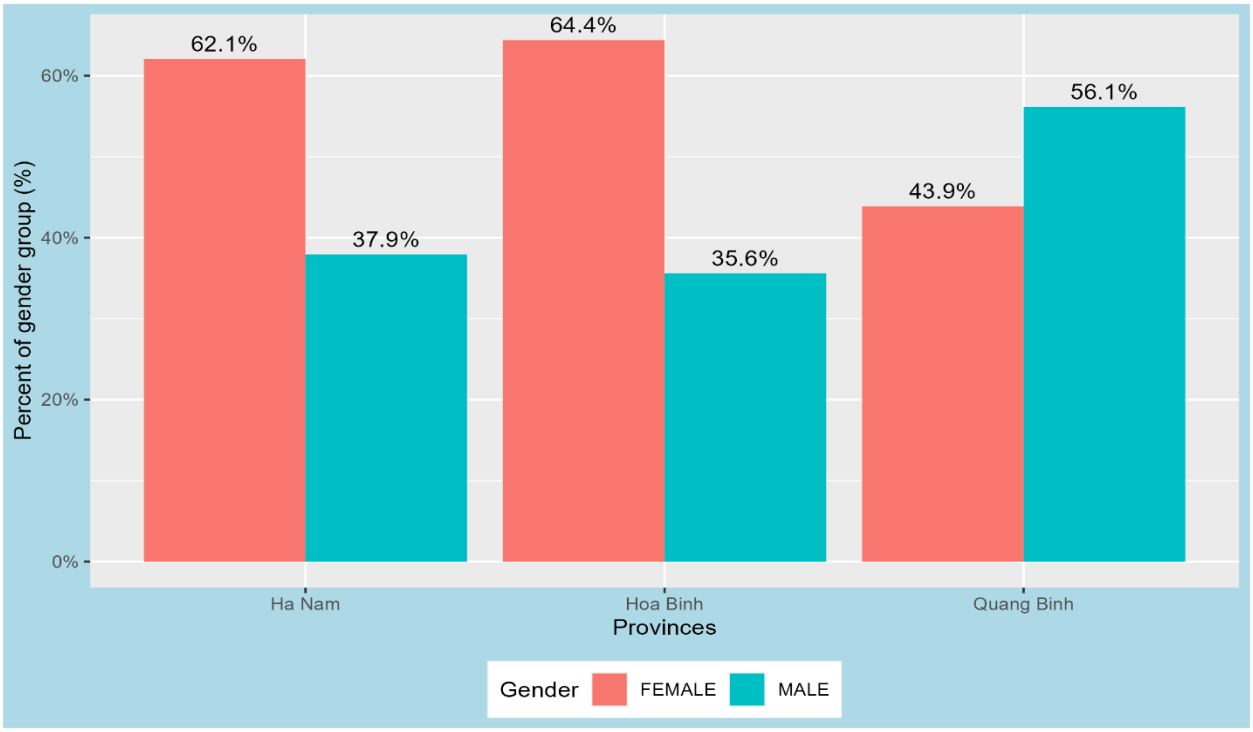
| | Ha Nam | Hoa Binh | Quang Binh | Total |
|---|---|---|---|---|
| Type of livestock | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Cattle | 0.1 (0.42) | 0.36 (1.01) | 1.51 (1.84) | 0.65 (1.37) |
| Sheep | 0 (0) | 0 (0) | 0.02 (0.19) | 0.01 (0.11) |
| Goat | 0.2 (1.88) | 0.17 (1.84) | 0 (0) | 0.12 (1.52) |
| Pigs | 13.02 (21.14) | 6.21 (10.01) | 1.1 (5.02) | 6.8 (14.62) |
| Ducks | 3.09 (8.97) | 22.06 (22.8) | 3.45 (8.18) | 9.64 (17.41) |
| Chicken | 52.65 (24.68) | 41.7 (17.14) | 35.8 (16.77) | 43.42 (21) |
| Land size (ha) | 0.31 (0.36) | 1.17 (1.55) | 0.17 (0.11) | 0.55 (1.03) |
| No. | 116 | 118 | 114 | 348 |

Note: SD denotes standard deviation.

# 3.3 Gender of the poultry farmer

Empirical studies show that most smallholder chicken production in developing countries is owned and managed by women (Phuong et al. 2015; Ahmed et al. 2021). Evidence from baseline data also confirmed that poultry farmers are women in 57% of households (Figure 2). Within male headed households, 49% of poultry farmers are female, while 98% are female in female headed households. This may suggest that women are the main actors in poultry production in study areas. The disaggregated data at the provincial level also indicate that 62.1% and 64.4% of the farmers in Ha Nam and Hoa Binh are women. But in Quang Binh province, the proportion of male poultry farmers is greater than that of female poultry farmers. The survey findings may suggest targeting women in poultry research and development interventions and developing strategies and customized business models to enhance their active participation.

Figure 2. Gender of poultry farmers (%) by province.




# 3.4 Livelihood of the smallholder farmers

Smallholder farmers in Vietnam have various livelihood activities. Different household members are engaged in various livelihood activities, including crop farming, livestock keeping, self-employment, trading and other non-agricultural activities. We summarize the livelihood activities of the household head in Table 3. The primary livelihood activities include formal salaried employment and crops and livestock production activities. Formal salaried employment refers to employment as a civil servant, employment in the private sector (in industry and service), non-farming labour and domestic work in the homes of other households. This is in line with other country level surveys that indicate wage employment is the main source of household livelihood activities in rural and urban areas (GSO 2019). Other livestock and poultry productions are household heads' most common secondary and tertiary livelihood activities. Most farmers consider poultry production among the three main livelihood activities, indicating the sector's important role in the well-being of rural households. Crop production is the second primary, third secondary and second tertiary activity, indicating the sector's importance. However, rural households primarily focus on activities other than a crop that could be associated with small land ownership by sample households and the availability of alternative livelihood activities. Moreover, very few proportions of household heads are involved in other nonfarm activities such as trading and services provisions.

Table 3. Livelihood activities of the household head

| | Ha Nam | | | Hoa Binh | | | Quang Binh | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Livelihood activities | PR | SCD | TR | PR | SCD | TR | PR | SCD | TR | PR | SCD | TR |
| Crop farming | 20.7 | 7.9 | 41.9 | 29.9 | 19.3 | 38 | 26.8 | 18 | 34 | 25.8 | 15 | 38.1 |
| Farm labourer | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 | 7.2 | 2.1 | 0.3 | 2.4 | 0.7 |
| Formal salaried employment | 50.9 | 1.8 | 3.8 | 61.5 | 17.5 | 4.3 | 53.6 | 14 | 8.2 | 55.4 | 11.2 | 5.4 |
| Livestock keeping | 9.5 | 53.5 | 6.7 | 6 | 33.3 | 9.8 | 11.6 | 30 | 6.2 | 9 | 38.9 | 7.5 |
| Old/retired | 11.2 | 0.9 | 1.9 | 1.7 | 0 | 0 | 1.8 | 0 | 3.1 | 4.9 | 0.3 | 1.7 |
| Poultry keeping | 4.3 | 36 | 44.8 | 0.9 | 21.9 | 39.1 | 2.7 | 26 | 45.4 | 2.6 | 28 | 43.2 |
| Self-employed services | 1.7 | 0 | 0 | 0 | 2.6 | 7.6 | 2.7 | 4.5 | 1 | 1.4 | 2.4 | 2.7 |
| Trading in non-livestock agricultural products | 1.7 | 0 | 1 | 0 | 5.3 | 1.1 | 0 | 0 | 0 | 0.6 | 1.8 | 0.7 |
| No. | 116 | 114 | 105 | 117 | 114 | 92 | 122 | 111 | 97 | 347 | 341 | 296 |

PR = Primary; SCD = Secondary; TR = Tertiary.

# 3.5 Contribution of poultry production to household income

The average reported annual household income was 89.4 million Vietnamese dông (VND) (USD 1.00 = VND 23,159.78 in 2021 (World Bank, 2023)), with a median income of VND 80 million (Table 4). Most smallholder producers generated income from selling eggs, live chickens, and chicken meat. The income generated from the sale of live chicken or chicken meat was significantly higher than the sales of eggs. This is expected, as most rural households in the country keep indigenous breeds that lay fewer eggs and are used mainly for live chickens rather than egg production. On average, the sample households generated VND 1,295 million and 6,327 million from selling eggs and chicken in 12 months.

Table 4. Income generated from the sale of eggs and chicken (VND 1,000/12 months)

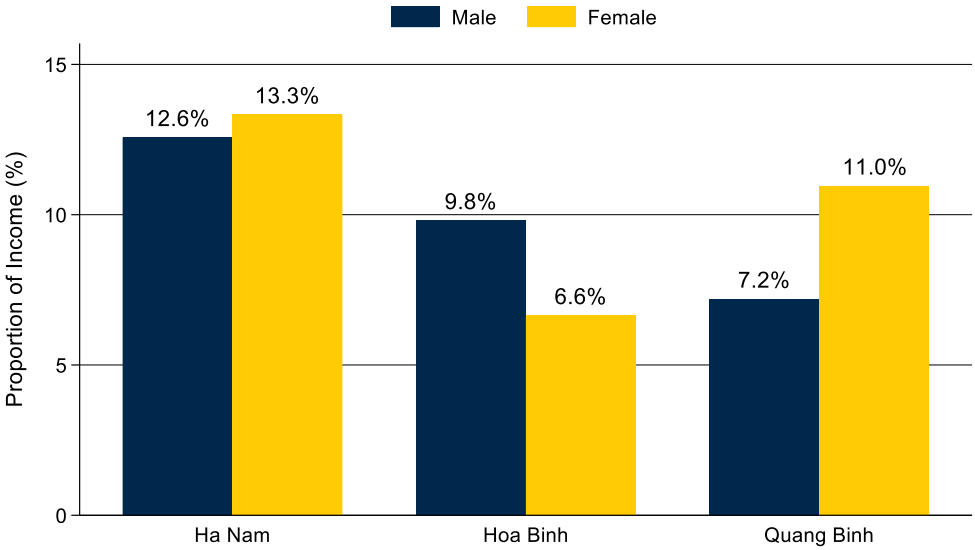
| | Ha Nam | Hoa Binh | Quang Binh | Total |
|---|---|---|---|---|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Egg | 966.41 | 1,133.32 | 1,797.59 | 1,295.29 |
| | (2,241.37) | (3,111.03) | (2,587.62) | (2,690.12) |
| Chicken | 10,128.96 | 4,897.96 | 3,938.28 | 6,327.25 |
| | (9,755.97) | (3,650.26) | (2,821.53) | (6,784.53) |
| Total (egg + chicken) | 11,095.37 | 6,031.28 | 5,735.86 | 7,622.54 |
| | (9,719.95) | (5,016.04) | (3,608.03) | (7,077.86) |
| Total household income | 95,064.68 | 87,323.48 | 85,675.44 | 89,381.75 |
| | (46,764.88) | (44,249.59) | (49,050.05) | (46,767.04) |
| No. | 116 | 118 | 114 | 349 |

Note: SD denotes standard deviation. USD 1.00 = VND 23,480.064.

Poultry production contributes significantly to total livestock income and overall household income. For example, the income from the sale of eggs and chicken accounted for 10.5% (± 13.5) of the total household income, with a minimum of 0 and a maximum of 100%. Poultry production is the sole income source for very few (0.86%) households. The gender

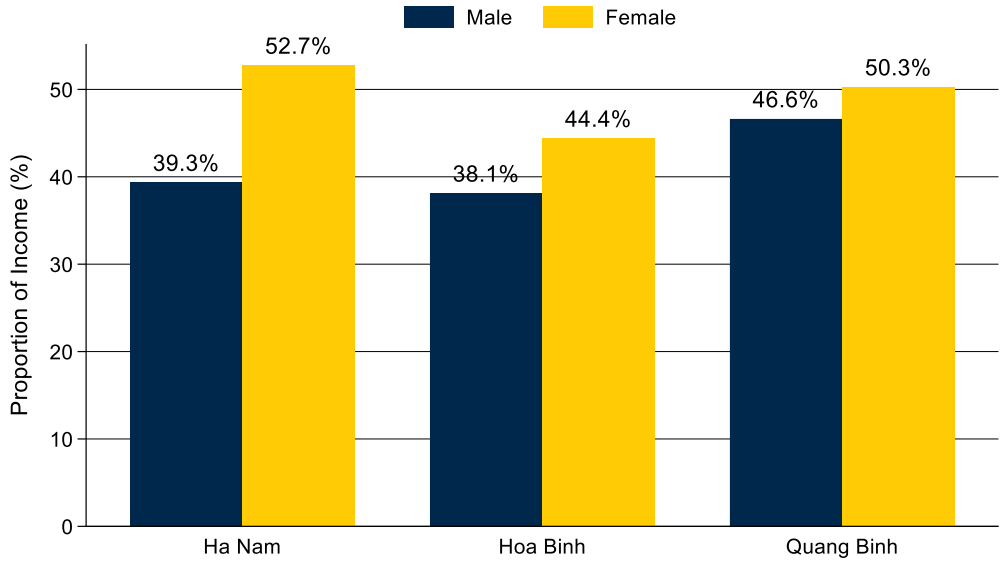
disaggregated data for the head of the household shows that poultry income contributes slightly more income in female headed households (10.6%) than in male headed households (9.6%) (Figure 3). However, when provinces disaggregate households, the variability in income contribution between male and female headed households would increase. For example, in Ha Nam province, income from poultry production contributes 13.3% and 12.6% in female and male headed households. In contrast, in Quang Binh province, it contributes 10.96% and 7.19% of the incomes of female and male headed households, respectively. Unlike Ha Nam and Quang Binh provinces, the contribution in male headed households is higher than female headed households in Hoa Binh province.

Figure 3. Contribution of chicken income to household income (%).



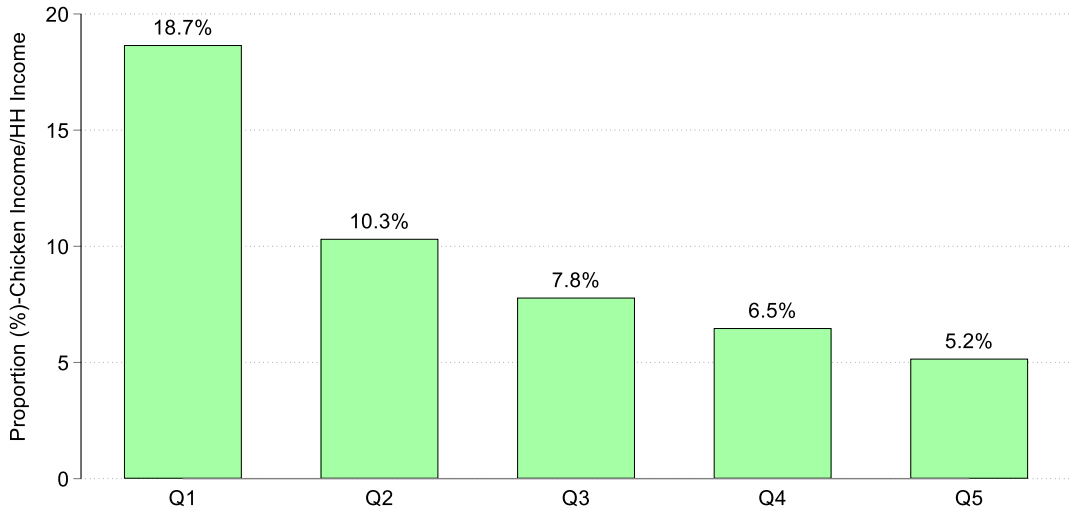

As indicated above, poultry production is one of the sample households' main livestock income sources. On average, chicken production accounts for 42.9% (± 37.05) of the total livestock income in the sample households. This confirms that poultry production is a vital livestock activity among sample households. The gender disaggregated data indicate that, in all provinces, female headed households generate a higher proportion of poultry production livestock income than male headed households (Figure 4). The average contribution of income from chickens to the total livestock income in female and male headed households was 50.9 and 40.9%, respectively. This could be associated with female headed households' lower ownership of other livestock species than male headed households and limited opportunities for other income generating activities, indicating the relative importance of poultry production in female headed households than male headed households. Unlike the total household income contribution, in all provinces, the livestock income contribution in female headed households is greater than in male headed households.

Figure 4. Contribution of chicken income to total livestock income.



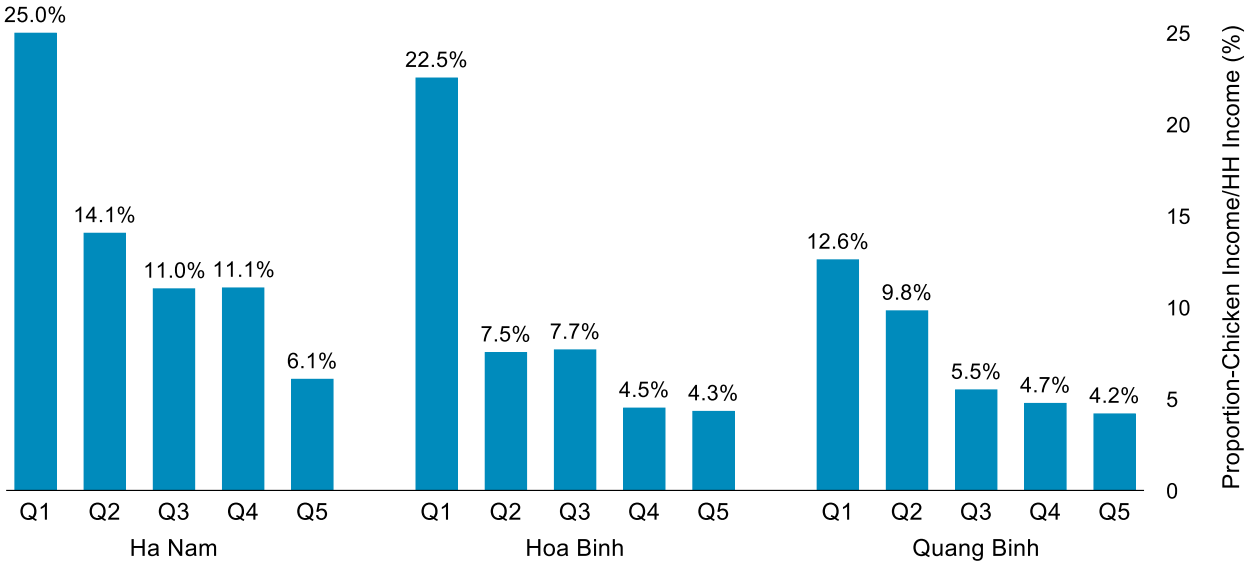

The relative importance of poultry production for different wealth groups of households in rural communities can be examined by disaggregating sample households by income quintile. The lowest quintile (Q1) refers to the 20% of households with the lowest income and the highest quintile (Q5) refers to the top 20% (80$^{th}$ percentile and above) of households with the highest income. Compared to households in the highest income quintile (Q5), income from poultry production accounts for the largest proportion of household income in the lowest income quintile. Chicken production accounts for 18.7% of household income in the lowest poorest households, while it accounts for about 5.2% in the richest households (Figure 5). The income contribution in the poorest households is about 3.6 times that of the richest 20% of households. This demonstrates the significant contribution of poultry production to the livelihoods of poor rural households. The higher contribution of poultry income to resource poor households may suggest that improving the production and productivity of the sector mainly benefits resource poor households more than resource rich households, which has strong implications for poverty reduction and improved food and nutritional security strategies.

Figure 5. Proportion of chicken income to total livestock income by income quintile.



Moreover, the average contribution of chicken income to household income varies from province to province due to variations in the production level and other factors such as household livelihood activities and access to the market. Figure 6 summarizes the proportion of chicken income to household income by province and household poverty status. The households in Ha Nam province generate the highest proportion of household income from chicken production than the households in other provinces. Interestingly, the proportion of income generated by the lowest and poorest 40% of households in Ha Nam province is significantly higher than in Hoa Binh and Quang Binh. Households in Quang Binh province have the lowest proportion of income from poultry production, potentially associated with a lower number of chickens owned and inadequate access to the input and output market and other factors. For example, as indicated above, the average chicken flock size in Quang Binh is lower than in other provinces and households in this province have larger land sizes than others.

Figure 6. Proportion of chicken income to total household income by province.

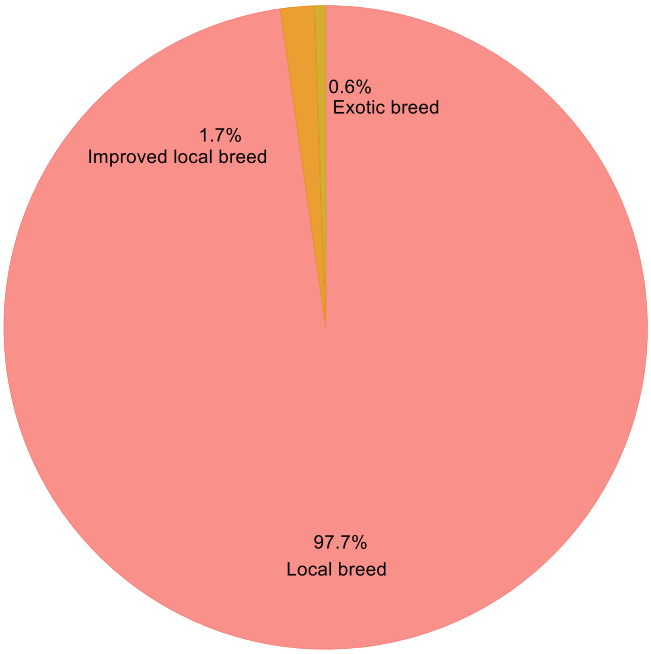



# 3.6 Type of chicken breeds and flock composition

As indicated above, among poultry species, chickens and ducks are the most common birds kept by smallholder producers and smallholder producers have adequate experience in poultry production. On average, sample smallholder producers kept chicken for 28.9 (± 9.7) years. The average experience in Ha Nam, Hoa Binh and Quang Binh provinces was 30.1, 31.1 and 22.0 years, respectively. Despite long years of experience, almost all households keep local/ indigenous chicken breeds and do not keep improved chicken breeds, including exotic ones (Figure 7). Approximately 97.7% of the households kept local breeds, 1.7% kept improved local breeds and only 0.6% kept exotic/crossbred birds.

Similarly, among households who kept local breeds during the survey, only 1.15% had experience keeping exotic/ crossbred birds. The lower level of adoption of improved chicken breeds could be associated with limited access to locally adapted and farmer favoured improved breeds, higher input costs and inadequate access to feed and other inputs associated with improved breeds. The objective of household production, such as focusing primarily on raising chickens for home consumption, may also affect their decision to adopt improved breeds.

Figure 7. Proportion of households that keep different breeds.




We examine the composition of the chicken flocks kept by the sample households. As indicated above, on average, households keep 43.42 (± 21) chickens, with a minimum of 35.8 in Quang Binh and a maximum of 52.65 in Ha Nam provinces (Tables 2 and 5). Hens constitute 49.83% of the flock composition, followed by cocks (28.4%) and chicks (12.48%). The composition of the female flock (hens and female growers) constitutes 55.77%, as households generally keep females for reproduction. The overall average cocks-to-hen ratio is 1:1.54, with the highest average in Hoa Binh (1:2.7) and the lowest average in Ha Nam (1:1.03). Households in Ha Nam keep more hens and cocks and fewer chicks than others, which could be associated with access to the market to purchase grower chickens and sell poultry products.

Table 5. Type and number of chickens kept by households by province

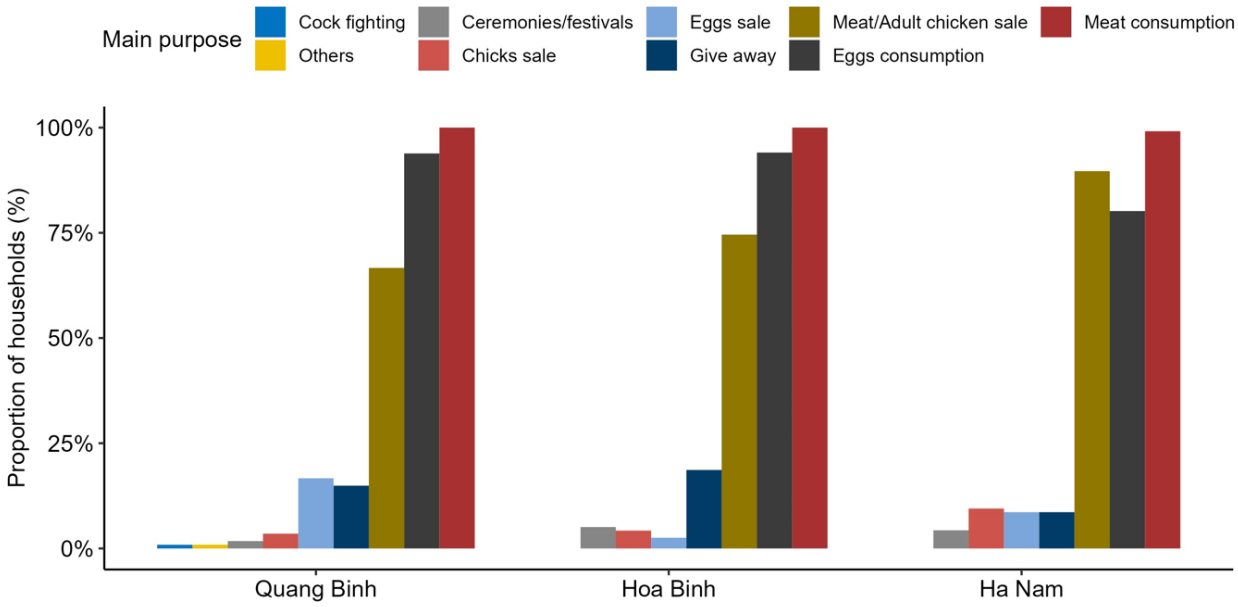
| | Ha Nam | Hoa Binh | Quang Binh | Total | |
|---|---|---|---|---|---|
| Type of chicken | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Per cent share (%) |
| Cocks | 24.94 | 7.38 | 7.01 | 13.11 | 28.4 |
| | (17.75) | (6.12) | (7.58) | (14.35) | (21.75) |
| Hens | 25.79 | 20 | 14.81 | 20.23 | 49.83 |
| | (13.93) | (7.72) | (9.51) | (11.57) | (22.63) |
| Grower males | 0.32 | 2.65 | 1.96 | 1.65 | 3.34 |
| | (2.57) | (4.78) | (3.99) | (4.01) | (7.96) |
| Grower females | 0.43 | 5.25 | 3.66 | 3.12 | 5.94 |
| | (3.27) | (9) | (7.79) | (7.39) | (13.51) |
| Chicks | 1.16 | 6.42 | 8.37 | 5.31 | 12.48 |
| | (9.49) | (10.31) | (11.46) | (10.85) | (23.18) |
| Total chicken | 52.65 | 41.7 | 35.8 | 43.42 | |
| | (24.68) | (17.14) | (16.77) | (21) | |
| No. | 116 | 118 | 114 | 348 | |

Note: SD denotes standard deviation.

# 3.7 Chicken production objectives and source of foundation stock

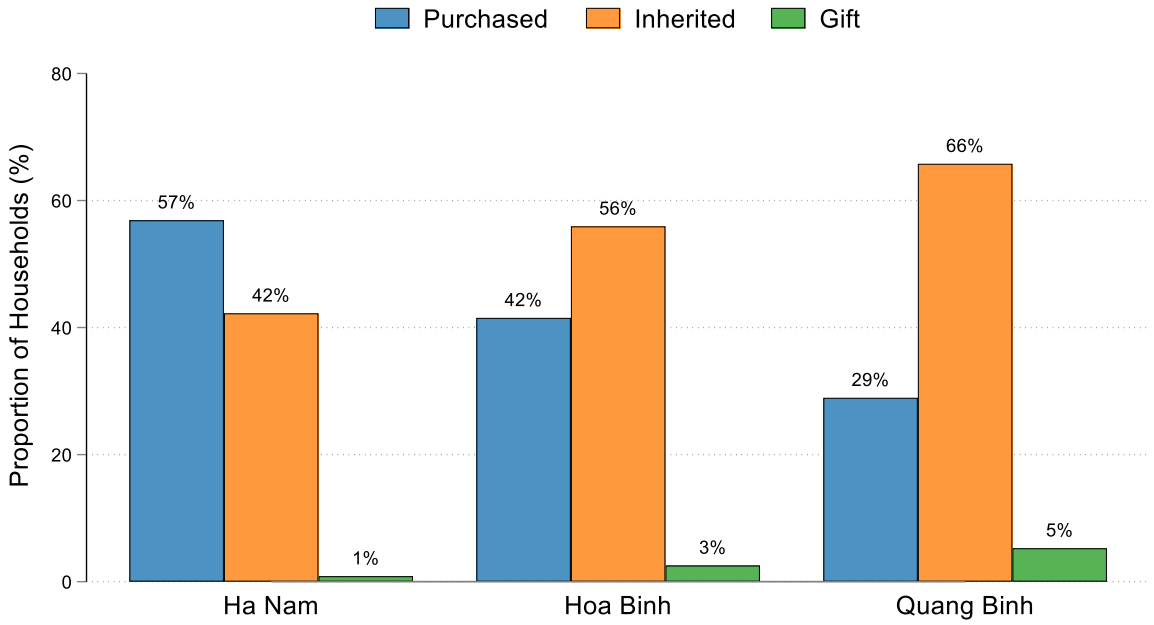
We summarize the three most important purposes of keeping chickens reported by households. Accordingly, meat consumption (99.7%), egg consumption (89.17%) and meat or adult chicken sale (76.92%) are the three main chicken production objectives reported by the sample respondents. Most households produce chickens for home consumption, followed by income generation. Similar results are observed when we disaggregated the data by provinces (Figure 8). Compared to other livestock production, studies have also indicated that the primary purpose of chicken production is home consumption (Moula et al. 2011; Phuong et al. 2015). Few sample respondents mention egg sales (9.4%) as the other main purpose of chicken production. However, as the income data indicates, egg sale remains the essential source of income for households. Some households have also indicated gifts (13.96%), chick sales (5.98%) and ceremonies (3.7%) among the three primary purposes of keeping chickens.

Figure 8. Main purpose and objectives of keeping chickens.




Evidence generated on the source of the foundation flock for existing chickens shows that purchase, inheritance and gift are the three main sources of foundation flock. Compared to others, the highest proportion (57%) of Ha Nam households used purchases as a source of foundation flock, followed by Hoa Binh (42%) (Figure 9). On the contrary, the highest proportion of households that used inheritance as a foundation flock was found in Quang Binh. In this province, the lowest proportion of households that used purchase as a foundation flock was found. Sources of the foundation flock can affect the flock sizes households keep. Especially due to the limited incubating and brooding capacity of local breeds and the increased incidence of mortality at the chick stage, households that use inheritance as a foundation flock would have a higher likelihood of keeping a smaller flock size. For example, as indicated above, the average flock size in Quang Binh province is significantly smaller than households in Ha Nam. Empirical evidence shows that flock size substantially affects the production and productivity of smallholder poultry producers (Birhanu et al. 2021a). This may suggest introducing an innovative chick multiplication and delivery system to smallholder farmers to enhance the production and productivity of the sector.

Figure 9. Main sources of foundation stock by provinces.




# 3.8 Chicken breed preference

Households were asked to rank different types of chicken in order of preference, even if they did not keep all. Breeds include local,[1] improved local, exotic,[2] improved exotic and crossbred[3] (local exotic). The highest proportion of the respondents, 97.72%, said they prefer local breeds and only 2.28% said they prefer improved local and crossbred chickens. For the most preferred breeds, local breeds, farmers provide up to 5 reasons for preference in order of importance. A summary of responses based frequencies shows that better taste of meat (81.87%), less illness (61.4%) and good physical appearance (beautiful) (53.22%) are the three most important reasons for preference. About 52.02% of the households also reported a better taste of eggs as an important reason. Other studies have documented a higher consumer preference for local/indigenous breeds in Vietnam than crossbred/exotic breeds (Birhanu et al. 2021b).

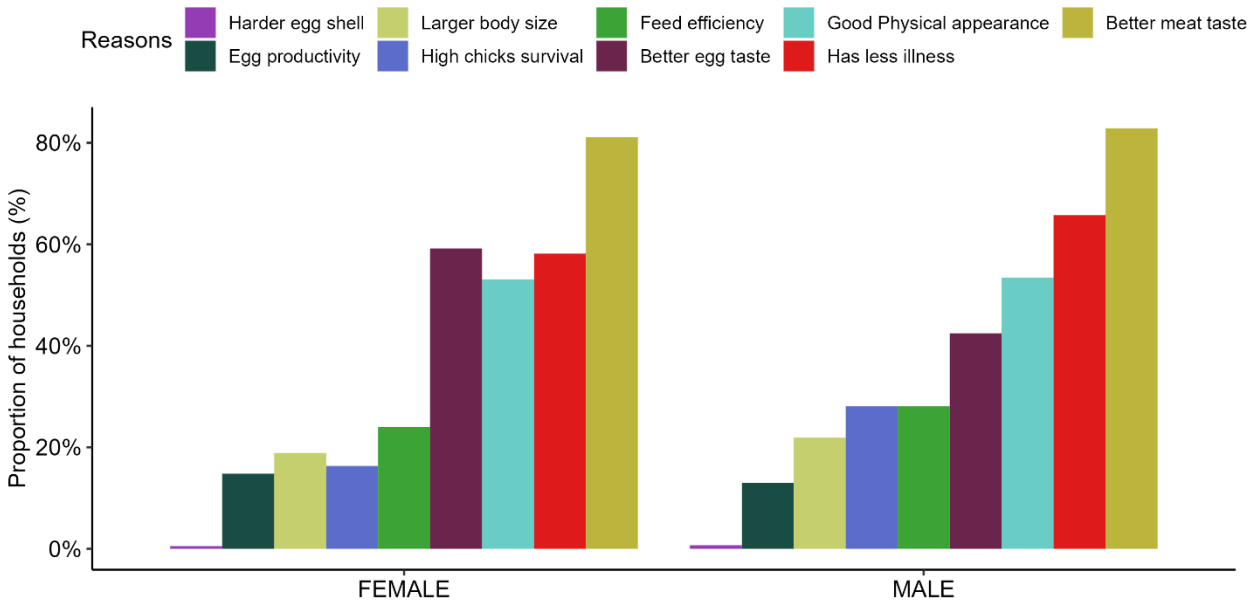
The reasons behind the preference for local breeds were disaggregated by the gender of the farmers and both men and women farmers have similar justifications (Figure 10). However, compared to male farmers, a higher proportion of female farmers reported better egg taste as a reason for preferring local chicken breeds. Only 14.04 and 20.18% of the sample respondents reported egg productivity and large body size as a reason for preference. This is expected mainly due to the limited genetic potential of local breeds in egg productivity and smaller body sizes. Most smallholder farmers use eggs for flock maintenance, as indicated by Moula et al. (2011). The above evidence reflects that the preference of households for local breeds is based primarily on taste and local adaptability rather than chicken productivity. This shows the need to consider these characteristics when testing chicken that would be potentially introduced to farmers or improving the production and productivity of local/indigenous breeds through various interventions (Van et al. 2020).

1 . Breeds which have been in the country for a sufficient time to be genetically adapted to one or more of traditional production systems or environments in the country (s) (FAO 2015). This also includes breeds which originated within the country.

2 . Breeds which are maintained in a different area from the one they were developed and including breeds that are not locally adapted. Exotic breeds comprise both recently introduced breeds (whose importation was within the last 5 generations) and continually imported breeds (whose local gene pool is regularly replenished from one or more sources outside the country) (FAO 2015).

3 . Offspring produced by mating parents of two different breeds; in this survey it mostly refers to a mating of a local/indigenous parent with an exotic parent.

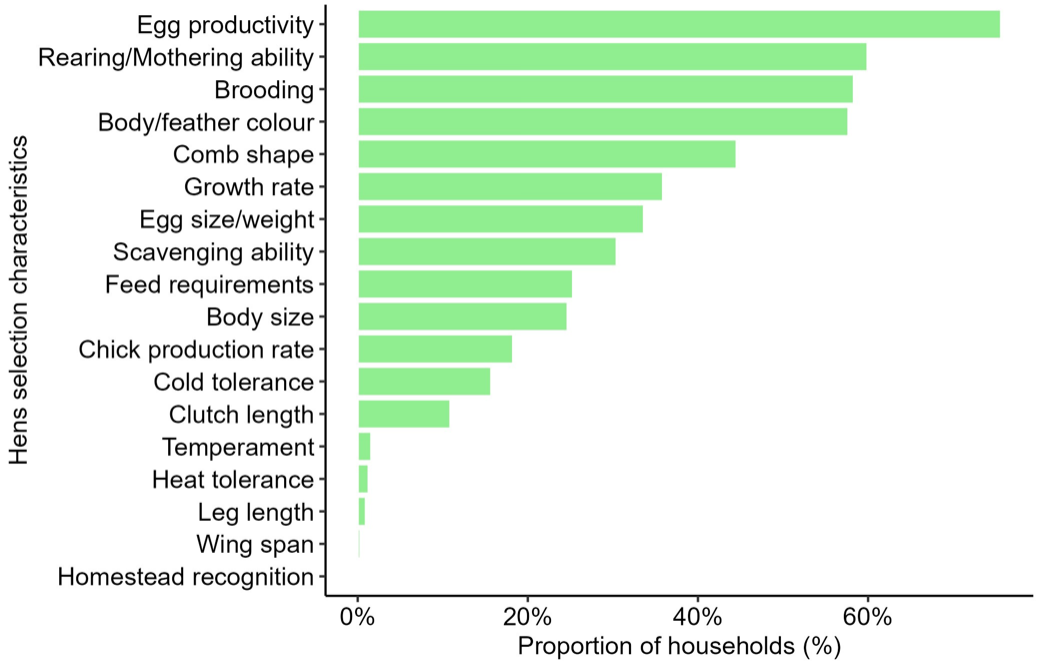
Figure 10. Households reason for local breed preference by sex of the farmer.




# 3.9 Households breeding practice and chicken selection characteristics

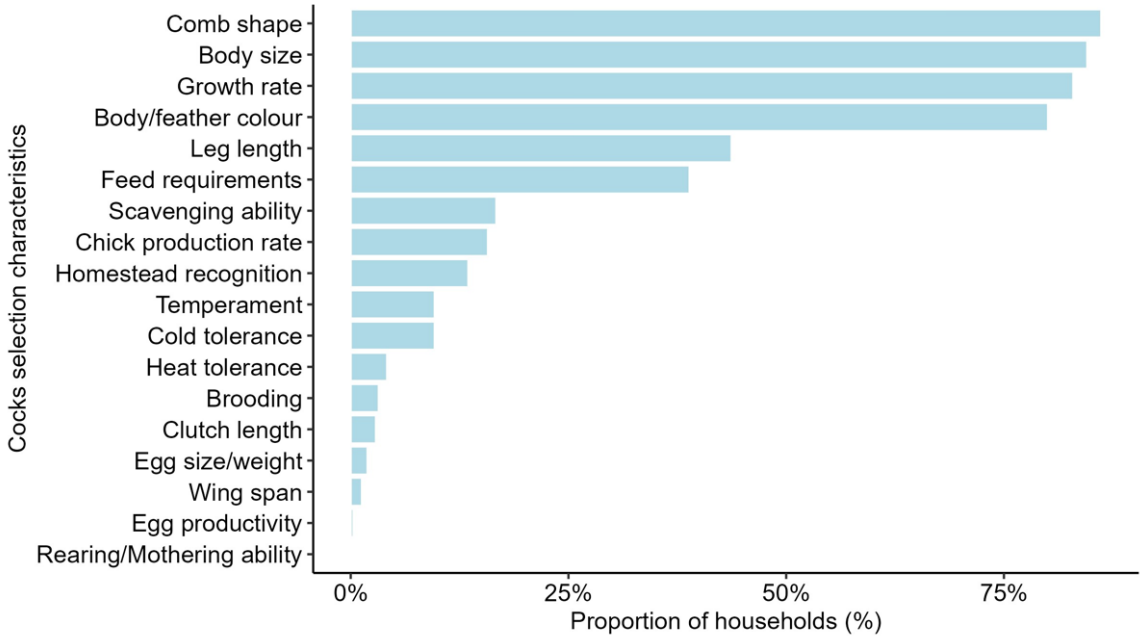
We examine whether households practice breed selection and most (93.16%) households reported that they practice breed selection. Households who practice breed selection were asked to indicate the most important characteristics or traits they used to select hens and cocks. Farmers were asked to provide up to five characteristics used to select chickens for breeding in order of importance. We summarize the responses based on characteristics' frequencies and Relative Importance Index (RII). Consequently, farmers consider egg productivity (75.6%), rearing or mothering ability (59.9%), brooding or hatching ability (58.3%) and body or feather colour (57.7%) to select hens (Figure 11). Egg productivity is the most frequently reported important characteristic that smallholder producers use for hen selection, which is usually low in local breed based production due to the limited genetic potential of most indigenous breeds. The number of eggs produced affects the number of chicks produced by natural incubation and the eggs used for consumption. For local breed based production, mothering or rearing and brooding ability are the other most frequently reported important characteristics to smallholder farmers, as the production system is highly dependent on natural incubation for a continuous supply of chicks. Body/feather colour, comb shape, growth rate and egg size/weight are also essential characteristics that smallholder farmers consider when selecting hens. Smallholder farmers prefer coloured chickens and chickens with specific comb types to others. In low input, low output production systems, the scavenging ability of chickens and the feed required seem important characteristics farmers consider during selection, as the birds are expected to fulfil their daily needs. This can also be associated with the limited access of households to feed, which has two important implications when introducing new breeds to smallholder farmers: first, considering the scavenging capacity as an important trait and second, improving smallholder access to feed packages together with genetic interventions.

Figure 11. Characteristics or traits of hen considered in selecting hens.




Similarly, the frequency of the characteristics reported indicates that farmers use the shape of the comb (86.2%), the size or weight of the body (84.6%), the growth rate (83.0%) and the colour of the body/feather (80.1%) to select the cocks (Figure 12). Most smallholder farmers in Vietnam consider the shape of the comb to be among the most important characteristics of cocks. Although the shape of the comb is an important attribute for hen selection, these characteristics look vital for the selection of the cocks. In some parts of Vietnam, cocks are used for cultural purposes and the shape of the comb is used as a selection criterion (Duy et al. 2015). Larger body size, growth rate and body/feather colour are the important characteristics most frequently reported by farmers for the selection of cocks. This is expected, as farmers usually need fast growing, large body sized cocks for consumption and income generation. Other important selection criteria include leg length, feed requirement, scavenging ability, temperament and homestead recognition.

Figure 12. Breeds characteristics used to select cocks.



We also generated a relative importance index based on farmers ranking on the above characteristics or traits. The index also shows similar results, despite some variations in the ranks of the selection characteristics of cocks. As indicated in the frequency of the selection characteristics (Figure 11), egg productivity, brooding/hatching ability, rearing/mothering ability and body/feather colour are the four most important characteristics or traits farmers use to select hens (Table 6). As indicated above, since farmers use natural incubation for reproduction, brooding or hatching ability and mothering abilities remain the most important characteristics. However, these can be replaced by introducing innovative hatching and rearing models or by establishing sustained chick delivery systems from commercial companies.

For cocks, body size/weight, growth rate, body/feather colour and comb shape/type are the four most important characteristics households ranked for selection, although the rank for comb shape is reduced in this case. Among others, the above evidence demonstrates that egg and chick productivity for hens, body size/weight and fast growth rate for cocks; body/feather colour and comb shape for both hens and cocks are important characteristics that should be considered in identifying and testing improved breeds for smallholder based production in the country.

Table 6. Relative Importance Index (RII) of ranked selection characteristics

| Characteristics | RII hens | Rank | RII cocks | Rank |
|---|---|---|---|---|
| Body size/weight | 0.046 | 9 | 0.248 | 1 |
| Growth rate | 0.094 | 5 | 0.190 | 2 |
| Feed requirements | 0.067 | 8 | 0.085 | 5 |
| Body/feather colour | 0.102 | 4 | 0.156 | 3 |
| Leg length | 0.002 | 14 | 0.059 | 6 |
| Comb shape/type | 0.077 | 6 | 0.143 | 4 |
| Wingspan | 0.001 | 15 | 0.002 | 15 |
| Homestead recognition | 0.000 | 16 | 0.025 | 8 |
| Chick production rate | 0.036 | 10 | 0.034 | 7 |
| Clutch length | 0.029 | 12 | 0.005 | 11 |
| Egg size/weight | 0.074 | 7 | 0.003 | 13 |
| Cold tolerance | 0.032 | 11 | 0.011 | 10 |
| Heat/drought tolerance | 0.003 | 13 | 0.004 | 12 |
| Temperament | 0.001 | 15 | 0.011 | 10 |
| Scavenging ability | 0.054 | 8 | 0.018 | 9 |
| Brooding/hatching ability | 0.121 | 2 | 0.003 | 14 |
| Egg productivity | 0.141 | 1 | 0.000 | 16 |
| Rearing/mothering ability | 0.119 | 3 | 0.000 | 16 |
| No. | 311 | | 310 | |

Note: Relative Importance Index (RII) = [(5 × # of households ranking first + 4 × # of households ranking second + 3 × # of households ranking third + 2 × # of households ranking fourth + 1 × # of households ranking fifth) for each objective]/[(5 × total # of households ranking any purpose first + 4 × total # of households ranking any purpose second + 3 × total # of households ranking any purpose third + 2 × total # of households ranking any purpose fourth + 1 × total # of households ranking any purpose as fifth)].

# denotes 'number'.

## 3.10 Qualities/attributes of a good chicken

Regardless of their breed selection practices, sample farmers reported what they think are the qualities or attributes of good cocks and hens and ranked these attributes in order of importance. We then generated a relative importance index using the ranked attributes. The results show that egg productivity or the production of many eggs, the production of better taste eggs and the production of chicks with high survival rates are the three most important attributes farmers look

for from the hens (Table 7). Producing tasty meat and having a good physical appearance is other quality attribute that smallholder farmers consider from hens. For cocks, having a large body size and weight for meat, tasty meat and good physical appearance are the three main attributes or traits farmers consider for breeding. As indicated above, farmers who practice breed selection also use these attributes to select hens and cocks. Both the selection practice indicators and the quality attribute indicators demonstrate that the taste of eggs and meat are important traits farmers consider for production, suggesting the need for incorporating these traits/attributes during breed testing and identifications and before disseminating chicken breeds for broader adoption.

Table 7. Attributes/qualities of good hens and cocks

| Qualities/attributes of a good chicken | Hens | Rank | Cocks | Rank |
|---|---|---|---|---|
| Produces a lot of eggs | 0.239 | 1 | 0.011 | 8 |
| Produces better tasting eggs | 0.146 | 2 | 0.040 | 7 |
| Produces eggs with harder/thicker shell | 0.085 | 6 | 0.004 | 10 |
| Has a large body size and weight for meat | 0.051 | 8 | 0.206 | 1 |
| The meat tastes better | 0.109 | 4 | 0.204 | 2 |
| Produces chicks with a high survival rate | 0.130 | 3 | 0.067 | 6 |
| Is feed efficient | 0.083 | 7 | 0.164 | 4 |
| Is beautiful/good physical appearance | 0.097 | 5 | 0.172 | 3 |
| Is good fighter | 0.000 | 11 | 0.003 | 11 |
| Has less illnesses | 0.057 | 9 | 0.123 | 5 |
| Lives a long time | 0.003 | 10 | 0.007 | 9 |
| No. | 348 | | 348 | |

Note: Relative Importance Index (RII) = [(5 × # of households ranking as first + 4 × # of households ranking as second + 3 × # of households ranking as third + 2 × # of households ranking as fourth + 1 × # of households ranking as fifth) for each objective]/[(5 × total # of households ranking any purpose first + 4 × total # of households ranking any purpose as second + 3 × total # of households ranking any purpose as third + 2 × total # of households ranking any purpose as fourth + 1 × total # of households ranking any purpose as fifth)].

# denotes 'number'.

## 3.11 Chicken production and productivity

We explore the productivity of chickens kept by sample farmers in the three provinces. Data on sexual maturity, eggs and chick productivity were collected from each household interviewed. Farmers were asked if they have a hen that lays an egg on their farm and 82.34 and 0.85% of the sample respondents said they had local and improved local hen breeds. The average reported sexual maturity for hens is 22.6 weeks (± 1.73), with a minimum of 12 and a maximum of 27 weeks. On average, cocks reach sexual maturity at 12.25 (± 0.53) weeks, with a minimum of 11 and a maximum of 16 weeks.

Local breed hens produce 12.4 eggs per clutch within an average of 12.8 days per clutch (Table 8). The average number of eggs produced in Hoa Binh is lower than in the other two provinces, which could be associated with genetic and environmental factors. On average, local breeds have five clutches per year. The annual number of eggs produced from local breed hens is 60.5 (± 10.1). This aligns with other studies that reported average annual eggs of 50–70 for strains such as Mia, Dong Tao and Ho (Duy et al. 2015; Phuong et al. 2015). Other researchers also reported that a hen hatches five times a year, the same number of clutches per year. Farmers, on average, set 12 eggs for hatching and the reported average hatchability is 90.2%, with a minimum of 71.4% and a maximum of 93.7%. The average hatchability in Ha Nam province is slightly higher than in Hoa Binh and Quang Binh provinces. On average, the survival rate of the reported chicks to the separation stage is 89.2%, with a minimum of 72.7% and a maximum of 92.8%. The chicks' hatchability and survival rate indicators seem better than those in other countries.

Table 8. Chicken production and productivity indicators by provinces

| | Ha Nam | | Hoa Binh | | Quang Binh | | Total | |
|---|---|---|---|---|---|---|---|---|
| Productivity indicators | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Eggs per clutch | 13.35 | 1.52 | 11.11 | 0.82 | 13.1 | 6.94 | 12.43 | 4.06 |
| Days per clutch | 14.46 | 1.92 | 11.47 | 1.07 | 12.63 | 1.53 | 12.79 | 1.97 |
| Number of clutches/years | 4.6 | 0.67 | 5.18 | 0.61 | 5.21 | 0.97 | 5 | 0.8 |
| Eggs per year | 60.9 | 8.69 | 57.71 | 9.32 | 63.58 | 12.05 | 60.51 | 10.28 |
| No. of time a hen hatch | 4.6 | 0.67 | 5.18 | 0.61 | 5.21 | 0.97 | 5 | 0.8 |
| No. of eggs set | 13.31 | 1.54 | 11.15 | 0.89 | 12.3 | 1.63 | 12.19 | 1.63 |
| No. of chicks/brood | 12.23 | 1.53 | 10.03 | 0.86 | 10.89 | 1.43 | 11 | 1.58 |
| Hatchability (%) | 91.82 | 2.05 | 89.96 | 3.27 | 88.7 | 4.87 | 90.18 | 3.74 |
| Chicks survived | 11.04 | 1.58 | 8.95 | 0.86 | 9.63 | 1.37 | 9.83 | 1.55 |
| Chicks survival rate (%) | 90.08 | 3.59 | 89.12 | 2.75 | 88.41 | 4.2 | 89.22 | 3.56 |
| No. | 78 | | 91 | | 73 | | 242 | |

Note: SD denotes standard deviation.

# 3.12 Households chicken management practice

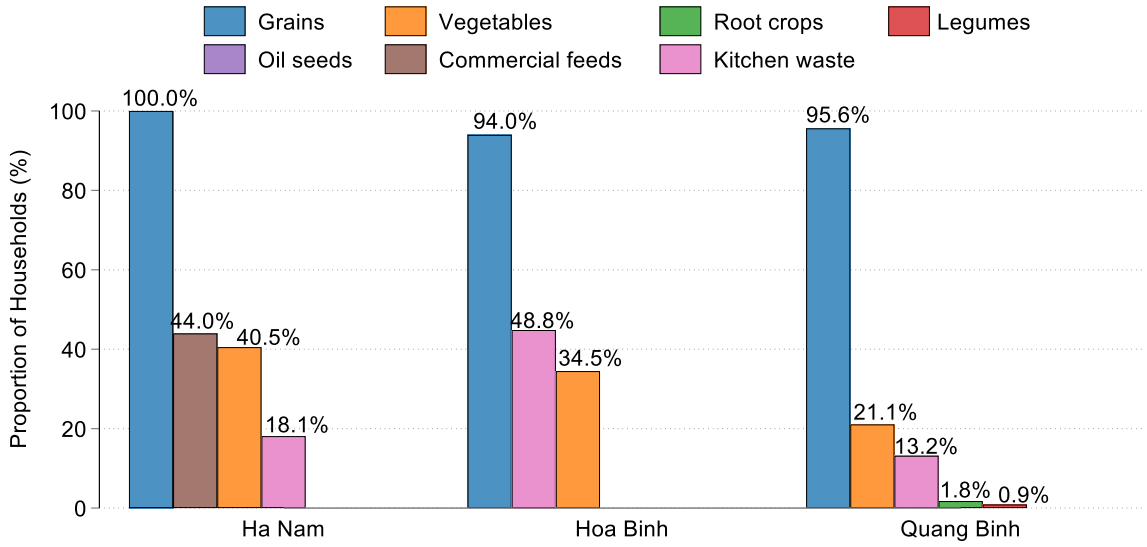
## 3.12.1 Chicken housing

Smallholder farmers indicated the type of houses they use in the wet and dry seasons. Most smallholder farmers use houses mainly during the night in the dry and wet seasons. Of the respondents, 97.72% and 96.87% used housing at night in dry and wet seasons. Most use a chicken house (coop/hut) made from mud/iron sheets/wood/rocks/bricks. In dry and wet seasons, households do not use any housing during days or adopt a free ranging system; only 0.5% use chicken houses or baskets. On average, households spent VND 233,318 (± 284,379) for house construction. They use these houses for 5.2 (± 1.2) years, with a minimum of 3 and a maximum of 10 years. This may suggest that households can construct chicken houses with modest costs that serve for a longer period.

## 3.12.2 Chicken feeding practices

Feed is the main input that accounts for the largest proportion of variable costs in poultry production. Households indicated that they provide additional feed for a longer period. Almost all households, 99.15%, provide additional feed to chickens. Most households reported that additional feeds are given throughout the year. Farmers provide grains, vegetables, commercial feed (e.g. wheat bran, oilseed by-products, mash) and kitchen waste as supplementary feed. Grains are the most common feed supplemented by 95.8% of the farmers' sampled in the three provinces (Figure 13). Vegetable, kitchen waste and commercial feed were given by 31.9, 25.29 and 14.66% of the sample respondents. However, commercial feed is provided only by farmers in Ha Nam province. Although vegetables can supply vitamins and minerals such as calcium, farmers do not commonly use them. Root crops, legumes and oil crops are rarely given as supplementary feed by sample households. Farmers provide supplementary feeds during the morning, afternoon and evening. Most of them, 93.1%, do not do any processing and only very few chop or grind the feed before feeding them to chickens. Most of them provide the feeds in a container and only very few (15.23%) throw the feed on the ground.

Figure 13. Types of feeds used by smallholder farmers.




We examine the main sources of supplementary feeds used by farmers. Farmers mainly used feed obtained from their farms. Of the respondents, 98.85% used feed from their own farms and only 13.51% used purchased feed, all found in Ha Nam province (Table 9). 40.5% of the sample households in Ha Nam province used purchased feeds. None of the farmers in Quang Binh and Hoa Binh used purchased feeds. A relatively higher proportion of the feed sources purchased in Ha Nam could be associated with larger flock sizes in the province and smaller average land holdings. Moreover, it could also be associated with better access to central markets or commercial feed sources. The above evidence demonstrates the experience of farmers in providing feed to chickens, which helps them easily adopt improved breeds that require good feeding practices. However, farmers' higher dependence on their feed sources and limited experience in processing may require appropriate feed formulating interventions that help them develop better feed rations for enhanced production.

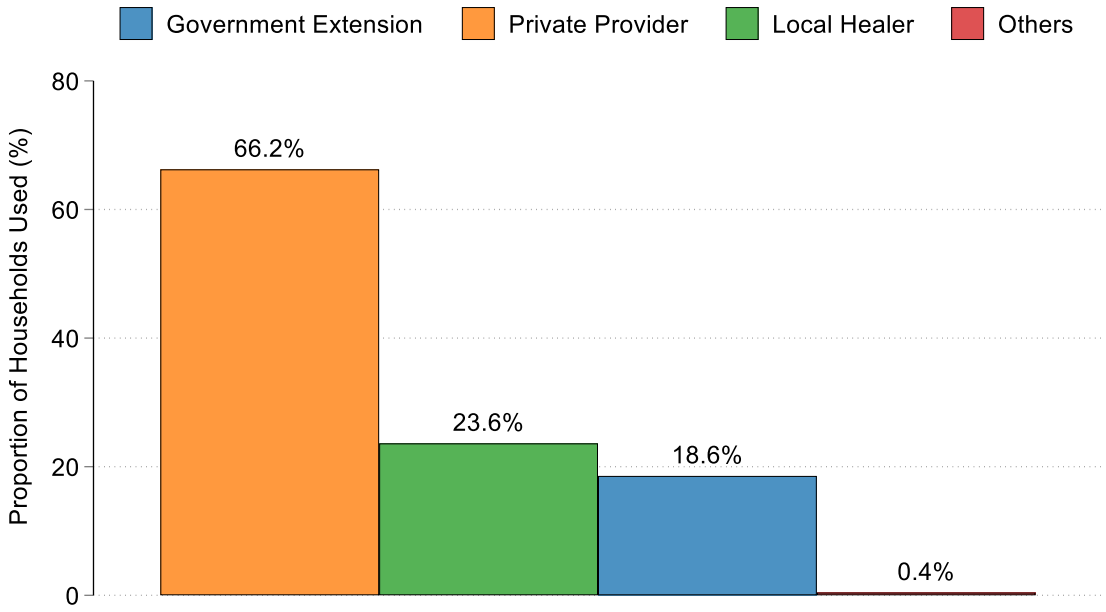
Table 9. Sources of supplementary feeds used by farmers

| | Own farm | | Purchased | | Both | |
|---|---|---|---|---|---|---|
| Provinces | No (%) | Yes (%) | No (%) | Yes (%) | No (%) | Yes (%) |
| Ha Nam | 3.4 | 96.6 | 59.5 | 40.5 | 94 | 6 |
| Hoa Binh | 0 | 100 | 100 | 0 | 100 | 0 |
| Quang Binh | 0 | 100 | 100 | 0 | 100 | 0 |
| Total | 1.2 | 98.8 | 86.4 | 13.6 | 98 | 2 |

## 3.12.3 Chicken health management practices

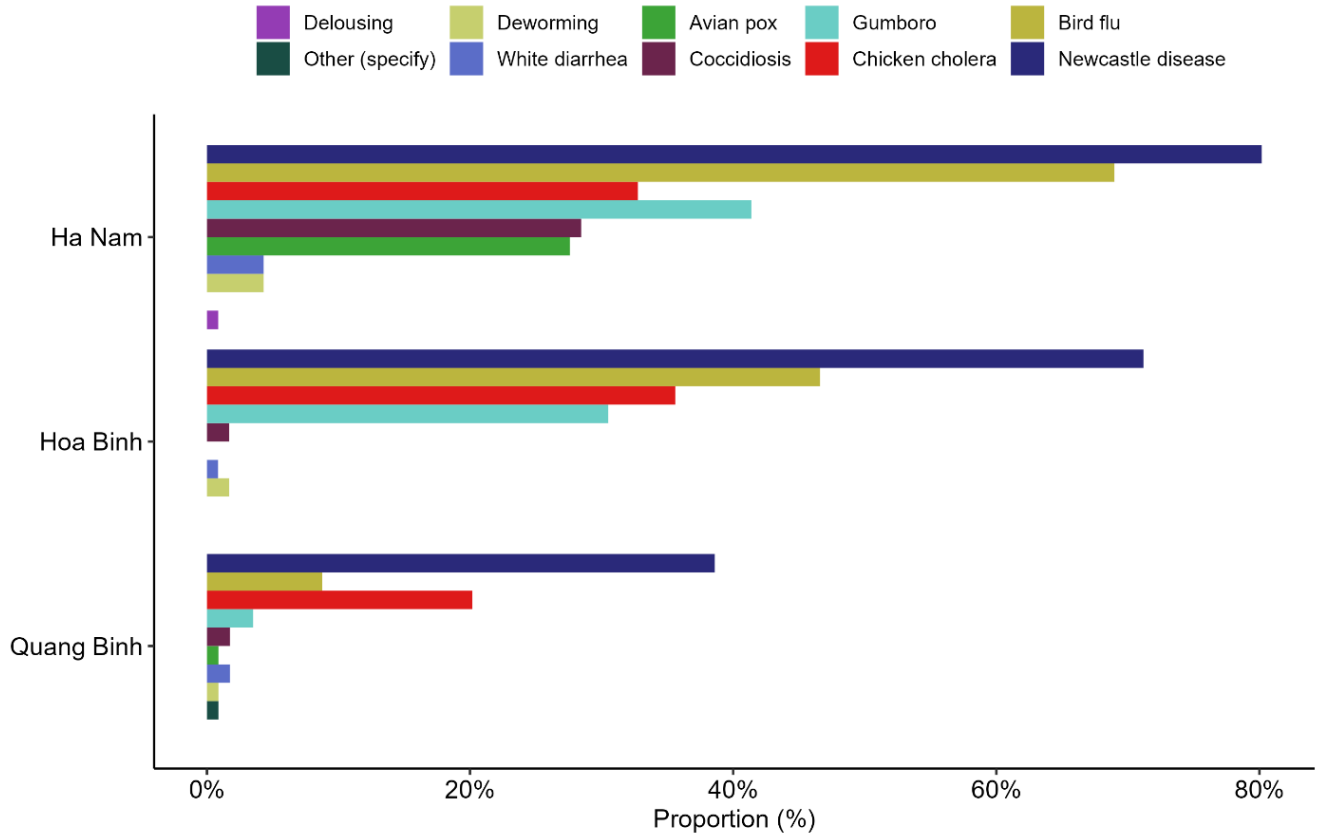
We examine the health management practices of chicken farmers in the sample provinces. Farmers were asked if they had performed routine vaccination and medication in the past 12 months. On average, 67.53% of farmers received a vaccination or routine medical treatment in the past 12 months. When we disaggregated these data by province, the proportion of farmers who performed vaccination and medical treatment was 83.62, 75.42 and 42.98% in Ha Nam, Hoa Binh and Quang Binh provinces. A lower proportion of vaccination and routine treatments used in Quang Binh province could be associated with access to vaccines and lack of awareness. Private health service providers (i.e. paraveterinary, shop, company) (66.6%), local healers (23.6%) and government extension (18.6%) are the main providers of routine vaccination or treatment reported by sample respondents (Figure 14).

Figure 14. Chicken vaccination/routine disease treatment providers.




Farmers were asked to indicate the type of vaccination or routine treatments they had undertaken in the previous 12 months. The three most common disease vaccination/routine treatments performed were Newcastle disease (63.5%), bird flu (41.67%) and chicken cholera (29.60%) (Figure 15). A higher proportion of farmers in Ha Nam province adopted various health management practices than farmers in the other two provinces and relatively few farmers in the Quang Binh provinces adopted lower disease management practices than others. This may indicate heterogeneity in poultry health practices between provinces and is mainly associated with inadequate access to health services or limited practices of farmers in Quang Binh province.

Figure 15. Type of chicken disease vaccination/routine treatment carried out.



On average, households spent VND 80.4 thousand per year for vaccination and routine medication (Table 10). Smallholder producers in Ha Nam spent significantly more money on vaccination or routine medication treatment than Hoa Binh and Quang Binh producers. Similarly, the average cost of vaccination is higher in Ha Nam than in other places. Higher total vaccination costs in Ha Nam could be associated with a higher number of vaccination rounds and a higher number of vaccinated chickens. As indicated above, households in Ha Nam have better vaccination and routine medication practices that could be associated with better access to health services or household awareness of disease prevention and treatment.

Table 10. Cost and frequency of vaccination by provinces

| | Ha Nam | Hoa Binh | Quang Binh | Total |
|---|---|---|---|---|
| Description | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Total vaccination round management (VRM) cost/year (VND 1,000) | 172.3 | 48.2 | 20.3 | 80.4 |
| | (439.2) | (66.9) | (36.1) | (265) |
| Average VRM cost/bird | 618.53 | 402.45 | 217.55 | 413.91 |
| | (612.67) | (371.68) | (359.02) | (489.56) |
| Number of vaccination round | 1.56 | 1.04 | 1.35 | 1.32 |
| | (0.99) | (0.18) | (0.55) | (0.73) |
| Average number of chickens vaccinated | 153.08 | 84.89 | 32.31 | 90.39 |
| | (160.33) | (75.43) | (50.70) | (117.08) |

Note: SD denotes standard deviation.

## 3.12.4 Household labour allocation

Smallholder poultry producers allocate labour for different activities, including purchasing inputs (including live birds), feeding (collecting and preparing), watering birds, cleaning houses/sheds/shelters, collecting farm manure, collecting eggs, selling eggs/birds/meat and disease control/caring for sick birds. Farmers reported the average weekly time, in minutes, allocated by each household member for the above activities for the last week. On average, households allocated 481.31 (± 373.44) weekly minutes for different activities (Table 11). Adult males spent 149.5 minutes per week and adult females spent 337.41 minutes per week. Women contribute 73.05% of the total time allocated to different activities, while adult male contributes 26.9% of the total time. This indicates that women are more of the primary household members involved in chicken production than men. Furthermore, the average time allocated in Hoa Binh is higher than in the provinces of Ha Nam and Quang Binh. Children (< 15 years) and hired labour allocated to different chicken production activities are almost zero, indicating that the main actors involved in poultry production are adult male and female family members.

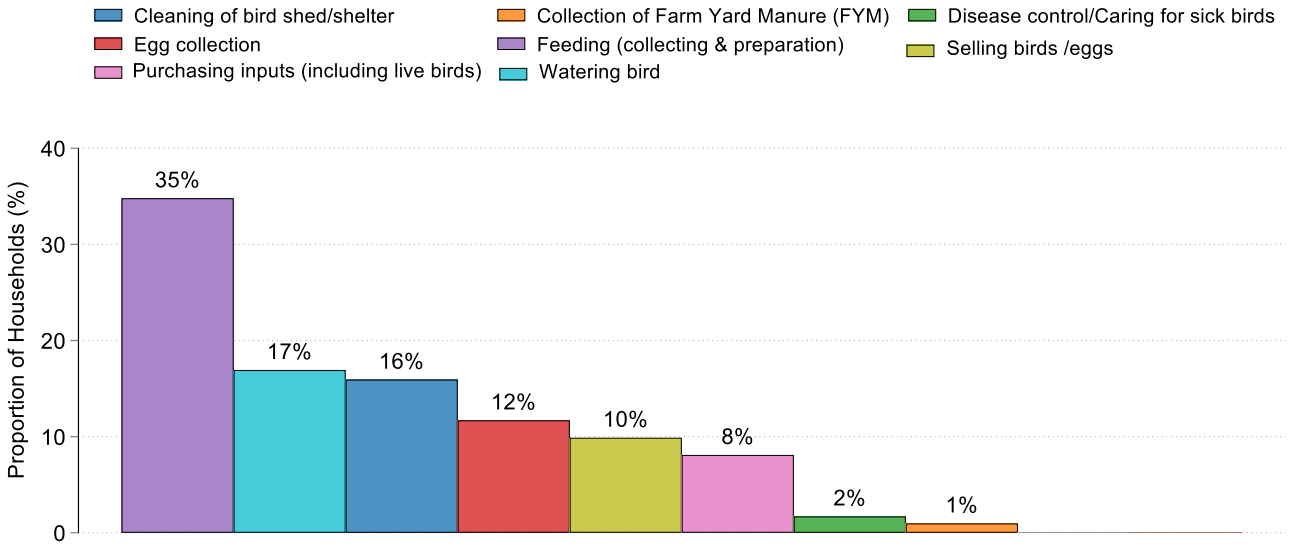
Table 11. Labour allocated to different chicken production activities (minutes/week)

| | Ha Nam | Hoa Binh | Quang Binh | Total |
|---|---|---|---|---|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Adult male | 118.53 | 217.37 | 110.76 | 149.5 |
| | (109.07) | (338.71) | (84.44) | (217.54) |
| Adult female | 304.44 | 409.78 | 296.06 | 337.41 |
| | (131.34) | (278.62) | (136.35) | (201.62) |
| Children | 0.02 | 0 | 0.01 | 0.01 |
| | (0.13) | (0) | (0.09) | (0.09) |
| Hired male | 0.02 | 0 | 0.01 | 0.01 |
| | (0.13) | (0) | (0.09) | (0.09) |
| Hired female | 0.02 | 0 | 0.01 | 0.01 |
| | (0.13) | (0) | (0.09) | (0.09) |
| Overall | 423.03 | 610.54 | 406.85 | 481.31 |
| | (199.38) | (567.05) | (168.35) | (373.44) |
| No. | 116 | 118 | 114 | 348 |

Note: SD denotes standard deviation.

The time of household members allocated for different poultry production activities can vary depending on several reasons, including flock size, availability of labour, household knowledge or skill, access to inputs and production objectives. The proportion of time allocated to different activities is presented in Figure 16. From the total time allocated to bird management, 35% of the time is used for feeding, including feed collection and preparation, followed by watering of birds (17%) and cleaning the birds' shed or shelter (16%). This is expected, as feeding, watering and cleaning of the shelter/shed are daily routine activities that should be undertaken to maintain a healthy and productive flock. The proportion of time allocated for egg collection and the sale of products is 12 and 10%. The lowest proportion of time is allocated for farmyard manure collection (1%) and disease control (2%), including the care of sick birds, suggesting the need for building farmers in flock health management and integrating innovative interventions with other genetic interventions to enhance production and productivity.

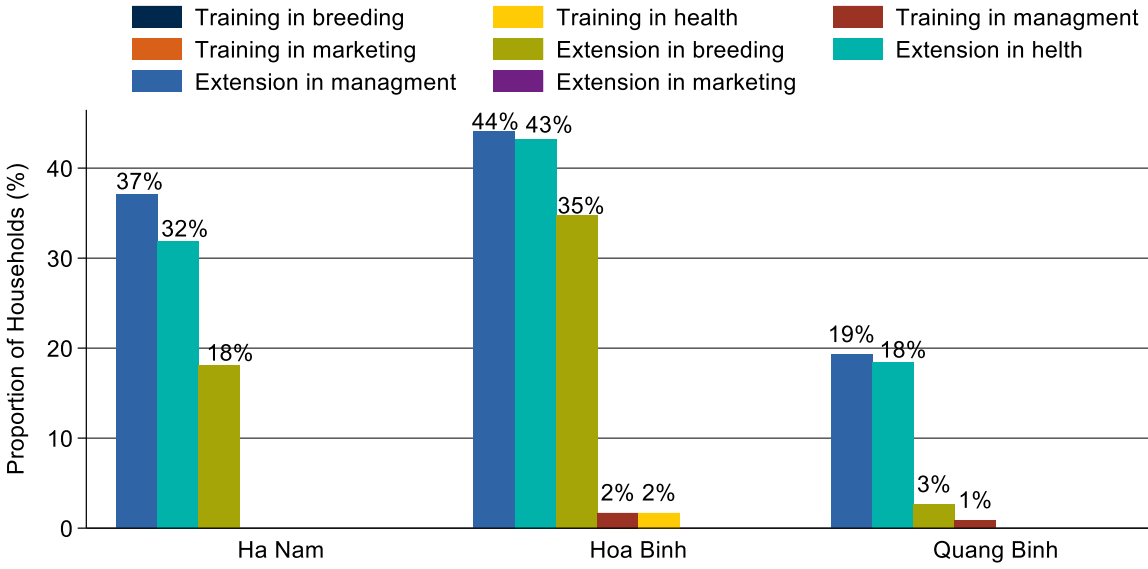
Figure 16. Proportion of chicken labour allocated to different activities in a week.



# 3.13 Training and extension services

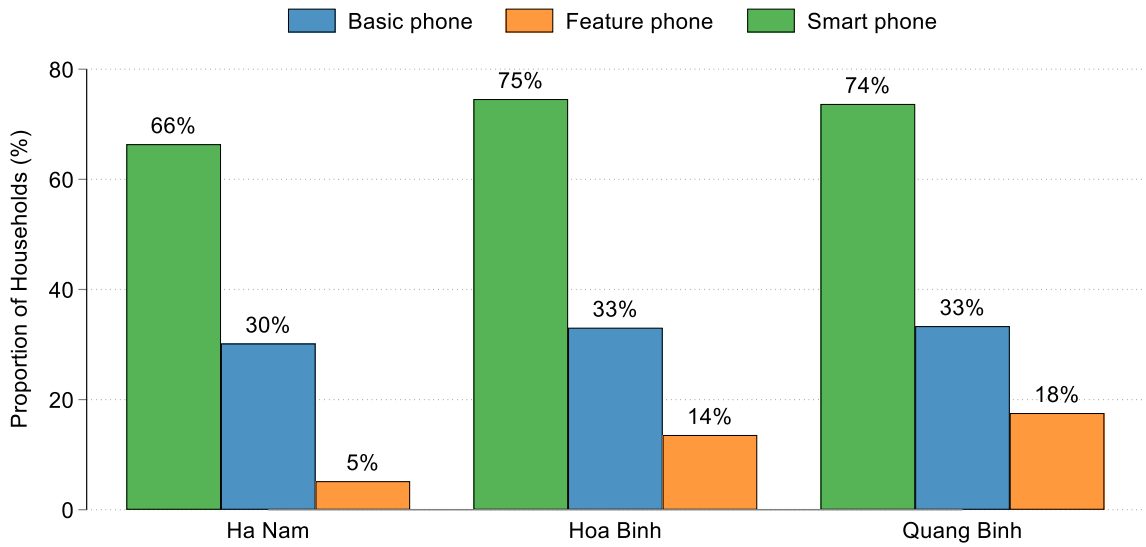
The vital role of training and extension services for improved poultry production and productivity is documented in various studies. We explored farmers' access to training and extension services in the last 12 months. On average, 36.18% of the households participated in training and extension activities in the last 12 months (Figure 17). The proportion of households that have participated in training in Ha Nam, Hoa Binh and Quang Binh provinces was about 37.93, 49.15 and 21.05%, respectively. When we disaggregate the type of service by province, most households participated in extension activities rather than training activities. Few households in Hoa Binh and Quang Binh participated in health and management related training. Government extension services provided all training and extension activities and only one household reported training in chicken breeding from NGO/project. The evidence from this assessment indicated that households have limited access to capacity building services, primarily on chicken breeding, health and marketing, indicating the need to organize training before implementing any research or development activities at the farm level. This would help control the effect of management variability on farm testing results between households in the same province and between provinces.

Figure 17. Farmers participated in extension and training services.




Development partners have increasingly promoted digital extension, advisory, training and support services to build the capacity of farmers and support their production activities in developing countries in Africa and Asia. There are various success stories in this regard and researchers suggest using this approach to improve production, productivity and enhance inclusion (Deichmann et al., 2016). Video training and mobile application are among the main tools that can be used at the smallholder level. In this sense, the role of mobile devices holding at household level is important. In this survey, farmers reported the type of mobiles they have and most have smartphones that can be used for this purpose (Figure 18). Of the total respondents, 71.5%, 32.1% and 12.0% of them have Smart, Basic and Feature phones. This indicates that most households own smartphones that can be used in digital extension and training activities. When the type of phone holding is disaggregated by province, a higher proportion of households in Hoa Binh and Quang Binh own smartphones than in Ha Nam. As indicated above, since most household heads have better literacy levels, there is a greater opportunity to use digital tools for extension and advisory services. Other researchers have also suggested introducing efficient advisory services to enhance farmers' management skills and knowledge and ensure commercial oriented chicken production's sustainability (Phu et al. 2021; Truong et al. 2021; Bâtie et al. 2022).

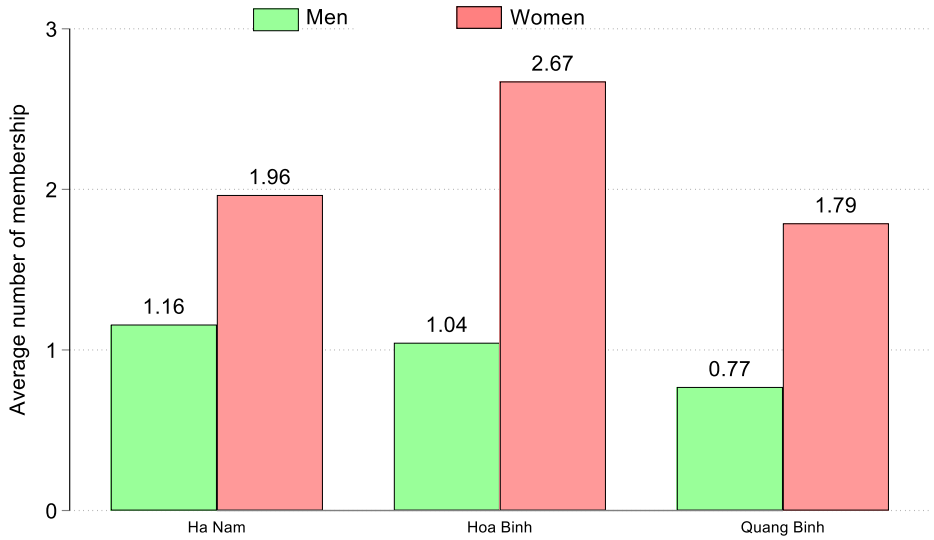
Figure 18. Household mobile phone ownership by province.




# 3.14 Group membership and access to credit

Membership in household groups improves their participation in community development and access to technologies and services (Birhanu et al. 2017). Households asked about the groups household members belong to, and half of the sample respondents, 50.43%, said at least one household member belongs to a group. Of the total households that are group members, 99.44% of them belong to social/welfare and community development groups. The number of households belonging to other group memberships such as savings and credit groups, agricultural producer groups, livestock (including chicken) producer groups, agricultural marketing groups, livestock marketing groups, livestock producer and marketing groups and agricultural producer and producer marketing is non-existent. This indicates the limited availability of groups that support livestock production and marketing activities. The main functions of the group, 94.35% of the household members belong, are social functions and networking. Only 10.7% and 9.6% belong to groups that provide access to the market for livestock and livestock products (including chicken) and access to inputs and services for livestock production (including chicken). Women are the major group members. The number of women who are members of groups is twice that of men (Figure 19). The average number of women and men group members is 2.14 and 1. Interventions that support households to participate in livestock production and marketing groups would be important to improve access to input and output markets.

Figure 19. Average number of group membership by gender.



Access to finance is among the main constraint in poultry production, especially in improved breed based production. Sampled households were asked if they had access to credit services and 74.3% of the sample households reported having access to credit. When the data are disaggregated by provinces, 84.5% in Ha Nam, 65% in Hoa Binh and 74.6% in Quang Binh reported that they have access to credit. However, only 16% of households have taken credit in the previous 12 months. These households used the loan for livestock purchase and management (30.4%), business (17.9%), farm inputs/equipment (16.1%), household items (16.1%) and school fees (14.3%). Better access to credit on the one hand and limited credit use on the other hand, could be associated with a lack of tailored financial products and services and delivery models for smallholder producers, suggesting the development of context specific financial products and services and associated delivery business models.

## 3.15 Consumption of poultry products

As indicated above, poultry meat and egg consumption are households' main poultry production objectives. During the last three months, households on average consumed 4.68 (± 3.26) chickens, with a maximum consumption of 5.51 in Ha Nam and a minimum of 4.18 in Hoa Binh (Table 12). Most of the chicken consumed comes from households own production and only a small proportion comes from purchased sources. Households in the three provinces also consumed ducks. The total average number of duck consumption was 3.10 (± 2.82), with a minimum consumption in Ha Nam (1.97) and a maximum consumption in Hoa Binh (4.87). Evidence demonstrates that households consume chicken and duck meat with some substitution effects. The three month average chicken egg consumption was 36.16 (± 16.68), with a minimum consumption in Hoa Binh (33.03) and a maximum in Ha Nam (38.97). Duck eggs are consumed mainly in the two districts, Hoa Binh and Quang Binh, and the households in Hoa Binh consume the highest number of duck eggs. No duck egg consumption was reported in Ha Nam. Overall, duck egg consumption in the three provinces was very low (0.59). Higher consumption of duck eggs in Hoa Binh province is associated with higher duck production than in the others. The survey results indicate that chicken and duck meats are among the main animal food sources in Vietnam. Other researchers have also documented the vital contribution of poultry products to animal sourced protein in Vietnam (Burgos et al. 2007).

Table 12. Total number of poultry products consumed by province

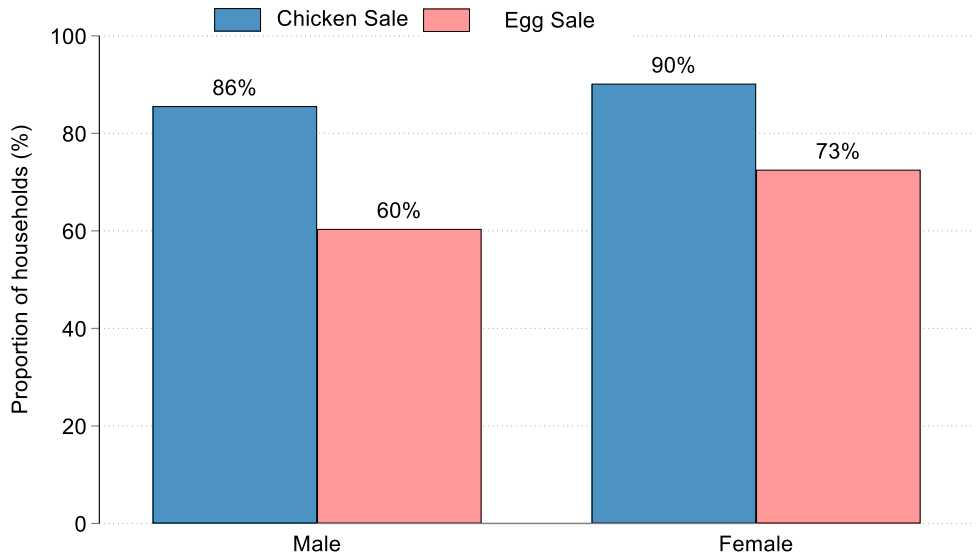
| | Ha Nam | Hoa Binh | Quang Binh | Total |
|---|---|---|---|---|
| Poultry products | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Chicken produced | 5.51 | 4.05 | 4.26 | 4.61 |
| | (3.41) | (1.95) | (3.87) | (3.23) |
| Chicken purchased | 0 | 0.04 | 0.09 | 0.04 |
| | (0) | (0.33) | (0.51) | (0.35) |
| Total chicken consumed | 5.51 | 4.18 | 4.35 | 4.68 |
| | (3.41) | (2.14) | (3.87) | (3.26) |
| Duck produced | 0.66 | 4.29 | 1.25 | 2.09 |
| | (1.55) | (3.26) | (2.41) | (2.97) |
| Duck purchased | 1.31 | 0.55 | 1.15 | 1 |
| | (1.77) | (1.6) | (1.5) | (1.66) |
| Total duck consumed | 1.97 | 4.87 | 2.41 | 3.1 |
| | (1.96) | (3.05) | (2.41) | (2.82) |
| Chicken eggs produced | 30.95 | 31.94 | 32.37 | 31.75 |
| | (23.24) | (13.39) | (19.21) | (18.98) |
| Chicken eggs purchased | 7.68 | 0.8 | 4.17 | 4.2 |
| | (16.35) | (4.65) | (12.06) | (12.3) |
| Total chicken eggs | 38.97 | 33.03 | 36.54 | 36.16 |
| | (19.42) | (13.22) | (16.46) | (16.68) |
| Duck eggs produced | 0 | 0.67 | 0 | 0.23 |
| | (0) | (5.78) | (0) | (3.38) |
| Duck eggs purchased | 0 | 0.76 | 0.31 | 0.36 |
| | (0) | (4.15) | (1.91) | (2.67) |
| Total duck eggs | 0 | 1.43 | 0.31 | 0.59 |
| | (0) | (7.05) | (1.91) | (4.28) |

Note: SD denotes standard deviation.

## 3.16 Marketing of poultry products

Income generation is one of the objectives of smallholder chicken production in Vietnam. We examined the activities of selling eggs and live chicken or chicken meat from sample households in the last 3 and 12 months. On average, 62.11% of households participated in egg sales during the previous 3 months, while 86.32% participated in live chicken or meat sales during the last 12 months. When the data are disaggregated by sex of the head of the household, a higher proportion of female headed households participated in the marketing of poultry products than male headed households, which may indicate the relative importance of income from chicken production to female headed households (Figure 20).

Figure 20. Proportion of households that participated in chicken products marketing.




## 3.16.1 Marketing of eggs

Among households participating in egg marketing, 97.2% sold eggs to generate cash for general household needs, such as buying food and covering other expenses. Very few of them sold eggs to meet emergency needs such as medical expenses. On average, households sold 44.33 eggs per week (Table 13). The average number of eggs sold in Ha Nam (55.6) province is greater than the average number sold in Hoa Binh (40.5) and Quang Binh (41.9) provinces. The higher reported number of eggs sold per week could be associated with a higher number of hens kept by households. For example, the average number of hens in Ha Nam province was 25.8, while the average number in Hoa Binh and Quang Binh is 20 and 14.8. The overall average price of local chicken eggs during the survey was VND 4,244.2 (± 690.7), with a minimum of VND 3,000 and a maximum of VND 5,000. The average price in Ha Nam is less than in the other two provinces.

Table 13. Average number of eggs sold and selling price

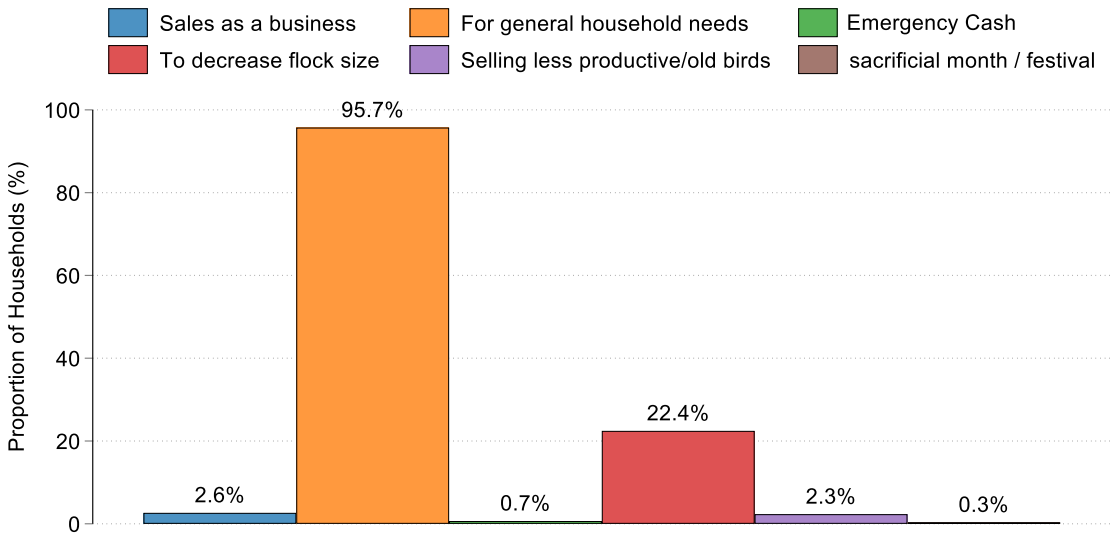
| Provinces | Variable | Mean | SD | Min | Max | No. |
|---|---|---|---|---|---|---|
| Ha Nam | Total number of hens | 25.8 | 13.9 | 0 | 100 | 116 |
| | Average number of eggs | 55.6 | 41.5 | 15 | 175 | 51 |
| | Egg price | 4,019.6 | 489.5 | 3,000 | 5,000 | 51 |
| Hoa Binh | Total number of hens | 20 | 7.7 | 4 | 40 | 118 |
| | Average number of eggs | 40.5 | 18.8 | 10 | 150 | 88 |
| | Egg price | 4,443.2 | 499.6 | 4,000 | 5,000 | 88 |
| Quang Binh | Total number of hens | 14.8 | 9.5 | 0 | 40 | 114 |
| | Average number of eggs | 41.9 | 23.5 | 20 | 120 | 77 |
| | Egg price | 4,166.7 | 903.3 | 3,000 | 5,000 | 78 |
| Total | Total number of hens | 20.2 | 11.6 | 0 | 100 | 348 |
| | Average number of eggs | 44.6 | 27.9 | 10 | 175 | 216 |
| | Egg price | 4,244.2 | 690.7 | 3,000 | 5,000 | 217 |

Note: SD denotes standard deviation.

# 3.16.2 Marketing of live chicken or chicken meat

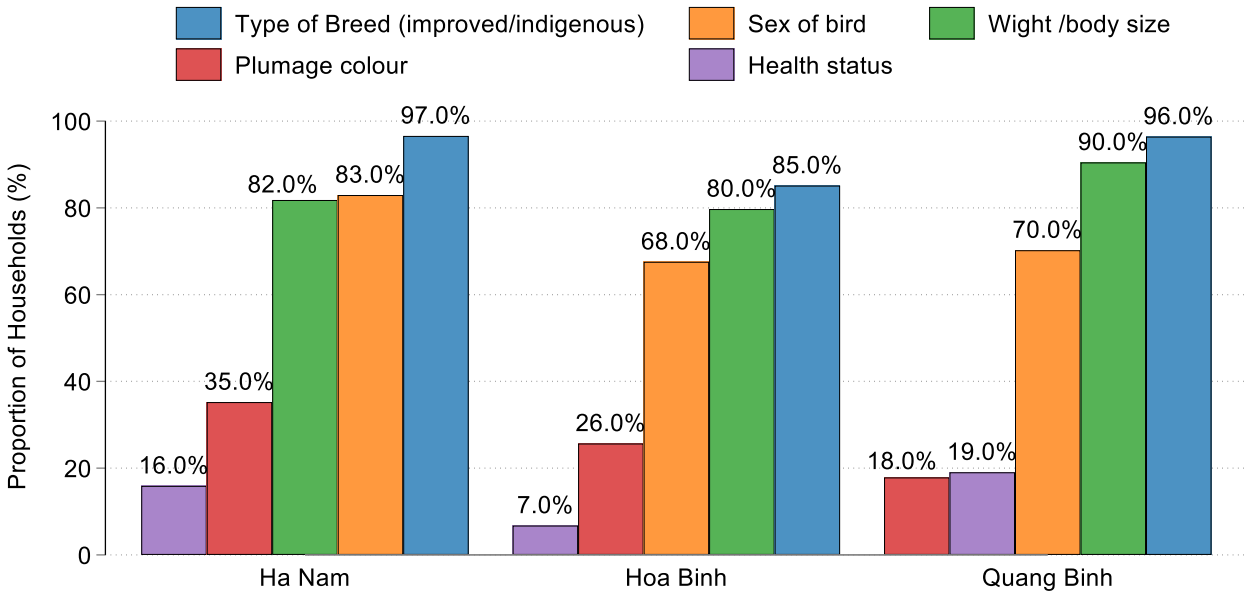
As indicated above, 86.32% of the sampled households participated in live chicken or chicken meat marketing in the previous 12 months. Of these households, 20.9 and 66.38% of them sold slaughtered chickens and live chickens. On average, market participant households sold 16.7 live chickens and 10.24 slaughtered chickens. Province level disaggregated data shows that households sold 29.0, 7.7 and 10.6 live chickens in Ha Nam's, Hoa Binh and Quang Binh provinces. Similarly, households in Ha Nam's province sold a higher number (12.4) of slaughtered chicken than households in Hoa Binh (9.9) and Quang Binh (8.1) provinces. A relatively higher number of live chickens/slaughtered chickens and eggs sold in Ha Nam province than others could be associated with a higher number of flock holdings and better production practices, such as improved management and access to inputs and services. Most households (95.7%) sold chicken mainly to generate income for household needs, such as purchasing foods and other items (Figure 21). Some sold to decrease flock sizes and very few of the households sold as a business indicating the limited business orientation of the existing poultry production system.

Figure 21. Major reasons for selling live chicken and meat in the previous 12 months.




The price of live chickens is determined by several factors such as type of breed, sex of birds, weight or body size of birds, plumage colour, and health status of birds. Among households that sold live chickens, most of them (92.8%) indicated that the price of chickens is determined by the type of breed (improved vs. indigenous) followed by body weight or size (83.94%) and the sex of birds (73.9%) (Figure 22). Indigenous birds have relatively higher prices than exotic birds due to tasty meat. As indicated above, the taste of meat is the main quality attribute that makes farmers prefer indigenous chicken over others. This also suggests considering meat taste during the country's breed improvement and dissemination efforts.

Figure 22. Criteria used to determine the price of live chickens.




The major marketing channels for live adult chicken or meat includes fellow farmer/individuals, traders, village market, city market, butchery and restaurant. Most of the farmers (64.35%) sold to traders, followed by buyers in village markets (26.07%) and restaurants (8.6%). Very few (6.0%) households sold to fellow farmers and less than 1% sold in city markets. Households in the sample provinces seem to have limited access to city markets. Sampled respondents reported that the price of live adult chicken/meat is mainly determined by producers (43.2%), traders (44.2%), and processors or butchery (17.8%). In most households (84.2%), male and female members jointly decided to sell chickens. In some households (14.5%), the decision to sell was made by only female household members and the decision made by only male household members was insignificant (0.7%).

# 4 Conclusion and implications

This report summarizes the baseline survey on smallholder poultry production activity in Vietnam. The report presents characteristics of smallholder poultry producers, poultry production practices, flock composition, household livelihood activities, chicken production practices, chicken breed and preference for traits, poultry product consumption and poultry product marketing. The findings of this survey indicate most smallholder farmers keep native/local breed chickens. Most smallholder farmers practice breed selection activities, indicating their desire to improve the production and productivity of their flock. Farmers prefer hens with high egg productivity, produce good egg and meat taste, and produce chicks with high survival rates. Cocks with large body sizes and weight for meat, better meat taste and beautiful/good physical appearance are preferable by farmers. Although farmers have limited experience in using exotic/crossbred chicken breeds, they are interested in testing new chicken breeds. Women are the main responsible household members in poultry production, marketing and consumption activities, suggesting targeting women in research and development efforts. The overall production and productivity of the sector remain low due to the limited genetic potential of existing breeds and multiple production and marketing constraints. This may suggest introducing integrated poultry packages, including farmers preferred and locally adapted improved chicken breeds for egg and meat production, innovative chick multiplication and delivery systems, digital extension and advisory services, tailored financial products and services, targeted training, collective actions, access to market and market information and improved market infrastructure and facilities. Improving the production and productivity of the sector mainly benefits women and resource poor households. Hence, improved poultry production can be considered an integral part of strategies that aim to reduce poverty, enhance food and nutritional security and diversify household income and livelihood in rural and peri-urban areas.

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ISBN:92-9146-755-3




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