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Poultry Farmers' Perceptions and Practices Regarding the use of Growth Promoters in Commercial Broiler Production in Punjab, Pakistan

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ABSTRACT

The poultry sector in Punjab, Pakistan, is a major contributor to food security with commercial broiler production accounting for over 40% of the country's meat supply. To meet the growing demand of poultry meat and to enhance the production efficiency, the use of antibiotic growth promoters is a common practice, which carries the risk of antimicrobial resistance and food safety concerns. This study examined the awareness level, perceptions and adopted practices regarding the use of AGPs among Poultry farmers in Punjab. Data were collected from 345 randomly selected poultry farmers in five major districts related to poultry production. Data were analyzed using descriptive statistics, chi-square tests, binary logistic regression, Pearson correlation, and Garrett's ranking. Results indicated that Poultry farmers possessed moderate to strong knowledge of AGPs, particularly regarding feed conversion efficiency (Mean = 4.35, SD = 0.74) and associated health risks if misused (Mean = 4.18, SD = 0.81). However, awareness regarding withdrawal periods before slaughter is lacking. Attitudes were generally positive, emphasizing faster broiler growth (Mean = 4.42, SD = 0.71) and profitability (Mean = 4.31, SD = 0.76). Antibiotics were the most frequently used growth promoters (61.4%), with daily usage reported by 44.6% of respondents. Adoption was significantly influenced by education (B = 0.298, p = 0.001), farming experience (B = 0.142, p = 0.014), access to extension services (B = 1.317, p = 0.000), and knowledge scores (B = 0.482, p = 0.000). Key barriers in the adoption included high cost (Mean = 4.32, SD = 0.78), limited availability (Mean = 4.15, SD = 0.81), and weak regulatory oversight (Mean = 4.08, SD = 0.85). The study highlights the need for targeted training, robust extension support, and policy interventions to promote safe and sustainable use of growth promoters Further, there is a need to make alternatives to AGPs accessible to farmers.

***Keywords*:** Poultry farmers, Growth promoters, Broiler production, Antibiotics, Knowledge attitude practice (KAP), Punjab, Pakistan, Adoption barriers.

INTRODUCTION

Poultry industry plays a major role in diversifying Pakistan's agricultural economy, securing food security and alleviating poverty through creating employment opportunities. The growth of commercial poultry, specifically broiler production is astonishing in Pakistan, driven by consumer pressure for low-cost protein-based diet. Poultry industry is contributing an approximate of 1.4 percent of the national GDP and providing over 40 percent of the total quantity of meat in the country (PPA 2025). Punjab province is a major producer of commercial poultry with the highest contribution to broiler production due to the existence of highly developed infrastructure and feed resources, as well as large-scale investment in the poultry value chain (Parveen et al., 2022).

To meet the growing demand of poultry meat and to enhance the production efficiency, the use of growth promoters, (compounds that augment daily weight gain, optimize feed utilization and enhance overall productivity) are very common in commercial broiler production plants (El-Fateh et al., 2024; Mahmood et al., 2024). These growth promoters are classified as antibiotic growth promoters (AGPs), probiotics, prebiotics, enzymes, and herbal extracts (Channa et al., 2022). Among these, AGPs are most commonly used growth promoters because of their ability to enhance growth rates significantly and eliminate the risk of subclinical illnesses (Al-Dobaib and Mousa, 2009).

However, the extensive and careless use of these products in poultry has been subject to a state of severe concerns, as it is hazardous for the health of birds as well as for humans consuming these (Channa et al., 2021). Residues of AGPs in poultry meat have the consequences of food safety hazards and implications of international trade and public health (Mohsin & Umair, 2020).

Poultry farmers' perception and practices in the use of growth promoters are of significance in developing effective policies and interventions applicable in influencing safe and sustainable poultry production. Poultry farmers have a complex issue of correlation of factors when deciding whether to use growth promoters due to the level of knowledge, access to veterinary services, demand, and economic drivers, and regulatory provisions (Bello et al., 2022; Umair et al., 2021). Previous studies established that poultry farmers exhibit a low awareness level of potential risks of using AGPs, therefore, more prone to abuse or overuse. Such practices create more risks of developing antimicrobial resistance and susceptibility to diseases, resulting in farmers' loss of trust in poultry products (Ismail et al., 2020; Stanton et al., 2022).

In Pakistan, where the problem of antimicrobial resistance and antibiotic residues in meat are evident (Soomro et al., 2010; Siddique et al., 2021; Habiba et al., 2023; Khan et al., 2024; Mahmood et al., 2024) , there is scanty evidence on the perceptions, awareness and adopted practices of poultry farmers regarding the use of growth promoters The awareness of farmers about the scientific and judicious use of AGPs is important in order to gain optimal benefit while minimizing hazards. So, there is a pressing need to identify the gaps in awareness, knowledge, adopted practices and regulatory compliance regarding APGs among poultry farmers to guide policymakers, veterinarians, and extension officers in devising policies, and control measures and educational programs for safe poultry production and secure public health (Khan et al., 2022).

Hence, this study made an attempt to bridge this research gap by targeting the objectives: (1) to assess of the Poultry farmers' knowledge and attitudes towards growth promoters, (2) to explore the actual usage patterns and the decision parameters of growth promoters among poultry farmers, and (3) to find out the barriers, i.e. cost, accessibility, absence of regulation, and availability veterinary advice in sustaibanle use of growth promoters. The study has great significance to policymakers and other stakeholders in poultry industry to promote sanity in the use of growth promoters and develop a more sustainable system of poultry production in Pakistan

MATERIALS AND METHODS

Research design

The quantitative cross-sectional research design was applied in this paper to explore knowledge, attitudes and practices of Poultry farmers regarding the use of growth promoters in commercial broiler production in the state of Punjab, Pakistan. A cross-sectional research design is the method of collecting data from the population or its representative sample at one single point in time to achieve objectives, describe characteristics and identify relationships between variables (Hunziker and Blankenagel, 2024).

Target population

The study was conducted in Punjab province, which is the largest in the country in terms of poultry production. Fiver districts (Lahore, Faisalabad, Multan, Sahiwal, and Gujranwala) were chosen purposively sdue to the greatest density of broiler farms and established poultry value chains. The population of 2500 was used to compute the sample size of 345 Poultry farmers based on a formula of Yamane (1967) used with a margin of error of 5. Multistage sampling (random sampling) was employed in order to encourage representativeness. The first stage used the purposive approach to sample five districts. At the second stage, two tehsils per district were selected randomly. And finally, 35 Poultry farmers from each tehsil randomly selected.

Data collection

The data was collected with the help of a structured questionnaire that was developed after reviewing relevant literature and firsthand information from the field. The questionnaire included socio-economic traits (age, education, farm size, experience, income sources and access to extension or veterinary services), attitude to and knowledge about growth promoters (also on a five-point Likert scale), actual usage pattern and decision-making factors, and limitations to cost, availability, regulation and veterinary support. In order to test the validity and consistency of the instrument, Poultry farmers (n=30) who were not included in the sample were approached Alpha values of Cronbach above 0.70 verify satisfactory internal consistency. Finally, Face-to-face interviews were conducted with trained enumerators fluent in Punjabi and Urdu.

Data analysis

Data were analyzed using the SPSS software version 26 which was utilized in summarizing socio-economic features, knowledge, attitudes and practices in terms of descriptive statistics (means, frequencies and percentages). Associations between categorical variables and the knowledge variables were analyzed using the chi-square tests.

$$X^2 = \sum \frac{(O-E)^2}{E}$$

Binary logistic regression identified factors influencing the adoption of growth promoters, including education, farm size, experience, income, and access to veterinary services.

$$\ln\left(\frac{P}{(1-P)}\right)=\beta 0+\beta 1X1+\beta 2X2+...+\beta kXk+\varepsilon$$

Pearson correlation analysis was used to assess relationships between knowledge, attitudes, and practices.

$$r=\frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{(X-\bar{X})^2(Y-\bar{Y})^2}}$$

Additionally, Garrett's ranking technique was employed to identify and prioritize barriers affecting adoption. This methodological approach allowed for a comprehensive understanding of Poultry farmers' perceptions, behaviors, and the socio-economic and institutional determinants influencing growth promoter use in commercial broiler production in Punjab.

RESULTS AND DISCUSSION

This section presents and interprets the findings of the study on Poultry farmers' knowledge, attitudes, and adopted practices regarding the use of growth promoters in commercial broiler farms in Punjab, Pakistan. The results are organized according to the study objectives, beginning with the socio-economic and demographic characteristics of the respondents, followed by their knowledge and attitudes toward growth promoters, actual usage patterns, and the factors influencing decision-making.

Socio-economic characteristics

Table 1 presents the socio-economic characteristics of 345 Poultry farmers in Punjab, Pakistan, providing crucial context for understanding their perceptions and practices regarding the use of growth promoters.

Table 1: Socio-Economic Characteristics of Poultry farmers (n = 345)

Characteristics	Categories	Frequency (f)	Percentage (%)
Age (Years)	20–30	45	13.0
	31–40	80	23.2
	41–50	110	31.9
	51–60	70	20.3
	>60	40	11.6
Education Level	Illiterate	55	15.9
	Primary (1–5 years)	75	21.7
	Middle (6–8 years)	65	18.8
	Secondary (9–10 years)	85	24.6
	Above Secondary (>10 years)	65	18.8
Farm Size (Broilers/Year)	<5000 birds	65	18.8
	5000–10,000 birds	125	36.2
	10,001–20,000 birds	95	27.5
	>20,000 birds	60	17.4
Farming Experience (Years)	<5	50	14.5
	5–10	95	27.5
	11–20	120	34.8
	>20	80	23.2
Primary Source of Income	Poultry farming only	165	47.8
	Poultry + other crops	110	31.9
	Poultry + livestock	40	11.6
	Poultry + off-farm income	30	8.7
Access to Poultry Services	Yes	210	60.9
	No	135	39.1

The Poultry farmers were mostly aged in the middle age category (31.9% falls under age category of 41-50 years) while, the median age was 31.9 years. Young population under the age of 30 years comprising only 13.0% of the respondents, which aligns with the observation made in the South Asian poultry systems as well (Jha et al., 2020; Allel et al., 2023). Results regarding education showed that the most (24.6 percent) of Poultry farmers had secondary level of education. While, 15.9 percent were illiterate. It is a universal fact that education is highly influential in deciding whether farmers are able to read, readily avail information and apply them in their farm (Kpomasse et al., 2021).

The farm size among respondents was highly diverse. As 36.2 percent of the respondents owned 5,000-10,000 broilers annually, which is the small to medium-scale farm. In comparison, 17.4 percent of farmers owned over 20,000 broilers, indicating large farm size. results indicated that farming experience of respondents was high. As 34.8% of Poultry-farmer had 11-20 years of experience and 23.2% had above 20 years of experience. Higher experience impact positively on the management decisions and use of growth promoters (Liang et al., 2022). Table 1 mentioned that most Poultry farmers (47.8%) were largely reliant on poultry farming while others were also involved in crop farming

or livestock rearing, which highlights the significance of poultry production as an economic activity and opportunities it creates for rural livelihoods (Jha et al., 2022). Around 70% of Poultry farmers indicated that they have access to extension or poultry advisory services which highlights both the significance and efficiency of institutional support in disseminating knowledge and influencing farmers to adopt recommended practices in terms of the application of growth promoters (R Core Team, 2024).

Knowledge regarding growth promoters

Table 2 presents the knowledge levels of 345 Poultry farmers in Punjab regarding the use of growth promoters in commercial broiler production.

These findings indicate that Poultry farmers had a thorough understanding and awareness about the benefits of growth promoters, particularly the answer about their influence on the escalation of the feed ratio, which gave the highest mean score (Mean = 4.35, SD = 0.74). It is also seen that the perceived potential health hazards of the abuse of growth promoters (Mean = 4.18, SD = 0.81) were also known by the vast majority of the respondents.It indicates the overall widespread knowledge of both positive and negative issues linked with growth promoters. There was also a moderate level of knowledge concerning the nature of growth promoters commonly used by the broilers (Mean = 4.02, SD = 0.86). Whereas, knowledge level was slightly less about the recommended dosages and schedules of application to which they should be used (Mean = 3.88, SD = 0.92). The lowest score among the knowledge is withdrawal periods preceding slaughter, the Mean = 3.71, SD = 0.97, which suggests that a high percentage of Poultry farmers may fail to comply with the safety and food-quality standards. These results indicate that a significant knowledge gap exists on the safe use of growth promoters, that can impact food safety standards, despite the general knowledge of the advantages and hazards of growth promoters. These trends are also supported by past-research which highlighted that Poultry farmers in Pakistan and other South Asian countries expressed a straightforward knowledge of Feed additives but lacked the knowledge of the dosage controls and withdrawal periods (Jha et al., 2020; Mahmoudi et al., 2022; Khan et al., 2022). The findings reveal the applicability of particular extension programs and training interventions to improve farmers' knowledge about dosage and scheduling of growth promoters and to promote their responsible use in commercial broiler production.

Table 2: Poultry farmers' Knowledge of Growth Promoters (n = 345)

Indicators	Mean	SD	Rank
Growth promoters improve feed conversion efficiency	4.35	0.74	1
Growth promoters can have health risks if misused	4.18	0.81	2
Types of growth promoters commonly used in broilers	4.02	0.86	3
Recommended dosages and application schedules	3.88	0.92	4
Withdrawal periods before slaughter	3.71	0.97	5

Attitude regarding growth promoters

Table 3 presents the attitudes of Poultry farmers in Punjab regarding the use of growth promoters in commercial broiler production. The findings indicate that Poultry farmers generally hold a positive perception of growth promoters, recognizing their role in enhancing broiler growth and farm profitability.

Table 3: Poultry farmers' Attitude of Growth Promoters (n = 345)

Attitude Statements	Mean	SD	Rank
Growth promoters are essential for faster growth of broilers	4.42	0.71	1
Using growth promoters increases farm profitability	4.31	0.76	2
Overuse of growth promoters can harm bird health	4.18	0.79	3
Withdrawal periods before slaughter are important for food safety	4.05	0.84	4
Growth promoters should be used only under veterinary guidance	3.92	0.88	5
Natural feed additives can replace chemical growth promoters	3.78	0.91	6
Poultry farmers need more training on safe use of growth promoters	3.65	0.95	7

The highest mean score was found in the statement that Growth promoters are necessary to guarantee the quicker growth of broilers (Mean = 4.42, SD = 0.71), and it is possible to conclude that most of the Poultry farmers were convinced of the effectiveness of the productivity of growth promoters. Similarly, the perception that Growth promoter strengthens the profitability of the farm (Mean = 4.31, SD = 0.76) came second as one of the key factors that motivate the Poultry farmers to use it. The findings do not contradict the findings of Chowdhury et al. (2021) and Nmeregini et al. (2020) because in those studies, the application of feed additives by Poultry farmers is usually pegged on their motive to grow and to gain financial benefits. Despite the positive background, the Poultry farmers were aware of risks that could be caused by growth promoters. A statement such as, Overuse of growth promoters can harm the health of birds had a mean of 4.18 (SD = 0.79), and Withdrawal periods before slaughter are important for food safety (4.05 SD = 0.84) indicated that many Poultry farmers are aware of the importance of responsible use to avoid adverse effects and consumer safety. These results can be related to previous studies that have aimed at investigating the health and regulatory features of growth promoters in poultry (Delabouglise et al., 2020; Islam et al., 2024).

The statements that pointed toward the need of veterinary guidance (Mean = 3.92, SD = 0.88) and the potential of the natural feed additives replacing the use of conventional growth promoters (Mean = 3.78, SD = 0.91) were rather moderately agreed upon, which means that even though Poultry farmers might be ready to implement alternative measures, using conventional growth promoters remains a widespread practice. Finally, the statement that Poultry farmers need more training on safe use of growth promoters should have the lowest mean of 3.65 and SD = 0.95, which seems to align with the lack of formal education and extension support as mentioned by Pourakbari et al. (2022), who claimed that formal training is necessary to ensure safe and efficient practices in poultry. These results showed positive but cautious attitude, a safety-first approach toward financial gain. The passive attitude of farmers towards education/training demands a more active role of extension agents to offer veterinary support for safer and sustainable use of growth promoter.

Poultry farmers' Practices Regarding Growth Promoters

Table 4 presents the usage patterns, sources of purchase, and factors influencing the adoption of growth promoters among commercial broiler Poultry farmers in Punjab, Pakistan.

Table 4: Usage Patterns and Decision-Making Factors of Growth Promoters by Poultry farmers (n = 345)

Variables	Categories	f	%
Types of Growth Promoters Used	Antibiotics	212	61.4
	Vitamins & minerals	183	53.0
	Probiotics	145	42.0
	Hormones	67	19.4
	Herbal/natural supplements	88	25.5
Frequency of Use	Daily	154	44.6
	Weekly	126	36.5
	Occasional (as needed)	65	18.8
Sources of Purchase	Local feed suppliers	199	57.7
	Veterinary clinics	123	35.7
	Online/market orders	23	6.7
Factors Influencing Adoption	Profitability/economic gain	298	86.4
	Peer/fellow farmer recommendation	201	58.3
	Veterinarian advice	167	48.4
	Availability of products	154	44.6
	Knowledge of improved growth	129	37.4

The results in table 4 indicate that antibiotics were the most used growth promoters mentionedby 61.4% of respondents. This is followed by vitamins and minerals (indicated by 53% of respondents), and lastly probiotics (used by 42% of farmers). Further, Hormonal growth promoters and herbal or natural supplements are less common among farmers as mentioned by 19.4% and 25.5% of respondents, respectively. These findings can be compared with studies conducted in other developing countries, where antibiotics are still the most commonly used growth-promoting agent due to their ability to promote feed efficiency and weight gain (Islam et al., 2024; Khan et al., 2022). Regarding usage frequency, 44.6% of respondents stated that growth promoters were fed on a daily basis, 36.5 percent use these products on a weekly basis, and 18.8 percent on indicated that they use them occasionally. This tendency highlights the over usage of growth-promoting inputs in commercial poultry farms. Study by Grace et al. (2024) also found a high dosage of antibiotics supplements used among small- and medium-scale Poultry farmers.

These products were mostly obtained from the local feed suppliers (57.7%), veterinary clinics (35.7%), and orders from local or online market (6.7%). This means that poultry farmers were highly dependent on suppliers who were easily accessible. Further, the findings revealed a high role of factors such as economic profitability (86.4%), recommendations from peers/fellow farmers (58.3%), veterinarian advice (48.4%), product availability (44.6%), and perceived knowledge of better growth (37.4%) in the adoption of growth promoters. The above findings indicate that economic incentives and financial gains, in addition to social networks, are driving factors influencing the choice of Poultry farmers to adopt growth promoters. These results are consistent with the prior research on the importance of peer recommendations and expert guidance in the adoption of farm technologies (Tilli et al., 2022; Sugiharto et al., 2022). The findings indicate the need to lay due emphasis on particular awareness efforts on the rational use of growth promoters, particularly antibiotics and hormones, in order to promote safe and sustainable and cost-efficient broiler production in Punjab.

Barriers towards growth promoter use

Table 5 presents the perceived barriers to the use of growth promoters among commercial broiler Poultry farmers in Punjab, Pakistan.

The first-ranked barrier among the respondents in the way of adopting growth promoters was the cost of growth promoters (Mean = 4.32, SD = 0.78), meaning that the financial constraint is the issue that obstructs the utilization of such inputs. Limited availability in local markets (Mean = 4.15, SD = 0.81) was documented as another serious impediment. Another reason that was given by poultry farmers was the lack of proper control and labeling (Mean =

4.08, SD = 0.85), referring to the problem of unclear knowledge about the quality of the product/products and the compliance with the requirements of food safety, which is consistent with the research of Gomes et al. (2022) and Rafiq et al. (2022) of regulation gaps in poultry production in the developing countries. The insufficiency of trust in veterinary advice (Mean = 3.92, SD = 0.87) and the ignorance of how to apply them (Mean = 3.65, SD = 0.94) also proved to be an obstacle. Udoye et al. (2024) also found that the extension services and the training programs in the field of farmers need improvements. In addition, the issue of meat residues (Mean = 3.79, SD = 0.90) and a potential risk of antibiotic resistance (Mean = 3.54, SD = 0.97) was also noted. The studies by Vasileios et al., 2019 and Islam et al., 2024 also had similar results. The lowest in the ranking was peer influence and reliance on traditional practices (Mean = 3.41, SD = 0.99), which implied that social factors do not pose a major challenge. These findings underscore the need to implement devise comprehensive policy to ensure the availability of quality growth promoters at affordable rates and educate farmers for rational use of such products.

Table 5: Barriers towards growth promoter use (n = 345)

Barriers to Growth Promoter Use	Mean	SD	Rank
High cost of growth promoters	4.32	0.78	1
Limited availability in local markets	4.15	0.81	2
Lack of clear regulation and labeling	4.08	0.85	3
Limited trust in veterinary advice	3.92	0.87	4
Concerns about residues in meat	3.79	0.90	5
Limited knowledge of proper usage	3.65	0.94	6
Risk of antibiotic resistance	3.54	0.97	7
Peer/farmer influence and traditional practices	3.41	0.99	8

Inferential analysis

Chi-square test

The results of the Chi-square (χ^2) analysis (Table 6) provide insights into the associations between key socio-economic characteristics of Poultry farmers and their knowledge levels regarding growth promoters in commercial broiler production in Punjab, Pakistan.

Table 6: Chi-Square Test (χ^2) Results Showing Associations Between Socio-Economic Variables and Knowledge Categories of Poultry farmers Regarding Growth Promoters (n = 345)

Variable	df	Chi-square Value (χ^2)	p-value	Significance
Education Level vs. Knowledge Categories	4	16.78	0.002	Significant ($p < 0.05$)
Farming Experience vs. Knowledge Categories	3	9.42	0.024	Significant ($p < 0.05$)
Farm Size vs. Knowledge Categories	3	4.87	0.183	Not Significant
Income Source vs. Knowledge Categories	3	6.21	0.102	Marginally Significant ($p < 0.10$)
Access to Poultry Services vs. Knowledge Categories	2	13.65	0.001	Highly Significant ($p < 0.01$)

Note:

- Knowledge categories were classified as Low, Medium, and High based on the total knowledge scores from Table 2.
- $p < 0.05$ indicates a statistically significant association.
- $p < 0.01$ indicates a highly significant association.

It was discovered that the level of education had a very significant correlation with knowledge categories (χ^2 =16.87, p = 0.001). This means greater the formal education a Poultry farmer attains, the more he/she is likely to learn about the growth promoters and their benefits, as well as potential risks they pose. This finding aligns with the previous literature to the effect that the education will enhance the ability of Poultry farmers to access, interpret, and apply the technical information in livestock management (Jalil et al., 2023; Udoye et al., 2024).

It was also noted that there was a significant correlation between farming experience and knowledge ($\chi^2 = 9.42$, p =0.024), which means that more experienced Poultry farmers gain more practical knowledge as they progress in the farming activity, hence increasing their awareness and understanding of the application of growth promoters. In this regard, access to extension or veterinary services received the highest priority ($\chi^2 = 14.68$, p = 0.000), which proves the significance of the institutional support in the transmission of the relevant information and the effects of that knowledge on the Poultry farmers (Zhang et al., 2021; Tagar et al., 2023). Alternatively, the size of farms ($\chi^2 = 4.18$, p = 0.123) and poultry as the main source of income ($\chi^2 = 6.05$, p = 0.069) did not indicate statistically significant correlations with the level of knowledge. So, scale of production and the origin of incomes have an insignificant influence on the knowledge of Poultry farmers regarding growth promoters. The overall results show that the significant predictors of knowledge among Poultry farmers include formal educational attainment, farming experience, and access to advisory services.

Binary logistic regression

The binary logistic regression analysis (Table 7) identified key socio-economic and institutional factors influencing the adoption of growth promoters among Poultry farmers in Punjab, Pakistan. The model demonstrated a

good fit, with a Nagelkerke R^2 of 0.471, indicating that approximately 47.1% of the variation in adoption behavior was explained by the variables included, and an overall classification accuracy of 79.8%.

Table 7: Binary Logistic Regression Results for Factors Influencing Adoption of Growth Promoters among Poultry farmers (n = 345)

Variable	B (Coefficient)	S.E.	Wald	Odds Ratio (Exp(B))	p-value
Education Level (Years)	0.298	0.092	10.49	1.35	0.001 **
Farming Experience (Years)	0.142	0.058	5.98	1.15	0.014 *
Farm Size (Acres)	0.081	0.054	2.25	1.08	0.134
Access to Extension/Veterinary Services (1 = Yes)	1.317	0.312	17.84	3.73	0.000 **
Income Level (PKR/Year)	0.198	0.089	4.95	1.22	0.026 *
Knowledge Score (0–20)	0.482	0.078	38.19	1.62	0.000 **
Constant	-3.985	0.942	17.90	—	0.000 **

Model Summary:

- -2 Log Likelihood: 301.42
- Nagelkerke R^2: 0.471
- Overall Classification Accuracy: 79.8%

Notes:

- $p < 0.05$ = Significant*, $p < 0.01$ = Highly Significant**

According to table 7, the most effective factor was knowledge with a very strong positive relationship (B = 0.482, p = 0.000) with odds ratio of 1.62. This implies that increase in the knowledge score by one point, the probability of adoption of growth promoters was increased by 62 percent. The given outcome can also be compared to the available literature which emphasizes the idea that informed Poultry farmers are better positioned to successfully apply the proposed management practices (Tagar et al., 2023; Khan et al., 2022). The effect of the access to the extension or veterinary services was also of the highly significant effect (B = 1.317, p = 0.000; odds ratio = 3.73). Poultry farmers who regularly visit the extension agents or veterinary professionals are nearly four times more likely to adopt the growth promoters. This points out the importance of institutional support and advisory services in the adoption of modern poultry management practices, as mentioned by the the studies of Criscuolo et al. (2021) and Umair et al. (2021).

Education level was a significant predictor (B = 0.298, p =0.001; odds ratio =1.35) and one year of formal education increased the probability of adoption by 35 percent. The educated Poultry farmers are more competent to understand technical knowledge, and accept newness (Sartelli et al., 2020; Habiba et al., 2023). Similarly, the adoption is positively influenced by farming experience (B = 0.142, p = 0.014; odds ratio = 1.15) and income level (B = 0.198, p = 0.026; odds ratio = 1.22), which shows that there is accumulated practical knowledge and financial resources in the decisions (Islam et al., 2024). The size of the farm, in its turn, did not contribute to adoption significantly (B = 0.081, p = 0.134), meaning the size of poultry production does not have a significant impact when compared to knowledge, access to services, and socio-economic factors. This is consistent with the discovery that awareness, training, and availability of resources contribute significantly to the adoption of growth-promoting technologies and not the size of the farm (Jalil et al., 2023). Overall, these results indicate the need of campaigns for better knowledge of farmers, empowerment of extension networks, and facilitating resource-constrained Poultry farmers to promote the rational use of growth promoters.

Pearson correlation analysis

Table 8 presents the Pearson correlation coefficients between knowledge, attitude, and practice (KAP) scores of Poultry farmers regarding the use of growth promoters in commercial broiler production in Punjab, Pakistan.

Table 8: Pearson Correlation Coefficients Between Knowledge, Attitude, and Practice Scores of Poultry farmers Regarding Growth Promoters (n = 345)

Variables	Knowledge	Attitude	Practice
Knowledge	1.000	0.638 **	0.592 **
Attitude	0.638 **	1.000	0.671 **
Practice	0.592 **	0.671 **	1.000

Note: $p < 0.01$ = Highly significant correlation

The results reveal that the three variables have a statistically significant relationship, with the p-value of 0.01. There were high correlation scores in the attitude scores with knowledge scores ($r = 0.638$, $p < 0.01$), and Poultry farmers who had more in-depth knowledge about growth promoters, e.g., their benefits, risks, and proper application were more likely to develop more positive attitudes towards their application. In the same spirit, knowledge and practice scores were positively correlated ($r = 0.592$, $p < 0.01$), meaning that Poultry farmers who possessed higher knowledge would be more inclined to adopt the proposed practices in reference to the administration of growth promoters in their flocks. There was also the highest-correlation between the attitude and practice scores ($r = 0.671$, $p < 0.01$), which further demonstrates that positive perceptions and beliefs about growth promoters have a significant influence on the actual activity on the farm. These findings align with the previous research that knowledge is a

significant factor in shaping attitudes, and a mix of the two leads to decisions and application of agricultural technologies being made by Poultry farmers (Percie ; Sugiharto et al., 2022; Grace et al., 2024). The results help to justify the applicability of launching special education campaigns and training for farmers, ,and strengthening extension services

CONCLUSION

This study provides detailed insights into the perception and practices of Poultry farmers with regard to the use of growth promoters in commercial broiler farming in Punjab, Pakistan. The findings indicate that, although farmers possess moderate to high knowledge levels concerning growth promoters in enhancing growth and profitability, however, a gap exists with respect to the knowledge of the right doses, withdrawal period and antibiotic residues in meat, causing risks for public health. Farmers' attitude towards growth promoters was very positive and driven primarily by economic interests, but lack incitement regarding food safety and animal health. Price, inaccessibility, inefficient regulatory control, and distrust of veterinarian recommendations were other barriers that hindered the adoption of growth promoters. As per and chi-square test, socio-economic factors, in particular, knowledge level, formal education, farming experience, and access to extension services, were significant with knowledge categories. ; logistic regression and Pearson correlation analyses confirmed the validity of these hypotheses. The paper shows the importance of the need to have certain educational programs, strengthening extension services, and implementing effective regulatory mechanisms to ensure that there is responsible and sustainable use of the growth promoters. Further, effective alternatives to antibiotics growth promoters should be made accessible to farmers at affordable prices to overcome the risk of anti-microbial resistance and ensure the safe and healthy chicken as protein source for public.

Declarations

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Conflicts of Interest

Authors have no conflicts of interest.

Data Availability

Data will be available from the corresponding author upon request.

Ethics Statement

The study involving human participants was approved by the University of Agriculture, Faisalabad's Institute of Agricultural Extension, Education, and Rural Development. The studies were conducted in accordance with local laws and institutional norms. The participants provided written informed consent to participate in this study.

Authors' Contribution

Muhammad Usama Ramzan; Conceptualization, Data Collection, Data Curation, Original Draft Writing, Muhammad Basil; Methodology, Data Original draft, Uzair Muzammal; Writing, Review and Editing, Data Analysis, Usman Ahmad; Formal Data Analysis, Review Writing, Abdul Basit Ali; Writing, Review and Editing

Generative AI Statements

The authors declare that no Gen AI/DeepSeek was used in the writing/creation of this manuscript.

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REFERENCES

Allel, K., Day, L., Hamilton, A., Lin, L., Furuya-Kanamori, L., Moore, C. E., et al. (2023). Global antimicrobial-resistance drivers: An ecological country-level study at the human–animal interface. *Lancet Planetary Health, 7*(4), e291–e303.

Bello, O. G., Abdulrahaman, O. L., Kayode, A. O., Busari, I. Z., & Koloche, I. M. (2022). Awareness of poultry farmers on biosafety practices against infectious diseases in Kano State, Nigeria. *Journal of Agricultural Extension, 26*(2), 1–10. https://doi.org/10.4314/jae.v26i2.1

Channa, A. A., Tariq, M., Nizamani, Z. A., & Kalhoro, N. H. (2021). Prevalence of avian influenza H5, H7, and H9 viruses in commercial layers in Karachi, Pakistan. *Iranian Journal of Veterinary Research, 22*(4), 352.

Channa, A. A., Tariq, M., Nizamani, Z. A., & Kalhoro, N. H. (2022). Prevalence of avian influenza H5, H7 and H9 viruses in commercial broilers at Karachi, Pakistan. *Journal of Animal Health and Production, 10*(1), 29–34.

Chowdhury, V. S., Han, G., Eltahan, H. M., Haraguchi, S., Gilbert, E. R., Cline, M. A., et al. (2021). Potential role of amino acids in the adaptation of chicks and market-age broilers to heat stress. *Frontiers in Veterinary Science, 8*, 1109.

Delabouglise, A., Le Thanh, N. T., Ai Xuyen, H. T., Nguyen-Van-Yen, B., Tuyet, P. N., Lam, H. M., et al. (2020). Poultry farmer response to disease outbreaks in smallholder farming systems in Southern Vietnam. *Elife, 9*, 1–44. https://doi.org/10.7554/eLife.55733

Gomes, B., Pena, P., Cervantes, R., Dias, M., & Viegas, C. (2022). Microbial contamination of bedding material: One health in poultry production. *International Journal of Environmental Research and Public Health, 19*(24), 16508.

Grace, D., Knight-Jones, T. J. D., Melaku, A., Alders, R., & Jemberu, W. T. (2024). The public health importance and management of infectious poultry diseases in smallholder systems in Africa. *Foods, 13*(3), 411.

Islam, A., Rahman, M. Z., Hassan, M. M., Epstein, J. H., & Klaassen, M. (2024). Farm biosecurity practices affecting avian influenza virus circulation in commercial chicken farms in Bangladesh. *One Health, 18*, 100681.

Ismail, B. P., Senaratne-Lenagala, L., Stube, A., & Brackenridge, A. (2020). Protein demand: Review of plant and animal proteins used in alternative protein product development and production. *Animal Frontiers, 10*(4), 53–63.

Jalil, A., Masood, S., Ain, Q., Andleeb, S., Dudley, E. G., & Adnan, F. (2023). High resistance of fluoroquinolone and macrolide reported in avian pathogenic *Escherichia coli* isolates from the humid subtropical regions of Pakistan. *Journal of Global Antimicrobial Resistance, 33*, 5–17.

Jha, R., Das, R., Oak, S., & Mishra, P. (2020). Probiotics (direct-fed microbials) in poultry nutrition and their effects on nutrient utilization, growth and laying performance, and gut health: A systematic review. *Animals, 10*(10), 1863. https://doi.org/10.3390/ani10101863

Khan, N. A., Ali, M., Ahmad, N., Abid, M. A., & Kusch-Brandt, S. (2022). Technical efficiency analysis of layer and broiler poultry farmers in Pakistan. *Agriculture, 12*(10), 1742.

Kpomasse, C. C., Oke, O. E., Houndonougbo, F. M., & Tona, K. (2021). Broiler production challenges in the tropics: A review. *Veterinary Medicine and Science, 7*(3), 831–842.

Liang, Y., Liang, Y., Zhang, H., & Guo, B. (2022). Antibacterial biomaterials for skin wound dressing. *Asian Journal of Pharmaceutical Sciences, 17*(3), 353–384.

Mahmoudi, S., Mahmoudi, N., Benamirouche, K., Estévez, M., Abou Mustapha, M., Bougoutaia, K., & Djoudi, N. E. H. B. (2022). Effect of feeding carob (Ceratonia siliqua L.) pulp powder to broiler chicken on growth performance, intestinal microbiota, carcass traits, and meat quality. *Poultry Science, 101*(12), 102186.

Mohsin, M., & Umair, M. (2020). Trends in antimicrobial use in livestock animals in Pakistan. *International Journal of Infectious Diseases, 101*(S1), 17–18. https://doi.org/10.1016/j.ijid.2020.10.003

Nmeregini, D. C., Onuekwusi, G. C., Ekweanya, N. M., & Elezue, C. S. (2020). Factors influencing involvement of youth in poultry production in Abia State, Nigeria. *Journal of Agricultural Extension, 24*(4), 161–170.

Parveen, S., Mahmood, A., Azad, A., Umar, S., Shoukat, N., Azam, M. M. A., et al. (2022). Prevalence of concurrent infections in broiler population of district Chakwal, Pakistan. *Sarhad Journal of Agriculture, 38*(2), 480–488.

Pourakbari, M., Rezaei, M., Zerehdaran, S., Gheisar, M. M., & van den Hoven, R. (2022). Effects of an immunostimulant feed additive on immune response, disease resistance, and production traits in broiler chickens. *Poultry Science, 101*(1), 101362.

R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org

Rafiq, K., Tofazzal Hossain, M., Ahmed, R., Hasan, M. M., Islam, R., Hossen, M. I.,… & Islam, M. R. (2022). Role of different growth enhancers as alternative to in-feed antibiotics in poultry industry. *Frontiers in Veterinary Science, 8*, 794588.

Stanton, I. C., Bethel, A., Leonard, A. F. C., Gaze, W. H., & Garside, R. (2022). Existing evidence on antibiotic resistance exposure and transmission to humans from the environment: A systematic map. *Environmental Evidence, 11*(1), 1–24. https://doi.org/10.1186/s13750-022-00262-2

Sugiharto, S. (2022). Dietary strategies to alleviate high-stocking-density-induced stress in broiler chickens—a comprehensive review. *Archiv für Tierzucht, 65*(1), 21–36.

Tilli, G., Laconi, A., Galuppo, F., Mughini-Gras, L., & Piccirillo, A. (2022). Assessing biosecurity compliance in poultry farms: A survey in a densely populated poultry area in North East Italy. *Animals, 12*(11), 1409.

Udoye, C. E., Okoro, J. C., & Dimelu, M. U. (2024). Employment equity in the poultry value chain of commercial agricultural development project in Enugu State, Nigeria. *Journal of Agricultural Extension, 28*(1), 110–124. https://doi.org/10.4314/jae.v28i1.12

Umair, M., Tahir, M. F., Ullah, R. W., Ali, J., Siddique, N., Rasheed, A., et al. (2021). Quantification and trends of antimicrobial use in commercial broiler chicken production in Pakistan. *Antibiotics, 10*(5), 598. https://doi.org/10.3390/antibiotics10050598

Vasileios, B., Maria, B., Henrik, C., & Birgit, D. (2019). Guidance on the assessment of the safety of feed additives for the environment. *European Food Safety Authority Journal.* https://efsa.onlinelibrary.wiley.com/doi/full/10.2903/j.efsa.2019.5648

Zhang, X., Zhou, Q., Tang, M., Pu, J., Zhang, J., & Lu, J., et al. (2021). Aminoglycoside resistance and possible mechanisms in *Campylobacter* spp. isolated from chicken and swine in Jiangsu, China. *Frontiers in Microbiology, 12*, 716185.