

SOCIO-CULTURAL, BUSINESS STRUCTURE AND ADDITIVE PRESCRIPTION CHARACTERISTICS OF AGRO-SERVICE PROVIDERS IN SOUTHERN NIGERIAN.

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Abstracts

The study focused on socio-cultural characteristics and additive prescription habits of agro-service providers in three southern states of Nigeria namely Imo, Akwa Ibom and Oyo states. Each of the three states was divided politically into three senatorial zones, and one of the senatorial zones will be selected purposively in each state, namely Owerri, Uyo and Ibadan zones for south east, south south and south west states, respectively. One local government area was selected purposively from each senatorial zone in which fifteen respondents (farmers) were selected from a town in each selected local government area. Thus, 45 respondents will participate in the study. Data generated were analyzed using descriptive statistics such as means, frequencies and percentages. Sex distribution of the agro-service providers is 73.53% for male and 24.43% for female. The highest number of agro-service providers fell within 41-50 years age bracket (33.26%), followed by the age group of 31-40 years (26.63%). The least however is the (above 60) group with the result of 2.20%. The marital status of the respondents showed that 66.63% are married while 33.30% are single. Educational qualifications of the respondents showed that majority of the respondents (82.16%) have formal education up to tertiary level while the rest (17.73%) have secondary school level education. Highest numbers of the respondents (42.20%) studied veterinary medicine, while 22.16% studied Animal science. The business structure showed that majority of the agro-service providers (75.49%) have between 1-15 years experience the rest (15.46%) have over 16 years experience. Highest numbers of respondents (24.23%) stocked vitamins/mineral additives, 17.46% stocked antibiotics, 14.60% stocked amino acids and 9.53% stocked toxin binders among others. 93.33% of the agro-service providers prescribe additive to farmers while 6.66% do not. Majority of them (46.80%) source their additives from retailers, 31.00% source from importers while 22.16% source from sales agents. Lysine (12.26%) is the most prescribed additive, closely followed by calcium (11.00%), vitamin/minerals (10.36%) and toxin binders (9.00%). Others are molasses (8.73%), methionine (8.46%), probiotics (6.23%) and enzymes (5.80%). Highest number of agro-service providers (47.13%) prescribed additives as the need arises, 29.50% prescribed monthly, 12.10% prescribed weekly while 9.53% prescribed daily. Contents of additives determines the prescription of most respondents (54.60%), 28.50% prescriptions are determined by

cost while 16.86% are determined by farmer's disposition. Efficacy of the additive is what mostly determined their use by farmers (57.80%), this is followed by cost (23.76%) and lastly by availability (18.40%). The majority of the agro-service providers (59.86%) are satisfied with their prescription results while 32.93% are not always satisfied.

Keywords: Poultry, agro-service providers, additives

Introduction

In an effort to improve the feed conversion ratio (FCR) and other production indices in poultry, it has become imperative to boost the quality and nutrient values of feeds being offered to the animals. Many additives have been offered as components of poultry diets in attempts to overcome poor nutrients utilization and performance challenges (Windisch *et al.*, 2008). In general, additives are products incorporated into the diets of often healthy animals by the farmer for a nutritional purpose on a permanent basis (i.e., during the entire production period of the animal category), in contrast to medicinal inputs which are applied for prophylaxis and therapy of diagnosed health issues for a limited period of time (Windisch *et al.*, 2008; Ezemo, 2012).

Different poultry feed and water additives have been and are being developed which may have similar or varied positive effects on the (GIT) and overall development of the birds (Langhout, 1999; Mohamed *et al.*, 2011; Lee *et al.*, 2007). These additives may include those of phyto-genic origins like organic acids, plant extracts, herbs and spices, enzymes, probiotics, prebiotics and fungi (Garcia *et al.*, 1999; Gita, 2013). Other additives that have been shown to be beneficial to the birds include flavourants, colourants, detoxicants, vitamins, minerals, synthetic and natural amino acids, osmo-regulators, anti Oxidants and methyl donors (Dhama *et al.*, 2014; Windisch *et al.*, 2008; Zhan *et al.*, 2006). The active principles and working mechanisms of these additives however vary widely (Langhout, 2000).

The sources, prescriptions and usage habit among stakeholders of these feed additives may also have wide variations in different production environment and Southern Nigeria in particular. The estimation of the socio-cultural characteristics such as sex, age and marriage status, business structure and additive prescription practices of agro-service providers in southern Nigeria will among others contribute to knowledge and provides data for various relevant agencies in various policy formulations in the area.

Materials and methods

The study will be undertaken in three states one each from the three geo-political zones that make up southern Nigeria. The three states for the study are Imo, AkwaIbom and Oyo representing south east, south south and south west geo political zones of southern Nigeria respectively. These study states were selected purposively because of the high levels of commercial poultry activities reported in them (Akandu, 2012). Each of the three states is divided politically into three senatorial zones, and one of the senatorial zones will be selected purposively in each state, namely Owerri, Uyo and Ibadan zones for south east, south south and south west states respectively. One local government area will be selected purposively from each senatorial zone in which thirty respondents (agro-service providers) will also be selected from a town in each selected local government area. Thus, 90 respondents will participate in the study.

The sampling design is therefore multi-stage sampling. The criteria for selection will be those stated above, in addition to willingness to participate in the study and the participant having a functional poultry farming enterprise.

The data needed for the study is generated with the aid of structured questionnaires and personal interviews. The actual survey is preceded by a preliminary informal survey of the study areas through which the researcher familiarized himself with issues associated with feed additive prescriptions and utilizations in the study areas, while also explaining the purpose of the study to the participants. The tables (1, 2, 3,4 and 5) below generally show the socio-cultural characteristics, business structure and additive prescription practices of poultry agro-service providers in southern Nigerian states of Imo, Akwa Ibom and Oyo.

Results and Discussions.

Socio-cultural characteristics of agro-service providers

Table 1 shows the socio-cultural characteristics of agro-service providers in Southern Nigerian.

(a) Sex distribution: Sex distribution of the agro service-providers in table 1 showed that most of them (75.53%) were males, while 24.43% only were females. This shows that the profession is dominated

by males in each of the three zones of southern Nigeria, in line with the reports of Ogegbuna (2014) for Anambra state and Bassey *et al.* (2018).

(b) Age distribution: Most of the respondents (33.26%) fall within the age the age bracket of 41-50 years (Table 1b). This was followed by those within 31-40 years age brackets which is 26.63% indicating that about 60% of them were in their active years (31-50 years). Bassey (2014) and Ogegbuna (2014) reported a younger age group of 20-30 years as the predominant group in AkwaIbom and Anambra states of Southern Nigeria. The age distribution of the agro-service providers was however more evenly distributed in Imo state with values standing at 20, 13, 26 and 20% for the 20-30, 31-40, 41-50 and 51-60 year age groups respectively. Such a result indicates that the profession has been more sustainable and enduring in the state.

(c) Marital status: Table 1c shows that 66.63% of the agro-service providers were married. Across states however, marriage patterns were 60.00, 53.30 and 86.60% for Imo, AkwaIbom and Oyo states respectively probably reflecting the different cultural practices of the peoples of the different states and/or the viability of the profession at these locations.

(d) Educational qualifications: Table 1d showed that all the agro-service providers had formal education up to secondary school level. Overall, 82.16 percent had tertiary education although at state level, Imo had the least (66.60%), while Oyo had the highest (93.30%). This result highlighted the fact that the profession requires some form of tertiary education, especially the health-service aspects of the business. Similar results were reported by Bassey *et al.* (2018) for Akwa Ibom state.

(e) Tertiary education discipline: Table 1e shows the different types of tertiary education attended by the agro-service providers. Most of the agro service providers studied veterinary medicine (42.20%), followed by those that studied animal science (22.16%) animal health and general agriculture (17.73% each). These results show that all the practitioners studied agriculture related courses. This is line with the conclusions of Bassey (2014) and Ogegbuna (2014) that agro service providers in Akwa Ibom and Anambra states are highly educated as expected of people involved in such specialized profession.

Table 1 Socio-cultural characteristics of agro service providers in three states of southern Nigeria

Parameter	Imo State (n=15) Frequency (%)	Akwa Ibom State (n=15) Frequency (%)	Oyo State (n=15) Frequency (%)	Mean (n=45) Frequency (%)
(a) Sex				
male	12(80.00)	13(86.60)	9(60.00)	34(75.53)
female	3(20.00)	2(13.30)	6(40.00)	11(24.43)
(b) Age				
20-30	3(20.00)	2(13.30)	2(13.30)	7(15.53)
31-40	5(33.30)	7(46.60)	3(20.00)	15(26.63)
41-50	4(26.60)	4(26.60)	7(46.60)	15(33.26)
51-60	3(20.00)	2(13.30)	2(13.30)	7(15.53)
Above 60	0(0.00)	0(0.00)	1(6.60)	1(2.20)
(c) Marital status				
Single	6(40.00)	7(46.60)	2(13.30)	15(33.30)
Married	9(60.00)	8(53.30)	13(86.60)	30(66.63)
(d) Educational qualification				
Nil	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Primary	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Secondary	5(33.30)	2(13.30)	1(6.60)	8(17.73)
Tertiary	10(66.60)	13(86.60)	14(93.30)	37(82.16)
(e) Tertiary education discipline				
Agriculture	4(26.60)	2(13.30)	2(13.30)	8(17.73)
Animal science	4(26.60)	2(13.30)	4(26.60)	10(22.16)
Animal health	2(13.30)	2(13.30)	4(26.60)	8(17.73)
Veterinary	5(33.30)	9(60.00)	5(33.30)	19(42.20)
Others	0(0.00)	0(0.00)	0(0.00)	0(0.00)

Source: Field survey.

Business structure and operations of the agro-service providers in southern Nigerian states

Table 2 highlights the business structure and operations of the agro-service providers in Southern Nigeria.

(a) Years of experience: Table 2a below shows that most of the agro-service providers(75.49%) have practiced for 1 to 15 years, with 6-10 years practices group accounting for 28.86% and the 1-5 years accounting for 26.63%. These results indicate that the profession is dominated by relatively new entrants similar to that of the farming population in the study area (table 4.1) that is also dominated by new farmers of (1-10 years experience) and showing that the profession has experienced significant growth in the recent years.

(b) Types of additive stocked: Table 2b showed that the most popular additives out of the 12 types stocked were vitamins and minerals (14.60%), antibiotics (17.46%), amino acids (14.60%) and mycotoxin (9.53%). It is interesting to note that at the time of this study, the agro-service providers were not aware of commercial preparations that serve as methyl donors such as betaine, choline and

methionine, hence none of them listed these in their response. This lack of awareness may influence their prescription of appropriate additives used in the formulation of their (cassava and cocoyam) based diets which are increasingly being used to replace costly grains as energy source in poultry diets. Mycotoxin binders were relatively more popular in Oyo state (19.20%) than the other states and was specifically not stocked in Imo state. Again, flavorants and acaricides were stocked in Akwalbom state only.

(C) Prescription of additives to farmers: The table 2c shows that most of the agro-service (93.33%) prescribed additives to farmers while the remaining 6.66% did not. This finding highlights the acceptability of the additives by farmers and agrees with the earlier findings of Ukwu *et al.* (2021).

(d) Sources of additives: Table 2d shows that majority of the respondents (46.80%) sourced their additives from distributors (wholesalers), importers (31.00%) and pharmaceutical agents (22.16%). These results are similar to the findings of Bassey (2014) and Ogegbuna (2014) in Akwalbom and Anambra state respectively.

Table 2 Business structure and operations of agro service providers in three states of southern Nigeria

Parameter	Imo State (n=15) Frequency (%)	Akwabom State (n=15) Frequency (%)	Oyo State (n=15) Frequency (%)	Mean (n=45) Frequency (%)
(a) Years of experience				
1-5	2(13.30)	6(40.00)	4(26.60)	12(26.63)
6-10	7(46.60)	3(20.00)	7(46.60)	17(28.86)
11-15	3(20.00)	3(20.00)	3(20.00)	9(20.00)
16-20	1(6.60)	2(13.30)	1(6.60)	4(8.83)
Above 20	2(13.30)	1(6.60)	0(0.00)	3(6.63)
(b) Types of additives stocked				
Vitamin-mineral	15(36.50)	12(22.60)	7(13.50)	34(24.23)
Herbal/plant	5(12.10)	5(9.40)	1(1.90)	11(7.80)
Antibiotics	9(21.90)	9(17.00)	7(13.50)	25(17.46)
Flavourants	0(0.00)	1(1.80)	0(0.00)	1(0.60)
Prebiotics	1(2.40)	4(7.50)	7(13.50)	12(7.80)
Probiotics	1(2.40)	3(5.60)	0(0.00)	4(2.66)
Acaricides	0(0.00)	1(1.80)	0(0.00)	1(0.60)
Enzymes	1(2.40)	3(5.60)	7(13.50)	11(7.16)
Synthetic chemical				
growth promoters	1(2.40)	2(3.70)	2(3.80)	5(3.30)
Mycotoxin binders	0(0.00)	5(9.40)	10(19.20)	15(9.53)
Mold inhibitors	1(2.40)	3(5.60)	2(3.80)	6(3.93)
Amino acids	7(17.10)	5(9.40)	9(17.30)	21(14.60)
(c) Prescription of additive to farmers				
Yes	15(100.00)	13(86.70)	14(93.30)	42(93.33)
No	0(0.00)	2(13.30)	1(6.70)	3(6.66)
(d) Sources of feed additive				
Retailers	11(73.30)	5(38.50)	4(28.60)	20(46.80)
Importers	2(13.30)	2(15.40)	9(64.30)	13(31.00)
Pharma agents	2(13.30)	6(46.10)	1(7.10)	9(22.16)

Source: Field survey

Additive prescription habits of agro service providers in three Southern Nigeria

Table 3 highlights the data on additive prescription habits of the agro-service providers.

(a) Common additives prescribed to farmers: Table 3a shows that lysine (12.26%) an amino acid is the most prescribed feed additive closely followed by calcium supplements (11.00%), vitamin and mineral supplements (10.36%), toxin binders (9.00%), molasses (8.73%) and methionine (8.46%) among others. Overall, 15 additives were listed. The prescriptions of amino acids are meant to boost the protein quality of feeds, while other feed components such as calcium supplements, vitamins, minerals and toxin binders are used to enhance feed efficiency and quality (Njoagwuani and Okoli, 2017; Ugwu and Okoli, 2017). This is expected since Okoli *et al.* (2005) reported low quality of poultry feeds as one of the major challenges of the poultry industry in the study areas. Therefore the prescription pattern of the agro-service providers appears to be geared towards ameliorating the effects of low quality feeds.

(b) Frequency of prescription of additives: Table 3b shows that majority of the agro service providers prescribe these feed additives as the need arose (47.13%), while 29.50% prescribed monthly basis. Others prescribed them on weekly (12.10%) and daily basis (9.53%) to the farmers. There has been

limited information on the volume or amount of additives used in livestock and feed industry in Nigeria. Ogbuewu *et al.* (2018) however reported that 12 herbal products are sold in veterinary shops in Owerri Imo state.

(c) Determinants of additive prescription: Table 3c shows that for most of the agro-service providers (54.60%) the prescriptions of additive were mostly determined by contents of the additive, followed by the cost of additive (28.50%) and the farmer's disposition towards the prescription (16.86%). The results of Ukwu (2021) however showed that 81.10% of farmers purchased the additives based on their cost effectiveness.

(d) Factors limiting the acceptance of prescriptions: The results in table 3d shows that the major factor limiting the acceptance of the prescribed additive was cost (62.23%) while effectiveness (20.00%) and availability (17.80%) were other important factors. Again, this is more so because several authors have reported high cost of inputs, poor capital outlay, and subsistent nature of poultry production among others as the major production constraints of poultry farming in Nigeria (Alimi *et al.*, 2001; Okoli *et al.*, 2005; Geiden *et al.*, 2006; Okoli *et al.*, 2006). It is therefore understandable why cost influences the choice of farm input of most of the farmers in the study area.

Table 4 highlights the influence of farmers on prescription of additives.

Table 4a shows that majority of the farmers buy these additives both by choice and by prescription (65.00%), while only 18.13% buy by prescription the rest buy by choice (16.86%). This is understandable since majority of these farmers are educated and are therefore capable of making decisions concerning their flocks needs (Wandschneider, 2003).

(b) Farm visits for additive prescription: Table 4b shows that most respondents (65.70%) prescribed these additives as the need arose (with or without farm visits). Some respondents (19.63%) however visited the farms before making prescriptions of the additives, while only 14.60% did not visit the farms. These findings are in agreement with the reports of Bassey (2014) for drug use habits of animal health practitioners in Akwa Ibom state.

(c) Frequency of farm visits: The frequency of farm visits by agro service providers as shown in table 4c was mostly monthly (49.36%), although weekly (21.66%) and daily (4.93%) were also carried out at limited levels. These reports highlighted the fact that farmer's choices are major factors that control agro-veterinary products use in the industry. This was also reported by Chima (2011) with regards to disinfectants use in Imo state among farmers.

(d) Analysis of feed samples before additive prescription: Table (4d) showed that (57.13%) did not analyze feed samples before making prescriptions to farmers, while 42.86% claimed that they sometimes analyze feed samples before making such prescriptions. This finding again confirmed that more than 50% of their prescriptions are based on factors other than diagnostic results of animal needs.

(e) Routes of additive administration: Table 4e showed that majority (57.03%) of the additives could be administered through both feed and water routes. 40.56% were administered only through feed while 2.36% were administered only through water.

Table 5 highlights the various reasons given by the agro-service providers for prescribing additives to the poultry farmers and some of the benefits derived from the use of the additives.

(a) Reasons for additive prescriptions: Eight reasons were listed for prescribing additives (Table 5a) and included growth promotion (23.16%), weight gain (18.73%), increase in egg and better egg size (11.83%) and (11.80%) among others. These reasons are generally related to performance enhancements which will ultimately translate to improved profitability of the poultry ventures.

(b) Satisfaction with prescription results: Table 5b showed that about 60.00% of farmers were always satisfied with the additive prescription results, while another 32.93% were not always satisfied, with Imo recording as high as 46.70%.

(c) Handling of expired additives: The results in table 5c showed that 28.80% returned expired additives to their suppliers, while most of them (63.80%) claimed that they destroyed such products. A low overall 7.36% was sold to farmers at subsidized rate although the percentage was as high as 15.40% at Akwa Ibom state and 6.70% at Imo state. Earlier studies by Okoli *et al.* (2002) reported that sharp practices such as re-labeling of expired veterinary drugs and poor storage of drugs are common in the study environment.

Table 3 Additive prescription habits of agro service providers in three states of southern Nigeria

Parameter	Imo State (n=15) Frequency (%)	AkwaIbom State (n= 15) Frequency (%)	Oyo State (n=15) Frequency (%)	Mean (n=45) Frequency (%)
(a) Common additives prescribed to farmers				
Lysine	9(18.00)	4(10.50)	4(8.30)	17(12.26)
Methionine	7(14.00)	2(5.20)	3(6.20)	12(8.46)
Acidifier	4(8.00)	1(2.60)	0(0.00)	5(3.53)
Vitamin C	3(6.00)	0(0.00)	4(8.30)	7(4.76)
Toxin binder	2(4.00)	4(10.50)	6(12.50)	12(9.00)
Dropping binder	1(2.00)	0(0.00)	2(4.20)	3(2.06)
Enzymes	3(6.00)	2(5.20)	3(6.20)	8(5.80)
Vitamin premix	5(10.00)	7(18.40)	2(4.20)	14(10.86)
Prebiotics	1(2.00)	1(2.60)	0(0.00)	2(1.53)
Probiotics	2(4.00)	4(10.50)	2(4.20)	8(6.23)
Antibiotics	4(8.00)	3(7.90)	4(8.30)	11(8.06)
Coccidiostat	0(0.00)	0(0.00)	3(6.20)	3(2.06)
Choline chloride	0(0.00)	0(0.00)	4(8.30)	4(2.76)
Mollasses	4(8.00)	3(7.90)	5(10.40)	12(8.73)
Calcium Supplement	5(10.00)	4(10.50)	6(12.50)	15(11.00)
(b) Frequency of additive prescription				
Daily	1(6.60)	1(7.70)	2(14.30)	4(9.53)
Weekly	0(0.00)	1(7.70)	4(28.60)	5(12.10)
Monthly	4(26.60)	5(33.30)	4(28.80)	13(29.50)
As the need arises	10(66.60)	6(46.20)	4(28.60)	20(47.13)
(c) Determinants of additive prescriptions				
Cost	5(33.30)	4(30.80)	3(21.40)	12(28.50)
Contents	10(66.60)	8(61.50)	5(37.50)	23(54.60)
Farmer disposition	0(0.00)	1(7.70)	6(42.90)	7(16.86)
(d) Factors limiting acceptance of prescription				
Cost	13(86.70)	9(60.00)	6(40.00)	28(62.23)
Availability	1(6.70)	3(20.00)	4(26.70)	8(17.80)
Effectiveness	1(6.70)	3(20.00)	8(33.30)	9(20.00)

Source: Field survey

Table 4 Influence of farmers on prescription habits of agro-service providers

Parameter	Imo State (n=15) Frequency (%)	AkwaIbom State (n= 15) Frequency (%)	Oyo State (n=15) Frequency (%)	Mean (n=45) Frequency (%)
(a) Additive purchase habits of farmers				
By choice	1(6.60)	2(15.40)	4(28.60)	7(16.86)
By prescription	7(46.70)	1(7.70)	0(0.00)	8(18.13)
Both	7(46.70)	10(76.90)	10(71.40)	27(65.00)
(b) Farm visit before prescription				
Yes	1(6.70)	4(30.80)	3(21.40)	8(19.63)
No	0(0.00)	2(15.40)	4(28.60)	6(14.60)
As need arises	14(93.30)	7(53.80)	7(50.00)	28(65.70)
(c) Frequency of farm visits				
Daily	0(0.00)	1(7.70)	1(7.10)	2(4.93)
Weekly	1(6.70)	2(15.40)	6(42.90)	9(21.66)
Monthly	12(80.00)	7(53.80)	2(14.30)	21(49.36)
Others	2(13.30)	3(23.10)	5(35.70)	10(24.03)
(d) Analysis of feed samples before prescription				
Sometimes	7(46.70)	6(46.20)	5(35.70)	18(42.86)
Never	8(53.30)	7(53.80)	9(64.30)	24(57.13)
(e) Route of additive administration				
Feed	4(26.70)	4(30.80)	9(64.20)	17(40.56)
Water	0(0.00)	0(0.00)	1(7.10)	1(2.36)
Both	11(73.30)	9(69.20)	4(28.60)	24(57.03)

Source: Field survey

Table 5 Reasons for additive prescription

Parameter	Imo State (n=15) Frequency (%)	Akwalbom State (n=15) Frequency (%)	Oyo State (n=15) Frequency (%)	Mean (n=45) Frequency (%)
(a) Reasons for feed additive prescriptions				
Growth	15(33.30)	9(23.70)	7(12.50)	31(23.16)
Weight gain	9(20.00)	9(23.70)	7(12.50)	25(18.73)
Early maturity	3(6.60)	5(13.20)	1(1.80)	9(7.20)
Increase in egg	6(13.30)	3(7.90)	8(14.30)	17(11.83)
Better egg size	6(13.30)	5(13.20)	5(8.90)	16(11.80)
Better egg quality	1(2.20)	3(7.90)	4(7.10)	8(5.73)
Disease prevention	3(6.60)	3(7.90)	10(17.90)	16(10.80)
Ailments treatments	2(4.40)	1(2.60)	4(7.10)	7(4.70)
(b) Satisfaction with prescriptions result				
Always	7(46.70)	8(61.50)	10(71.4)	25(59.86)
Not always	7(46.70)	4(30.70)	3(21.40)	14(32.93)
Rarely	1(6.70)	1(7.70)	1(7.10)	3(7.16)
Never	0(0.00)	0(0.00)	0(0.00)	0(0.00)
Expired additive handling				
Return to supplier	3(20.00)	4(30.70)	5(35.70)	12(28.80)
Destroy	11(73.30)	7(53.80)	9(64.30)	27(63.80)
Prescribed at low				
Cost to farmers	1(6.70)	2(15.40)	0(0.00)	3(7.36)

Source: Field survey

Conclusions

Agro-service providers in Southern Nigeria have formal education up to secondary school level and majority of them (82.16%) have tertiary education. This result highlighted the fact that the profession requires some form of tertiary education, especially the health-service aspects of the business. All the practitioners studied agriculture related courses with most of them measuring in veterinary medicine.

Majority of the agro-service providers have practiced for 1-15 years. These results indicated that the profession is dominated by relatively new entrants similar to that of the farming population in the study area that is also dominated by new farmers of (1-10 years experience)

Additive prescription was popular among the agro-service providers and the results showed that the most popular additives out of the 12 types stocked were vitamins/minerals, antibiotics, amino acids and mycotoxin.

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