ESJ Social Sciences

Extensive and Improved Traditional Poultry Farming in Togo: A Comparative Analysis of Socioeconomic Characteristics of Farmers

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Doi:10.19044/esj.2021.v17n35p274

Submitted: 26 November 2020
Accepted: 20 October 2021
Published: 31 October 2021

Cite As:
Soviadan M.K., Enete A.A., Okoye C.U. & Dossa K.F. (2021). *Extensive and Improved Traditional Poultry Farming in Togo: A Comparative Analysis of Socioeconomic Characteristics of Farmers*. European Scientific Journal, ESJ, 17 (35), 274.
https://doi.org/10.19044/esj.2021.v17n35p274

Abstract

Since 2014, the Agricultural Sector Support Project (PASA) has been assisting smallholder farmers in Togo with the adoption of Improved Traditional Poultry Farming Technique (ITPFT) in rural areas for wealth creation, food security and poverty alleviation. This paper focuses on comparing the socioeconomic characteristics of beneficiaries and non-beneficiaries of PASA subsidies. Both random and purposive sampling techniques were used to select 400 farmers. The sample consisted of 86 project beneficiaries and 314 non-beneficiaries. Structured questionnaires were used to collect data. Results of analysis indicated that there is a significant difference in socioeconomic variables such as self-financing capacity, level of education, membership in cooperative societies, household size, farm size, and annual sale of poultry between project beneficiaries and non-beneficiaries prior to the implementation of PASA. Descriptive statistics show that five

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

years after the implementation of PASA, the annual poultry sales per farmer ranged from 0 to 1700 birds for beneficiaries and from 9 to 200 birds for non-beneficiaries. The turnover per farmer ranged from US $ 0 to US $ 42409 and from US $ 33 to US $ 996 for beneficiaries and non-beneficiaries, respectively. The profit per farmer ranged from US $ 0 to US $ 25446 for beneficiaries and from US $ 26 to US $ 797 for non-beneficiaries. The magnitude of the standard deviations of the potential outcome variables among beneficiaries and non-beneficiaries suggests that adoption rates of ITPFT may vary from one farmer to another. As a result, compared to non-beneficiaries, beneficiaries experienced a greater increase in potential outcomes five years after the implementation of PASA. Failure to comply with improved production technique on certain farms, despite receiving subsidies, is a factor that could negatively impact the effective, efficient, and optimal achievement of the project's expected results. Further research will concentrate on determining the added value of PASA through the use of appropriate and thorough econometric adoption and impact assessment methods.

Keywords: Traditional Poultry Farming, PASA, Government Subsidies, Improved Production Technique, Comparative Analysis, Socioeconomic Characteristics, Togo

1. Introduction

Traditional poultry farming in rural areas is critical for sustaining livelihoods and supplying poultry products in rural, suburban, and urban areas, as well as providing important support to developing countries' most vulnerable groups (FAO, 2014). As long as poverty persists in rural areas, traditional poultry farming will continue to provide opportunities for high quality income generation and nutrition for the human population (FAO, 2015). Poultry farming in Togo is essentially characterized by two types of production, namely traditional poultry farming based on the breeding of local birds and the modern poultry faming based on the rearing of imported exotic breeds with different degrees of intensification. The bird species are mainly chickens, guinea fowls, ducks, turkeys, and pigeons (Tona, 1992; Aklobessi, 2003; Dao, 2010). Poultry farming is one of the largest livestock sectors in the country. It contributes significantly to the Agricultural Gross Domestic Product (Gauthier & Langlois, 2010) and occupies an important place in the daily living of Togolese people, especially in rural areas where poultry are raised not only for the production of meat and eggs, but also as a means of income through sales (Kondombo et al., 2003). In some African cultures, chickens are also used as gifts and for rituals.

Local poultry are characterized by high genetic variability (Hoffmann, 2007), hardiness, disease resistance under severe rearing conditions, better

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

breeding ability of the females (brooding and hatching) and protection of their offspring especially against predators, and bad weather (Kondombo, 2005). Traditional poultry farming is characterized by extensive free-range farming where the birds must look for their food in the environment (Kondombo, 2005; Pousga et al., 2005). However, supplement cereals are often distributed to birds at certain times of the day. This is characterized by low productivity because its production potential is inherently low combined with poor environmental and feeding conditions. Losses are usually greater during the rainy season, and are also due to theft and slaughter because of the extensive nature of this type of breeding. There is also high mortality and slow growth of birds essentially because of diseases, predation, external parasites, and accidents. Long brooding periods per poultry which results in low production of poultry ready for slaughter or sale is common (Mcainsh et al., 2004; Pousga et al., 2005).

The Agricultural Sector Support Project (PASA) is one of the projects of the National Program for Agricultural Investment and Food Security (PNIASA) developed by the government of Togo in its 2010-2015 investment plan with the assistance of the Food and Agriculture Organization of the United Nations (FAO) and the World Bank (WB) (Gauthier & Langlois, 2010). The overall objective of PNIASA is to increase the productivity and/or competitiveness of strategic food crops, export crops, and livestock production, as well as the promotion of an enabling environment for privately driven agricultural development (Gauthier & Langlois, 2010). In this regard, a second sub-component of PASA was aimed at reviving the livestock sub-sector. The specific objective is to provide short-term emergency assistance to rehabilitate poultry and small ruminant production, assist small livestock farmers to develop and improve livestock production in rural areas for wealth creation, food security and poverty reduction (PNIASA, 2016). With specific reference to the case of poultry, it was to enable farmers that will benefit from the grants to improve their poultry farming technique in order to reduce the constraints associated with the above-mentioned traditional extensive poultry farming, increase production, enhance food security, increase income, and reduce poverty.

Thus, as part of the implementation of this second PASA sub-component, the government provided farmers with a subsidy for the adoption of ITPFT in 2014. A total of 86 farmers were involved in the initial selection phase of PASA. The purpose of this research is to examine the socioeconomic characteristics of farmers, both beneficiaries and non-beneficiaries of the project's subsidies, before and after the implementation of PASA.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

2. Materials and Methods

2.1. Field of Study

Togo, a West African country, is geographically located between 6° and 11° North latitude, and 0° and 2° East longitude, with a surface area of 56,600 square kilometers. It is bordered by the Bight of Benin and Burkina Faso in the south and north, respectively. Togo is bound in the west by Ghana and in the east by Benin Republic (RNA, 2012). It is subdivided into five regions namely, the Maritime Region, the Plateaux Region, the Central Region, the Kara Region, and the Savannah Region (Figure 1). The Togolese population is estimated at 8,082,366 inhabitants (UN-DESA-PD, 2019). Togo has significant agricultural potential despite its limited size. Cultivable land is estimated at nearly 3.4 million hectares (64% of the territory), 45% of which is currently cultivated. The country's varied climate divides it into several agro-ecological zones allowing the production of a diversified range of agricultural products. Irrigable land is estimated at 86,000 hectares and exploitable lowland at 175,000 hectares (Gauthier & Langlois, 2010).

Despite this significant agricultural potential, more and more regions are facing the adverse effects of climate change and increasing land pressure through over-exploitation of land, resulting in declining fertility and land degradation, and a decrease in agricultural production and productivity (Gauthier & Langlois, 2010; NDP, 2018). The rural population is estimated at 3,843,049 (FAO, 2013). In 2012, the number of active farmers was estimated at 3,738,430 representing more than 60% of the national population and was unevenly distributed in terms of space as follows (FAO, 2013):

- Maritime Region: 776,135 inhabitants, or 20.8%
- Plateaux Region: 1,161,580 inhabitants, or 31.1%
- Central Region: 457,173 inhabitants, or 12.2%
- Kara Region: 601,036 inhabitants, or 16.1%
- Savannah Region: 742,506 inhabitants, or 19.9%

2.2. Sampling Technique

2.2.1. Sampling Procedure

Documentation and field visits allowed us to identify the different districts and localities of the five major rural areas involved in this investigation. The study focused on Togolese farmers. The size of the target population represented the total number of farmers in Togo. The sample size for this study was determined using the sample calculation formula below, with a 95% confidence level:

$$\boldsymbol{n = \frac{N}{1 + N \times e^2}} \qquad (\mathbf{1})$$

Source : (Fellegi, 2003)

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

With:
N = the size of the target population (Togolese farmers),
n = the sample size and
e = the level of precision (5%).

The vast majority of the active agricultural population is involved in both agriculture and traditional poultry farming. As a result, the national agricultural population size N of 3,738,430 was used to calculate the study's sample size.

Calculation of the Sample Size (n)

$$\boldsymbol{n = \frac{3\,738\,430}{1 + 3\,738\,430 * (0,05)^2}\ ;\ n = 399,957206 = 400}$$

2.2.2. Sample Size Per Stratum

In 2014, 86 farmers participated in the Ministry of Agriculture's Agricultural Sector Support Project (PASA) for the adoption of improved traditional poultry farming technique. The project's beneficiaries were distributed across the country's five regions and by district, and they were included in the overall sample. The non-beneficiaries of the project made up the remainder of the sample which was also distributed by region based on the region's weight in the national agricultural population. The regional samples were also stratified based on the distribution of project beneficiaries by district (Table 1a and 1b).

2.3. Data Collection

This study adopted a farm household survey design in Togo. The study utilized primary data on extensive and improved traditional poultry farming. Data were collected using survey instrument administered on 400 respondents of which the beneficiaries of the project were purposively selected. Note that the beneficiaries of the project consisted of 86 farmers, while the non-beneficiaries consisted of 314 farmers. The 86 beneficiaries received a grant from the Ministry of Agriculture. Thereafter, they received technical training and technical support for the improvement of traditional poultry farming technique. Data collected covered five consecutive years of poultry farming and two periods, specifically, from 2014 (the year the project began, the baseline) to 2018 (five years after the implementation of the project, the follow-up).

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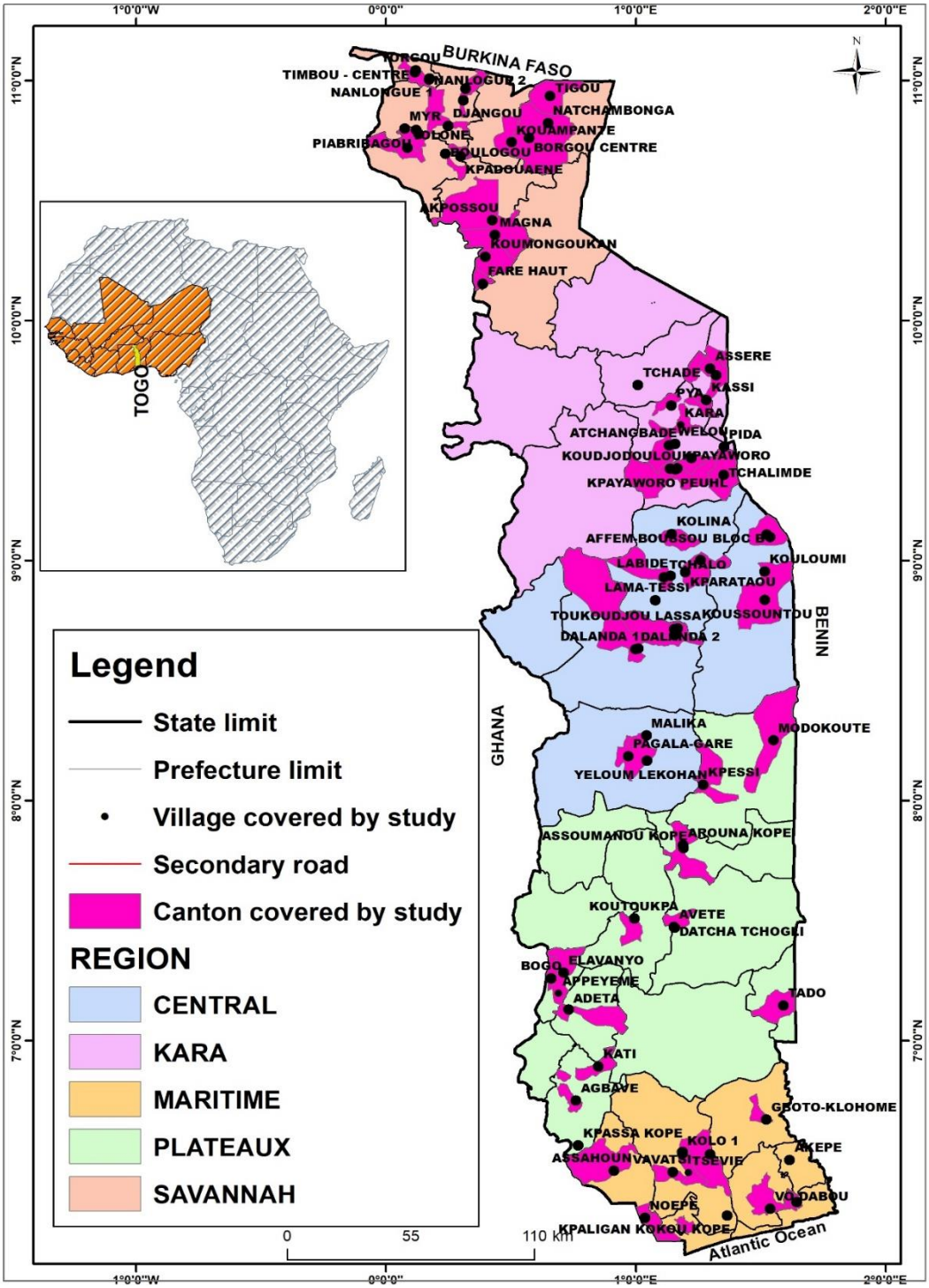

Figure 1. Map of the Study Area (Togo)
Source: Author's Conceptualization

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

2.4. Estimation Method

Data for the study were analyzed using statistical and econometric tools. The objective of this investigation was achieved by describing and comparing the socio-economic characteristics of beneficiaries and non-beneficiaries of the project.

2.4.1. Pearson Chi-Square Significance Test (χ2)

The Pearson's Chi-square significance test (χ2) was used to compare the socio-economic qualitative variables of both beneficiaries and non-beneficiaries of the project. The equation is specified as thus:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)}{E_i} \qquad (2)$$

Source: (Franke et al., 2012)

Where:
χ^2 = Pearson Chi-Square
O = Observed Value
E = Expected Value
$\sum$ = Summation sign
n = The sample size
H_0 is not rejected if P-Value (Chi-square (χ2)) is greater than 5% or rejected otherwise.

2.4.2. Student Significance Test (t-test)

The Student Significance Test (t-test) was used to compare the mean of the socioeconomic quantitative variables of both beneficiaries and non-beneficiaries of the project. The equation is specified as thus:

$$t = \sqrt{n}\frac{\bar{x} - \mu_0}{s} \qquad (3)$$

Source: (Zabell, 2008)

Where:
t = Student Value
$\bar{x}$ = The mean of the beneficiaries of the project
μ_0 = The mean of the non-beneficiaries of the project
s = The standard deviation
n = The sample size

H_0 is not rejected if P-Value (T-Student) is greater than 5% or rejected otherwise.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Table 1a. Sample Size Per Region

Region	Agricultural Population by Region	Weight of the Region	Sample Stratified by Region
Maritime	776 135	21%	83
Plateaux	1 161 580	31%	124
Central	457 173	12%	49
Kara	601 036	16%	64
Savannah	742 506	20%	80
Total (Togo)	3 738 430	100%	400

Source: Author's Conceptualization

Table 1b. Full Sample Design of the Study

Region	District selected	Beneficiaries	Weight of Beneficiaries Per Districts	Non-Beneficiaries	Sample Per District selected
SAVANNAH	TANDJOARE	**5**	24%	14	19
	OTI	5	24%	14	19
	TONE	6	29%	17	23
	KPENDJAL	5	24%	14	19
Total Savannah	4	21	100%	59	80
KARA	BINAH	6	35%	17	23
	KOZAH	6	35%	17	23
	ASSOLI	5	29%	14	19
Total Kara	3	17	100%	47	64
CENTRAL	TCHAOUDJO	6	35%	11	17
	SOTOUBOUA	5	29%	9	14
	BLITTA	3	18%	6	9
	TCHAMBA	3	18%	6	9
Total Central	4	17	100%	32	49
PLATEAUX	AGOU	3	17%	18	21
	AMOU	1	6%	6	7
	EST-MONO	3	17%	18	21
	OGOU/ANIE	5	28%	29	34
	DANYI/KPELE	5	28%	29	34
	MOYEN MONO	1	6%	6	7
Total Plateaux	6	18	100%	106	124
MARITIME	GOLFE	2	15%	11	13
	LACS	2	15%	11	13
	ZIO SUD	4	31%	22	26
	AVE	3	23%	16	19
	VO	1	8%	5	6
	YOTO	1	8%	5	6
Total Maritime	6	13	100%	70	83
TOTAL	23	86	100%	314	400

Source: Author's Conceptualization

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

3. Results and Discussion

Table 2. Socioeconomics Characteristics of Beneficiaries and Non-Beneficiaries of PASA

Attributes	Categories	Frequency			Percentage (%)		
		Beneficiaries	Non beneficiaries	Sample	Beneficiaries	Non beneficiaries	Sample
Region	Savannah	21	59	80	24.44	18.78	20
	Kara	17	47	64	19.76	14.97	16
	Central	17	32	49	19.76	10.20	12.25
	Plateau	18	106	123	20.93	33.75	31.00
	Maritime	13	70	83	15.11	22.30	20.75
Gender	Male	75	274	349	87.20	87.26	87.25
	Female	11	40	51	12.80	12.74	12.75
Age	22 – 30	1	28	29	1.16	8.92	7.25
	31 – 40	18	103	121	20.93	32.80	30.25
	41 – 50	33	115	148	38.38	36.62	37
	51 – 60	26	51	77	30.23	16.24	19.25
	61 – 76	8	17	25	9.30	5.42	6.25
Education	Yes	86	298	384	100	95	96
	No	0	16	16	0	5	4
Marital Status	Single	2	9	11	2.33	2.87	2.75
	Married	82	294	376	95.34	93.63	94
	Divorced	0	2	2	0	0.63	0.50
	Widower	2	9	11	2.33	2.87	2.75
Level of Study	Primary	19	232	251	22	74	62.75
	Secondary	39	55	94	45	18	23.50
	High School	23	11	34	27	3	8.50
	University	5	0	5	6	0	1.25
	Non-Formal	0	16	16	0	5	4
Membership of Cooperative	Yes	83	11	94	96.5	4	23.5
	No	3	303	306	3.5	96	76.5

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Improved Poultry House	Yes	86	0	86	100	0	21.5
	No	0	314	314	0	100	78.5
Semi-Modern Equipment	Yes	59	0	59	68.60	0	14.75
	No	27	314	341	31.40	100	85.25
Incubator	Yes	32	0	32	37.21	0	8
	No	54	314	368	62.79	100	92
Food Quality	Yes	86	0	86	100	0	21.5
	No	0	314	314	0	100	78.5
Water	Yes	86	0	86	100	0	21.5
	No	0	314	314	0	100	78.5
Hygiene	Yes	48	3	51	55.81	1	12.75
	No	38	311	349	44.19	99	87.25
Health Care	Yes	79	118	197	91.86	37.58	49.25
	No	7	196	203	8.14	62.42	50.75
Type of Poultry Farm	Semi-Intensive	65	0	65	75.58	0	16.25
	Extensive	21	314	335	24.42	100	83.75
Technique Support	Yes	86	0	86	100	0	21.5
	No	0	314	314	0	100	78.5

Source: Author's Computation Based on Field Data, 2014, 2020

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

3.1. Descriptive Statistics

Region

Table 2 shows that 24.44% of the 86 farmers who benefited from the project were in the Savannah region, 19.76% in the Kara region, 19.76% in the Central region, 20.93% in the Plateaux region, and 15.11% in the Maritime region. Similarly, of the 314 non-beneficiaries of the project, 18.78% were in the Savannah region, 14.97% in the Kara region, 10.20% in the Central region, 33.75% in the Plateaux region, and 22.30% in the Maritime region. These findings support the results of MAEP (2014) and Aklobessi (2003), who found that the Savannah, Kara, and Plateaux regions are the most involved in traditional poultry farming in Togo.

Gender

Table 2 shows that out of the 400 farmers surveyed, 87.25% were males and 12.75% were females. Out of the 86 project beneficiaries, 87.20% were males while 12.80% were females. Furthermore, 87.26% of the 314 non-beneficiaries were males while 12.74% were females. Women are less represented in traditional poultry farming than men, according to these findings, in both beneficiary and non-beneficiary groups. These findings are consistent with those of Lombo et al. (2018) and Moussa Amadou et al. (2011). Concerning farmer participation in PASA for the improvement of traditional poultry farming, prior to receiving the project subsidy, which amounted to approximately US $ 6,364 per farmer in general, the government imposed on the farmers self-financing covering which is 10% of the cost of installation of the improved poultry farm. The self-financing capacity can be in cash or in kind, and in most cases, the beneficiaries used their land as a construction site for the improved poultry farm. This self-financing capacity criterion did not allow women to benefit from the subsidy in large numbers. This is because in rural areas, it is difficult for women to easily mobilize approximately US $ 637 and they also rarely have lands. These results are in line with those of Anyanwu (2014) and Guèye (2000a, 2000b, 2005). Along the same lines, Akinola and Essien (2011), Chowdhury (2013), Das et al. (2008), Guèye (2000a, 2000b, 2005, 2007), Riise et al. (2005), and Saleque and Mustafa (1996) argued that projects and programs promoting traditional poultry farming for rural development must encourage the participation of vulnerable groups, especially poor women with no financial resources and those who rarely have lands.

Age

The youngest of the 86 farmers who used PASA was 25 years old and the oldest was 68 years old, and this is five years after the implementation of PASA. With a standard deviation of 8.84, the average age was 48.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

The youngest of the 314 non-beneficiaries of the project was 22 years old, while the oldest was 76. With a standard deviation of 9.82, the average age was 44 years. In terms of age groups, out of the 86 beneficiaries of the project, 1 farmer (1.16%) was between the ages of 22 and 30, 20.93% were between the ages of 31 and 40, 38.38% were between the ages of 41 and 50, 30.23% were between the ages of 51 and 60, and 9.30% were between the ages of 61 and 68. Similarly, out of the 314 non-beneficiaries of the project, 8.92% were between the ages of 22 and 30, 32.80% were between the ages of 31 and 40, 36.62% were between the ages of 41 and 50, 16.24% were between the ages of 51 and 60, and 5.42% were between the ages of 61 and 76. Beneficiaries and non-beneficiaries of the project were roughly the same age.

Marital Status

2.33% of the project's 86 recipients were single, 95.34% were married, and 2.33% were widowed. 2.87% of the 314 non-beneficiaries were single, 93.63% were married, 0.63% were divorced, and 2.87% were widowed. The majority of farmers in both beneficiary (95%) and non-beneficiary (94%) groups are married according to these findings. This could be one of the reasons why rural households practice traditional poultry farming to meet their financial and nutritional needs. Farayola et al. (2013), Sankara et al. (2018), and Umunna et al. (2012) all came to similar conclusions.

Education and Level of Study

96% of the 400 farmers polled were literate, while 4% were not. At least one form of education was available to all 86 project beneficiaries. 95% of the 314 non-beneficiaries of the project had at least one form of education, while 5% did not. According to the findings of the analysis, 22% of the 86 project beneficiaries had primary education, 45% had secondary education, 27% had higher education, and 6% had university education. In the case of the 314 non-beneficiaries of the project, 74% had a primary education, 18% had a secondary education, 3% had a higher education, and 5% had no formal education.

Despite the fact that the majority of the respondents were literate (Anyanwu, 2014; Umunna et al., 2012), project beneficiaries had a higher level of education than non-benefiaries. One of the motivating factors for participation in PASA for the improvement of traditional poultry farming could be the level of education.

Membership in Cooperative Societies

In terms of cooperative societies membership, 96.5% of the 86 project beneficiaries were members, while 3.5% were not. In addition, 4% of the 314 non-beneficiaries of the project were members of cooperative societies, while

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

96% were not. According to these findings, the majority of project beneficiaries (96.5%) are members of agricultural cooperatives societies, while only 4% of non-beneficiaries are members. Farmers' membership in agricultural cooperatives societies, according to Umunna et al. (2012), plays an important role in their access to needed information. One of the factors motivating farmers to participate in PASA for the adoption of the improved traditional poultry rearing technique could be their membership in agricultural cooperative societies.

Housing and Equipment

Table 2 shows that the 314 non-beneficiaries of the project continued to raise their poultry in traditional poultry houses using traditional equipment. This finding is in agreement with those of Dessie and Ogle (2001), Kumaresan et al. (2008), and Magothe et al. (2012) who argued that village poultry were raised in very poor housing. In contrast, all the 86 beneficiaries of the project had improved their poultry houses with 69% using semi-modern equipment. Similarly, Chowdhury (2013), Riise et al. (2005), and Saleque and Mustafa (1996) also found that traditional poultry housing and equipment had been improved through development programs and projects that benefited farmers in rural areas. Regarding feeding and watering equipment, Table 2 shows that none of the non-beneficiaries were using modern feeding and watering equipment in their poultry farm. However, the majority of beneficiaries of the project were using them. The maximum number of feeding troughs used per beneficiary was 52 and the average was 7 with a standard deviation of 7.96. As for watering troughs, the maximum number used per beneficiary was 40, and the average was 6 with a standard deviation of 6.35. All the non-beneficiaries of the project continued to use traditional poultry equipment due to insufficient means of obtaining modern or semi-modern equipment. In contrast, 31% of the beneficiaries of the project who were not using semi-modern poultry equipment had received subsidies to procure such equipment, but they voluntarily decided not to purchase or renew them when they were out of use. Magothe et al. (2012) argued that the use of feeding and watering equipment by farmers on their improved traditional poultry farms is very important for a healthy balanced diet and enables farmers to practice the sanitary measures indispensable for the reduction of mortality. The absence of semi-modern equipment in some improved poultry farms of project beneficiaries could affect the expected results of PASA.

Incubator

Regarding ownership of incubator, out of the 86 beneficiaries of the project, only 37.21% had incubator in their poultry farms, 62.79% did not have. All the non-beneficiaries did not have incubators in their poultry farms.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

The incubator is the machine in the poultry sector that produces day-old bird in sufficient quantities to meet the needs of poultry farms. One of the most important equipment to be acquired by farmers that had received subsidies for the improvement of their traditional poultry farms was the incubator. Azahar et al. (2020) reported that not only will the egg incubator significantly improve traditional poultry production, it will also provide income consistency, and thereby, enabling smallholder farmers to move into eventual rural entrepreneurship. Unfortunately, out of the 32 incubators inventoried in the field, only 2 were operational. In addition, the farmers involved in PASA for the improvement of traditional poultry farming technique had not received any technical training on the use of these incubators. We must take note of the fact that manipulation of the incubator requires technical skills. The absence and the unsatisfactory condition of incubators on the improved poultry farms, and the failure to train the beneficiaries in its use could affect the project's expected results. It should be noted that none of the non-beneficiaries of the project was using the incubator for breeding day-old small birds, the incubation being natural, as it has always been the case in traditional free-range poultry farming. According to Chambers et al. (2012), natural incubation does not allow a rapid reproduction of poultry. The introduction of the incubator through PASA for the adoption of Improved Traditional Poultry Farming Technique (ITPFT) by project beneficiaries is a very commendable initiative, but much work remains to be done in terms of the effectiveness of this innovation.

Food and Water

Table 2 shows that all the 86 project beneficiaries provided their birds with a balanced diet and safe drinking water. Farmers who practiced traditional free-range poultry farming were attempting to balance their poultry's diet with the seasonal residual resources available. In the dry season, Mcainsh et al. (2004) discovered that feed intake is generally insufficient for any production beyond basic herd maintenance needs. According to FAO (2015) and Weis (2008), the size and productivity of traditional poultry farms are ultimately determined by the human population, including household and crop residues, as well as the availability of other food resources. Surveys in Nigeria resulted in the compilation of a list of food resources available to smallholders (Sonaiya & Swan, 2007). These ingredients were mostly kitchen or agro-industrial waste, and they were similar to other tropical foods. Kitchen waste, cereals and their by-products, roots and tubers, oil seeds, tree leaves and/or fruits, animal proteins, aquatic plants, and commercial foods make up the residual food base to peck (Moussa Amadou et al., 2011; Sonaiya & Swan, 2007). Food resources for poultry are available at all stages of production. Available resources are supplemented with appropriate ingredients, feed

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

waste, and insects as needed in the traditional poultry farming system. The importance of these food resources for poultry farming varies by region and is dependent on their availability in sufficient quantities (FAO, 2015). A regular supply of low-cost balanced feed, in addition to simple rationing, is essential for improved traditional poultry farming productivity.

Health Care and Hygiene

Five years after the implementation of PASA, 91.86% of the project's beneficiaries were taking sanitary measures to prevent disease. On the other hand, 37.58% of the non-beneficiaries of the project made health-related provisions to prevent disease. Only 55.81% of the beneficiaries were able to follow proper hygiene practices. Diseases are a bottleneck in most local poultry farms, resulting in significant losses. Predators (shrews, raptors, and wild animals), theft, and accidents are all important causes of poultry losses in addition to disease (FAO, 2015). According to farmers and the majority of extension workers, Newcastle disease is the leading cause of disease deaths. This conclusion is based on farmers' lack of understanding of poultry diseases and their symptoms (Guèye, 1999; Pattison et al., 2007). Virus-borne diseases are the most lethal. Vaccines can prevent them but not treat them. Vaccination of poultry against diseases, on the other hand, is not a common practice in traditional poultry farming management activities. This neglect is most likely due, on the one hand, to the government's disengagement from implementing periodic poultry vaccination programs in rural areas and, on the other hand, to farmers' lack of interest in vaccination. Among project beneficiaries, poultry care was limited to regular vaccinations. Whereas among the non-beneficiaries, poultry care was frequently limited to empirical treatments and rarely to therapeutic treatments using traditional or pharmaceutical remedies. Farmers must consider hygiene and health care rules, such as prophylaxis and vaccinations, when dealing with animal health in general, and poultry health in particular.

Type of Poultry Farming

Five years after the implementation of PASA, 75.58% of the beneficiaries were able to practice semi-intensive traditional poultry farming system. Free-range traditional poultry farming continues to be practiced by all the non-beneficiaries. Only the beneficiaries were able to practice the semi-intensive traditional poultry farming system because they were receiving advisory support, training, follow-up, and evaluation services from technical support structures such as the National, Regional and Prefectural Directorates of Agriculture and the Institute for Technical Advice and Support. According to Chowdhury (2013) and Singh et al. (2011), motivating farmers for semi-intensive or small-scale intensive poultry production systems can help with

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

livelihood security, because the basic scavenging model of production has shown its limits for poverty alleviation, and the system is being held responsible for the recent outbreak of emerging poultry diseases. Hence, the fact that not all project beneficiaries who received government subsidies practiced semi-intensive system could affect the project's expected results.

Household Size

There was only one person in the smallest household in the study area. The largest household had 34 and 22 people for project beneficiaries and non-beneficiaries, respectively. The average household size among beneficiaries was 10 with a standard deviation of 5.37, while it was 7 with a standard deviation of 3.18 among non-beneficiaries. These findings show that household size is significantly larger among project beneficiaries than non-beneficiaries. One of the factors associated with participation of farmers in PASA for the adoption of improved traditional poultry farming technique could be household size. Furthermore, the average household size was around ten people. This can be explained by the fact that for rural farm households, children and relatives serve as an available family labor force and a source of human resource wealth. According to Anyanwu (2014), the lack of well-developed social security systems and low savings in developing countries, particularly in Sub-Saharan Africa, tends to increase fertility rates, particularly in rural areas, so that parents can receive some economic support from their children when they reach adulthood. Moreover, as Schultz (1981) and Anyanwu (2014) pointed out, high infant mortality rates in sub-Saharan African countries tend to lead to an excess of replacement births or births to guard against high infant and child mortality, thereby increasing household size. Furthermore, developing countries in Africa (particularly rural populations) continue to believe that, in the face of a high mortality rate, a high birth rate is the best alternative. As a result, many people believe that they should have as many children as possible because they don't know which ones will survive. Furthermore, children are viewed as an essential component of the household labor force in order to ensure income and as a form of insurance against aging. However, a large number of children and their participation in household production may stymie investment in human capital, resulting in low household income and the creation or perpetuation of poverty-fertility traps (Lanjouw & Ravallion, 1995; Szekely, 1998; Anyanwu, 2014).

Farm Size

Prior to the implementation of PASA, among non-beneficiaries, the minimum number of poultry per farmer was 8, the maximum was 101, and the mean was 33 with a standard deviation of 19.24. While among project beneficiaries, the minimum was 14 per farmer, the maximum was 241, and the

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

mean was 72 with a standard deviation of 40.07. Five years after the implementation of PASA, among the non-beneficiaries, the minimum number of birds was 8 per farmer, the maximum was 380, and the mean was 42 with a standard deviation of 38.84. While among project beneficiaries, the minimum was 0 per farmer, the maximum was 1051, and the mean was 188 with a standard deviation of 201.10. In terms of types of poultry raised, among the non-beneficiaries of the project and on average per respondent, the results of the analysis yielded proportions of 67%, 24%, 6%, and 3% for chickens, guinea fowl, ducks, and turkeys, respectively before the introduction of PASA, and 65%, 26%, 7%, and 2% after the implementation of PASA. While among project beneficiaries, on average per respondent, the results of the analysis yielded proportions of 62%, 31%, 4%, and 3% for chickens, guinea fowl, ducks, and turkeys, respectively before the introduction of PASA, and 60%, 33%, 4%, and 3% after the implementation of PASA. These findings, in line with those of RNA (2012), Dao (2010), Aklobessi (2003) and Tona (1992), confirm that chickens followed by guinea fowl are the predominant poultry species in Togo.

Grant Value

The average amount granted to each project beneficiary was US $ 5,825. The minimum amount of subsidies granted to farmers who benefited from PASA for the adoption of ITPFT was US $ 3,440 and the maximum amount granted was US $ 6,364. The government approved a maximum grant amount of US $ 6,364 for each recipient under this project which is considered a standard grant. As a result, any amount less than US $ 6,364 was considered a substandard grant. According to descriptive statistics, 59% of the project's beneficiaries received the standard grant, while 41% received a substandard grant.

Hatching Rate of Eggs

Table 4 shows that, prior to the implementation of PASA, among the non-beneficiaries of the project, the minimum hatching rate of eggs per farmer was 40%, the maximum was 85%, and the average was 68% with a standard deviation of 0.08. While among project beneficiaries, the minimum hatching rate of eggs was 40%, the maximum was 80%, and the average was 65% with a standard deviation of 0.07. These hatching rates of eggs were in agreement with those reported by Chowdhury (2013), Ekue et al. (2002), Moussa Amadou et al (2011), Msami (2000), Sarkar and Golam (2009), and Sonaiya (1995). Five years after the implementation of PASA, among the non-beneficiaries of the project, the minimum hatching rate of eggs was 40% per farmer, the maximum was 85%, and the average was 66% with a standard deviation of 0.098. While among project beneficiary

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

es, the minimum hatching rate of eggs was 0%, the maximum was 95%, and the average was 91% with a standard deviation of 0.04. Conroy et al. (2005) stated that projects aimed at improving hatching rates of poultry eggs based on local equipment had demonstrated their effectiveness. In contrast, Kumaresan et al. (2008) reported that the hatchability percentages were higher under backyard conditions than in the intensive system. According to Kumaresan et al. (2008), the higher hatchability observed with natural hatching may be due to the use of fresh eggs, whereas the low hatchability observed with artificial hatching was due to delays in eggs setting due to time lost in transportation of the eggs. These findings show that the project's beneficiaries improved their eggs hatching rate by strengthening the technical production itinerary. One of them, however, had an egg hatching rate of 0%. After receiving the grant for the improvement of his poultry farm, the latter beneficiary abandoned this production to invest in other economic activities. This project beneficiary's 0% egg hatching rate may have negative impact on the project's expected outcomes.

Poultry Loss Rate

Disease is a major cause of poultry losses. Ignorance of hygiene rules, non-cleaning of drinkers, feeders, and shelters; the introduction of poultry into the flock without respecting the quarantine deadline; cramped habitat; wandering animals; lack of periodic vaccinations and prophylactic measures, and so on are all factors that favor susceptibility to diseases (Biswas et al., 2006; FAO, 2004, 2013, 2015). Table 4 shows that, prior to the project's implementation, the minimum poultry loss rate among non-beneficiaries was 50%, the maximum was 90%, and the average was 70% with a standard deviation of 0.85. Among project beneficiaries, the minimum poultry loss rate per farmer was 45%, the maximum was 90%, and the average was 69% with a standard deviation of 0.11. Traditional poultry farming is generally constrained by a high poultry loss rate. This is frequently due to death, predation, theft, and accidents. These findings are in agreement with those of Chowdhury (2013), Conroy et al. (2005), Das et al. (2008), Guèye (1998), Kumaresan et al. (2008), Mcainsh et al. (2004), Msami (2000), and Sarkar and Golam (2009). Following the implementation of PASA, among the non-beneficiaries of the project, the minimum poultry loss rate was 50%, the maximum was 95%, and the average was 76% with a standard deviation of 0.09. Among project beneficiaries, the minimum poultry loss rate per farmer was 5%, the maximum was 100%, and the average was 14% with a standard deviation of 0.04.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Table 3. Summary Statistics of the Primary Data Collected from the 400 Respondents

Attributes	Minimum			Maximum			Mean			Standard Deviation		
	Benefi ciaries	Non-bene-ficiaries	Total Sample	Benefi-ciaries	Non-bene-ficiaries	Total Sample	Benefi-ciaries	Nonbene-ficiaries	Total Sample	Benefi-ciaries	Non-bene-ficiaries	Total Sample
Farm Size before the treatment	14	8	8	241	101	241	72	33	41	40.07	19.24	29.72
Farm Size after the treatment	0	8	0	1051	380	1051	188	42	74	201.10	38.84	115.2
Chickens before the treatment	8	8	8	128	62	128	45	23	28	22.13	10.20	16.41
Chickens after the treatment	0	8	0	884	180	884	113	28	47	120.38	19.41	67.75
Guinea Fowl before the treatment	0	0	0	113	42	113	23	8	11	19.60	9.48	13.78
Guinea Fowl after the treatment	0	0	0	839	161	839	62	11	22	117.41	16.77	59.95
Ducks before the treatment	0	0	0	35	16	35	3	2	3	6.99	4.42	5.08
Ducks after the treatment	0	0	0	78	35	78	7	3	4	15.18	5.49	8.70
Turkeys before the treatment	0	0	0	16	9	16	2	1	1	3.09	0.85	1.66
Turkeys after the treatment	0	0	0	89	16	89	7	1	2	14.91	1.94	7.49
A.A.S of Poultry before the treatment	9	10	9	123	69	123	49	24	30	24.71	12.70	18.88
A.A.S of Poultry after the treatment	0	9	0	1700	200	1700	287	31	86	303.71	22.58	176.3
A.A.S. of Chickens before the treatment	6	8	6	74	38	74	31	17	20	14.39	6.84	10.62
A.A.S of Chickens after the treatment	0	5	0	1025	95	1025	174	21	54	184.75	12.21	106.5
A.A.S of Guinea Fowl before the treatment	0	0	0	58	29	58	15	5	7	11.61	6.35	8.68
A.A.S of Guinea Fowl after the treatment	0	0	0	1198	85	1198	82	8	24	152.34	10.25	77.15
A.A.S of Ducks before the treatment	0	0	0	25	14	25	3	2	2	4.87	3.43	3.78
A.A.S of Ducks after the treatment	0	0	0	182	25	182	10	2	4	25.30	4.09	12.63
A.A.S of Turkeys before the treatment	0	0	0	16	10	16	1	1	1	2.80	0.78	1.50
A.A.S of Turkeys after the treatment	0	0	0	676	16	676	18	1	4	76.38	1.75	35.99
Age	25	22	22	68	76	76	48	44	45	8.84	9.82	9.76
Household Size	1	1	1	34	22	34	10	7	8	5.37	3.18	3.86
Waterers	0	0	0	40	0	40	6	0	1	6.35	0	3.79
Feeders	0	0	0	52	0	52	7	0	2	7.96	0	4.67
Grant Value	3440			6364			5825			794		

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Table 4. Summary Statistics of the Potential Outcomes of PASA

Attributes	Minimum		Maximum		Mean		Standard Deviation	
	Beneficiaries	**Non-beneficiaries**	**Beneficiaries**	**Non-beneficiaries**	**Beneficiaries**	**Non-beneficiaries**	**Beneficiaries**	**Non-beneficiaries**
Hatching Rate of Eggs Before the treatment	0.4	0.4	0.8	0.85	0.65	0.68	0.07	0.08
Hatching Rate of Eggs After the treatment	0	0.4	0.95	0.85	0.91	0.66	0.04	0.098
Poultry Loss Rate Before the treatment	0.45	0.5	0.9	0.9	0.69	0.7	0.11	0.85
Poultry Loss Rate After the treatment	0.05	0.5	0.25	1	0.14	0.76	0.04	0.09
Turnover Before the treatment	33	37	796	529	222	99	152	63
Turnover After the treatment	0	33	42409	996	2498	134	4913	125
Profit Before the treatment	26	29	637	424	178	79	122	51
Profit After the treatment	0	26	25446	797	1499	107	2948	100

Sources (Tables 3 and 4): Author's Computation Based on Field Data, 2014, 2020
Notes: A.A.S.= Average Annual Sale.
Farm Size: Total number of poultry in the farm (Average Annual)
Monetary values are estimated in US dollars. (US $ 1 = XOF 550 at the time of the study)

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

These findings show that by improving habitats, implementing a semi-intensive system, balancing diet, and adhering to hygiene and health care measures, the poultry loss rate in project beneficiaries' poultry farms decreased dramatically. The findings back up those of Kumaresan et al (2008). However, one of the beneficiaries had a 100% poultry loss rate because, after receiving a state subsidy to improve his poultry farm, he abandoned this production to invest in other economic activities. This project beneficiary's 100% poultry loss rate may have negative impact on the project's expected outcomes.

Poultry Sales, Turnover, and Gross Profit

Prior to the implementation of PASA in Togo, among the non-beneficiaries, the average annual minimum number of poultry sold per farmer surveyed was 10, the maximum was 69, the mean was 24, and the standard deviation was 12.70. Among the beneficiaries, the average annual minimum number of poultry sold per farmer surveyed was 9, the maximum was 123, and the mean was 49 with a standard deviation of 24.71. Five years after the implementation of PASA, the information collected from the 400 respondents showed that among the non-beneficiaries, the average annual minimum number of poultry sold per farmer surveyed was 9, the maximum was 200, and the mean was 31 with a standard deviation of 22.58. While among the beneficiaries, the average annual minimum number of poultry sold per farmer surveyed was 0, the maximum was 1,700, and the mean was 287 with a standard deviation of 303.71.

In terms of turnover, prior to the implementation of PASA, the minimum annual turnover among the non-beneficiaries was US $ 37 per farmer, the maximum was US $ 529, and the mean was US $ 99 with a standard deviation of 63. While among the beneficiaries, the minimum annual turnover was US $ 33 per farmer, the maximum was US $ 796, and the mean was US $ 222 with a standard deviation of 152. Five years after the implementation of PASA, among the non-beneficiaries, the minimum annual turnover was US $ 33 per farmer, the maximum was US $ 996, and the mean was US $ 134 with a standard deviation of 125. While among the recipients, the minimum annual turnover was US $ 0 per farmer, the maximum was US $ 42409, and the mean was US $ 2498 with a standard deviation of 4913.

In terms of profit, prior to the implementation of PASA, the minimum annual profit among the non-beneficiaries was US $ 29 per farmer, the maximum was US $ 424, and the mean was US $ 79 with a standard deviation of 51. While among the recipients, the minimum annual profit per farmer was US $ 26, the maximum was US $ 637, and the mean was US $ 178 with a standard deviation of 122. Five years after the implementation of PASA, the minimum annual profit for the non-beneficiaries was US $ 26 per farmer, the maximum was US $ 797, and the mean was US $ 107 with a standard deviation

of 100. While among the beneficiaries, the minimum annual profit was US $ 0, the maximum was US $ 25446 per farmer, and the mean was US $ 1499 with a standard deviation of 2948.

Traditional poultry farming is generally practiced for three main purposes and this include sale, consumption, and ceremonies (Dolberg, 2007; FAO, 2004, 2013, 2015; Guèye, 2000a). Before the implementation of PASA, farm size, average annual poultry sale by farmer, turnover, and profit of each farmer surveyed among the beneficiaries of the project were slightly higher than those of non-beneficiaries, indicating that these variables could be determinants in farmers' decision to participate in PASA. The findings show that five years after the implementation of PASA, the non-beneficiaries of the project naturally experienced a slight increase in annual number of poultry sold, turnover, and gross profit. Five years after the implementation of PASA, the increase in these variables was much greater for project beneficiaries than non-beneficiaries, and this could positively affect the project's potential outcomes. However, the absence of birds on certain beneficiaries' farms despite the subsidies received is a negative indicator for effective achievement of the expected results within the framework of PASA, because this absence of production is explained by the fact that certain farmers, after benefiting from the subsidies for the improvement of their poultry farms, have abandoned traditional methods of production. Furthermore, five years after the implementation of PASA, the magnitude of the standard deviations of the potential outcome variables among project beneficiaries such as farm size, average annual sale of poultry by beneficiary, turnover, and profit of each beneficiary indicate that the adoption rate of ITPFT may differ from one farmer to the next.

3.2. Comparative Analyses of Certain Socioeconomic Characteristics of the Beneficiaries and Non-Beneficiaries before the Implementation of PASA

Following the work of Lancaster (1969), Plackett (1983), Franke et al. (2012), Gosset (1908), Raju (2005) and Zabell (2008), the inferential statistics (the Pearson's Chi-square significance test ($\chi 2$) between the qualitative variables and the Student significance test (t-test) between the means of the quantitative variables) yielded the results presented in Table 5. The levels of significance of these two tests revealed that prior to the implementation of PASA, for some socioeconomic variables such as location, gender, age, marital status, religion, education, and poultry loss rate, there is no significant difference between beneficiaries and non-beneficiaries surveyed. As a result, these variables may or may not influence farmer participation in the project, and they may also be used as control variables in the project's impact evaluation analysis. Other socioeconomic variables, such as self-financing capacity in cash or in kind, level of education, household size, agricultural

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

cooperative membership, hatching rate of eggs, farm size, and average annual sale of poultry, show a significant difference at the 1% level between beneficiaries and non-beneficiaries surveyed prior to the implementation of PASA. As a result, these variables could be related with participation of farmers in the project. Furthermore, five years after the implementation of PASA, there is a significant difference in the means of potential outcome variables such as poultry loss rate, hatching rate of eggs, farm size, annual sale of poultry, turnover, and gross profit for both beneficiaries and non-beneficiaries. The impact evaluation of the adoption of improved traditional poultry rearing technique on the potential outcomes of project beneficiaries is thus justified and necessary in order to quantify the added value created by this emerging agricultural practice among farmers in rural areas.

Table 5. Comparative Table of Socioeconomic Characteristics of the Beneficiaries and Non-Beneficiaries before and five years after the Implementation of PASA

Socioeconomic Characteristics	Unit/Measurement	Chi-square test ($\chi 2$)	Student test (T-test)	P-Value
Before the Implementation of PASA				
Sex	(Male=1, Female=0)	0.0002		0.99
Age	Years		-3.57	0.99
Marital Status	Categories	0.7125		0.87
Religion	Categories	12.35		0.15
Canton/Location	Categories	59.89		0.82
Self-Financing Capacity	US $	296.20		0.0000
Level of Study	Years	116.65		0.0000
Household Size	Number of members		-4.91	0.0000
Membership of Cooperative	(Yes=1, No=0)	324.85		0.0000
Loss Rate of Poultry	In %		0.55	0.58
Hatching Rate of Eggs	In %		3.30	0.0011
Farm Size	Number of Poultry		-12.57	0.0000
Average Annual Sale of Poultry	Number of Poultry sold		-12.33	0.0000
Education	Years	3.39		0.066
Five years after the Implementation of PASA				
Loss Rate of Poultry	In %		56.38	0.0000
Hatching Rate of Eggs	In %		-22.93	0.0000
Total Number of Poultry	Number of Poultry		-12.12	0.0000
Average Annual Sale of Poultry	In US $		-14.47	0.0000
Turnover	In US $		- 8.54	0.0000
Profit	In US $		- 8.37	0.0000

Source: Author's Computation Based on Field Data, 2014, 2020

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Conclusion

The purpose of this investigation is to analyze the socioeconomic characteristics of beneficiaries and non-beneficiaries of government subsidies in Togo within the framework of the implementation of the second sub-component of the Agricultural Sector Support Project (PASA) in 2014. Significance levels of Pearson's Chi-square test ($\chi 2$) and Student's t-test indicate that before the implementation of PASA, there is a significant difference between the beneficiaries and non-beneficiaries of the project with respect to socioeconomic variables such as self-financing capacity in cash or in kind, level of education, household size, farm size, membership in cooperative societies, hatching rate of eggs, average annual sale of poultry, turnover, and profit. These variables could therefore be important determinants of farmers' participation in PASA.

Five years after the implementation of PASA, it emerged from the results of the study that the beneficiaries of the project experienced a larger and very important decrease in their poultry loss rate and increases in their hatching rate of eggs, farm size, average annual sales of poultry, turnover, and profit due to participation in the project, and this might have a positive impact on their income and welfare. However, the large discrepancy between the standard deviations of the outcome variables of the beneficiaries of the project indicate that the adoption rates of improved traditional poultry farming technique might differs from one farmer to another.

In addition, the non-compliance of all the beneficiaries of the project with the semi-intensive poultry farming system, the failure to scrupulously respect the improved traditional poultry farming technique, the absence and inadequacy of hatcheries or incubators, the lack of training and strengthening of technical production capacities, the failure to comply with hygiene and sanitary care measures and the absence of production and sales in some improved poultry farms after receiving PASA subsidies are factors that could have negative effect on the efficient, effective, and optimal achievement of the expected results of PASA.

Like every other scientific research, we end by mentioning a limitation of the study. Firstly, we guide the understanding of this analysis from a correlation viewpoint. Given the fact that we used cross-sectional data and could not control for many confounding in the way of identifying participation into PASA, we do not make any causal claims. Future research may want to credibly identify participation into PASA as well as the impact evaluation of PNIASA through the use of longitudinal data sets or in a more controlled experimental setting.

 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

Conflict of Interests
The authors declare no conflict of interest.

Funding
The authors are grateful to the German Academic Exchange Service (DAAD) for funding this research.

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 ISSN: 1857-7881 (Print) e - ISSN 1857-7431

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