

GIS mapping of pig population and distribution in the derived savannah, Oyo state, Nigeria

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Abstract

Pig production in the rural areas has not been adequately linked with urban markets thus negatively affecting pig industry. Many researchers have associated major challenges confronting pig production as a business to inadequate capital, land, labour, environmental degradation and religion belief. However, information on pig population and distribution, which is key in pig production value chain is scanty, thus the need to investigate pig population and distribution in the derived savannah area of Oyo state. A three-stage sampling technique was used to purposively select 180 pig farmers, nine respondents per village, three villages per cell and three cells were randomly selected for derived savannah, Oyo state, were evaluated. Parameters measured were average herd size, distribution pattern of pigs across locations comprised of Oluyole, Ona-ara, Akinyele, Egbeda, Ido and Ibarapa East LGA. The ARC-GIS software processed the Global Positioning Systems (GPS) data of pig population using the ARC-GIS model 10.0. The mapping of the pig farmers' distribution was done using the spatial analytical tool of the GIS. Data were analyzed using descriptive statistics. The farmers' average herd size of pigs ranged from 2 (Ona-ara and Akinyele) to 100 (Egbeda). The average herd sizes were 5, 20 and 40 in Oluyole, Ibarapa East and Ido, respectively. Only Egbeda had piggery capacity of more than 20 piglets on average. The large pig production in Egbeda were probably influenced mainly by abundance of agro-industrial by-product and feed resources. The off-takers of pig production value chain should focus on Egbeda for supply of pigs with advantage of resources and other productions factors.

Keywords: Pig, distribution, mapping, Global Positioning System, ecological zones

Cartographie SIG de la population de cochons et de la distribution dans la savane dérivée, l'État Oyo, Nigéria



Résumé

La production de porc dans les zones rurales n'a pas été suffisamment liée aux marchés urbains ayant une incidence négative sur l'industrie du porc. De nombreux chercheurs ont des défis majeurs associés à des défis majeurs confrontés à la production de porc en tant qu'entreprise de capital inadéquat, de terres, de travail, de dégradation de l'environnement et de religion. Cependant, des informations sur la population de cochons et la distribution, qui est la clé de la chaîne de valeur de la production de porcs est maigre, la nécessité d'étudier la population de cochons et la distribution dans la zone de Savannah dérivée de l'État Oyo. Une technique d'échantillonnage à trois étages a été utilisée pour sélectionner à dessein de 180 porteurs de porcs, neuf répondants par village, trois villages par cellule et trois cellules ont été sélectionnés au hasard pour Savannah dérivé, Oyo State, ont été évaluées. Les paramètres mesurés ont été la taille moyenne du troupeau, le modèle de distribution de porcs à travers les emplacements d'oluyole, Ona-Ara, Akinyele, Egbeda, Ido et Ibarapa East LGA. Le logiciel ARC-SIG a traité les données de la population de cochons

de système de positionnement global (SPG) à l'aide du modèle 10.0 Arc-SIG. La cartographie de la distribution des agriculteurs de porc a été effectuée à l'aide de l'outil analytique spatial de la SIG. Les données ont été analysées à l'aide de statistiques descriptives. La taille moyenne du troupeau des fermiers des porcs allait de 2 (Ona-Ara et Akinyele) à 100 (Egbeda). Les tailles moyennes du troupeau étaient de 5, 20 et 40 à Oluyole, Ibarapa East and Ido, respectivement. Seul Egbeda avait une capacité de porcère de plus de 20 porcelets en moyenne. La grande production de porc à Egbeda a probablement été principalement influencée par l'abondance des ressources agro-industrielles et des ressources alimentaires. Les preneurs de la chaîne de valeur de production de porc devraient se concentrer sur Egbeda pour l'approvisionnement en porcs ayant un avantage des ressources et d'autres facteurs de production.

Mots clés: cochon, distribution, mappage, système de positionnement global, zones écologiques

Introduction

There is a serious disconnect between production and marketing in the pig value chain system. There should be concerted efforts in the linkage of production to market to stimulate efficiency because of increasing population of pig farmers in Ibadan/Ibarapa area of Oyo state. The location and population of these farmers are dispersed which make access to market a very difficult task. It is important to identify the location of the livestock producers with a view of effective agricultural planning and policy implementation. Geographic Information System (GIS) is a computerized database management system for capture, storage retrieval, manipulation, analysis and display of spatial information (Gebber and Adamchuk, 2010). Information on the location and livestock production can be collected from Global Positioning System (GPS). GPS provides knowledge and reliable data for agricultural planning and policy formulation (Ikhuoria and Rilwani, 2006). In Nigeria, the relevance of space technologies in technological advancement becomes more pronounced after the launch of Nigeria SAT-1 in March 2003 in Siberia, Russia (Nigeria Sat 1 report, 2003). The high-resolution satellite was only useful in taking landmarks and settling boundary disputes (Balaselvakumar and Saravun,

2003 and PrecisionAg.com.Org, 2003). However, in the launch of low-resolution satellite of Nigeria, SAT-2 in 2005 in Siberia was more relevant to Agriculture (Oyinloye and Oloukosi, 2013). Geo-information was used for disease behavior and epidemiological studies (Olugazaet *al.*, 2014), Forest Resources (Olatoye and Odutaru, 2013), land resources (Ikhuoria and Rilwani, 2002) or nutrient evaluation for fertilizer application (PrecisionAg.com.Org.2003), feed resource (Babayemiet *al.*, 2014) and broiler production population (Omodele and Okere, 2014). Fig 1 showed the relevance of GIS/ GPS in animal production in the derived savannah area of Oyo State. Olugazaet *al.* (2014) reported the relevance of bioinformatics in diseases epidemiology study among farmers in rubber plantation in Liberia and mapping exercise using spatial analytical tool of GIS among poultry farmers in southwestern, Nigeria (Omodele and Okere, 2014). There is a pressing need therefore, to provide (production) information about pig business enterprises in Nigeria. Such information is needed for proper planning and regulation of the industry in Nigeria (Rilwani and Ikuoria, 2006). Available data on the current facts about entrepreneurial characteristics and constraints to robust development of pig business enterprises in Southeastern

Nigeria are however scanty and fragmented (RIM, 2010). Omodele and Okere (2014) reported the use of GIS to investigate the preferred chicken type among all poultry business enterprises in Nigeria as it is reflected in the national production of the poultry products. Unlike any other type of information handling tool, GIS can understand the concept of location and will help poultry producers with optimal and cost-effective poultry management. Thus, GIS capability in poultry management is achievable in land type description, feed cost monitoring, disease spread analysis and monitoring credit facility sources

(Omodele and Okere, 2014)., On the other hand, others workers had examined the ability of village-level factors to potentially influence spatial patterns in crop-livestock evolution pathways in West Africa (Kristjanson *et al.*, 2002; Rilwani and Ikuoria, 2009). Information on recent technologically-based pig production and distribution which can enhance its marketing efficiency in the derived savannah is scanty, therefore, this study was designed to map the pig production business using the spatial analytical tool to identify the location and population of pigs among farmers in Ibadan/Ibarapa area of Oyo state.



FIG 1: Flow chart of GPS/GIS relevance to animal production
Source: Sosina (2017)

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Materials and methods

Description of the study area

The study was conducted in the Ibadan/Ibarapa Area of Oyo State of Nigeria as shown in Figure 2. The area is ethnically heterogeneous with a high concentration of smallholder crop and livestock farmers, considered as the occupational group with the high incidence of poverty. The population is 81,115 out of which 52% are males and 48% are females. The area lies within Longitudes 1°5' W and 1°39' W and Latitudes 7°9' N and 7°36' N, covering an area of 1,782.2 km². It has a bimodal rainfall pattern ranging between 1200 and 1500 mm with a major rainy season from April to August, and a minor rainy season from August to November. The zones experiences rain-forest, derived and guinea savannah climatic conditions ecological vegetation (Sosina, 2017). The soils in the study area according to Ogunkunle (2013), are poor in nutrients and regarded as low in fertility comprising of pH (6.09-6.65),

organic matter (1.21-1.91%), total nitrogen (0.075-0.093%), sodium (0.23-0.29 meq/100g soil), calcium (0.17-0.59 meq/100g soil), potassium (0.17-0.21 meq/100g soil), available phosphorous (4.83-7.13 ppm), exchangeable acidity 0.77-1.70 and organic carbon (0.70-1.11%). The study locations comprised of Oluyole, Ona-ara, Akinyele, Egbeda, Ido and Ibarapa East LGA were purposively selected from Ibadan/Ibarapa zone, Oyo state. The study lasted between November, 2017 to February, 2018 (dry season) and May to July, 2018 (rainy season) and carried out among crop-livestock farmers in purposively selected agrarian areas of the study area. The Global Positioning Systems (GPS) of the farmers' location, livestock population and distribution were recorded, taking the longitude and latitude of the locations in question. The recorded GPS data of the study area were transferred into the ARC-GIS. The ARC-GIS software processed the data into location using the ARC-GIS model 10.0. Data analyzed using descriptive statistics.

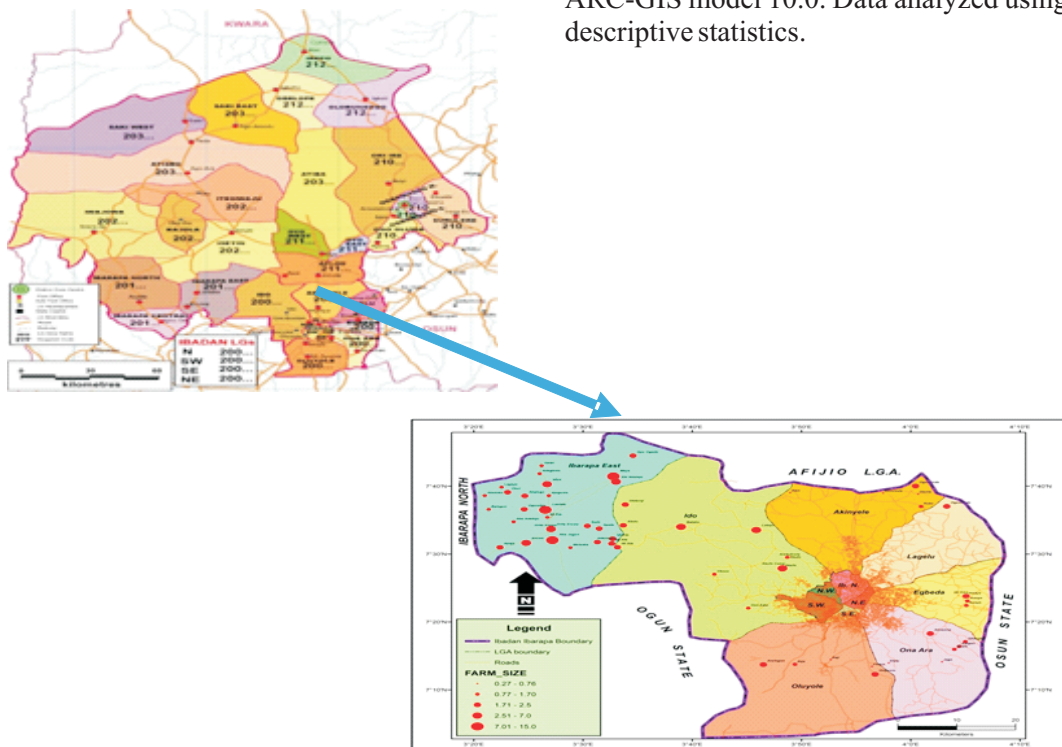


Fig 2: Mapping of pig production using spatial analytical tool of GIS

Results

Mapping of Pig production and distribution in Ibadan/Ibarapa zone: The GIS mapping of pig production of farmers in the study area was identified as in Fig 3. The locations of the farmers involved in the pig production in the study areas were represented with dots on the GIS map. The

locations of the pig farmers were done using the spatial analytical tool of the GIS and the average herd size of pigs both indigenous and improved strain kept by farmers in the study area. The highest average herd size of pig per respondent farmer of 11 was found in Egbeda, closely followed by Ido with an average of 4 pigs compared with other locations in the study area.



Fig. 3: GIS mapping of pig population and distribution in Ibadan/Ibarapa area

Oluyole, Ibarapa East, Akinyele and Ona-ara had appreciable average herd size per respondent farmer of between 1-2 pigs as shown in Fig. 4. Pig production business were well dispersed evenly among farmers in the study area though large pig farms were sparingly scattered in Egbeda and Ibarapa East. Small piggery farms were evenly distributed across the LGA.

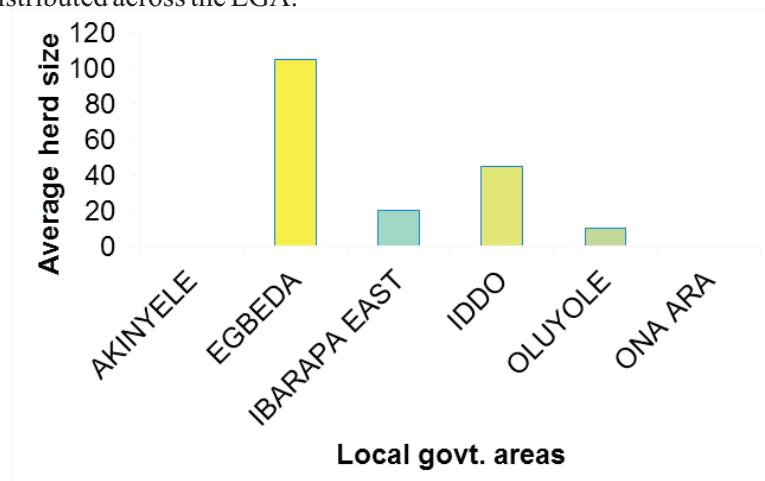


Fig.4: Graphical representation of pig production distribution in Ibadan/Ibarapa area

Discussion

Large population of pig farmers in the humid areas was attributable to the availability of wide range of pig feed as a result of omnivorous nature of pigs. The average herd size of pigs among respondent farmers in the study area ranged from 2 to 100. Egbeda location had the highest average (herd) size of 100 while the lower value was found among farmers in Ona-ara, and Akinyele LGA. However, the average herd sizes of 5, 20 and 40 were found among farmers in Oluyole, Ibarapa East and Ido, respectively. The study showed that piggy business thrived best in Egbeda compared with other locations which could be attributed to some factors notably the nearness to big agro industrial companies that produce important feed ingredients for pig production. The small piggy farms ranged between 0-5 pigs were found mostly in Akinyele, Oluyole and Ona ara, irrespective of the size, breed or age while medium farms were in Ibarapa East and Ido which ranged between 5-19 piglets while big piggy farms are farms with average size ranged above 20 piglets common only in Egbeda. Moreover, the climatic factor in Egbeda was considered favorable for pig production especially in the dry season and stress factor compared with other locations in the study area. Apart from the little sales that comes from local consumption at rural markets and eateries, pig consumption and business is on the increase in the urban or cosmopolitan which slightly favored Egbeda also. This could be due to the management systems adopted by farmers in Egbeda consisting of the semi intensive and extensive systems of production practiced especially in the humid ecological zone. This agreed with the findings of Bolorunduro *et al.* (2004) and Adesehinwa *et al.* (2003) that support the commercial pig production in the humid tropics. With this map, the location and the population as well as the classes of pig

raised by farmers in each location within the study area could be identified. This finding agrees with the report of Gebber and Adamchuk (2010), Ikhuoria and Rilwani (2002); Rilwani and Gbakeji (2009) and Olugaza *et al.* (2014) that reported the relevance of bio informatics collecting relevant data for livestock production. In this study the breeds and the classes of the pigs were randomized through mapping procedure using GIS which could help in livestock census and documentation for policy and decision making as well as implementation of this also agrees with the findings of Oyinloye and Oloukosi (2013) and Sosina (2017) that GIS assists in taken decision relevant livestock developments.

Conclusion

The study showed large pig production in Ibadan/Ibarapa area of Oyo state which can be a good location for the up-takers for supply of pigs, therefore, government should plan ahead for policies and programs that could enhance increase production of pigs in the study areas and improve on interventions that can sustain the pig value chain program through increased funding and livestock extension. It could also be deduced that bio informatics is an important instrument for efficient livestock system extension delivery and policy implementation.

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