



## The influence of the African swine fever on porcine industry in an isolated region of Armenia for a period of seven years

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**Abstract.** In the present paper was investigated the loss in porcine populations in smallholder farmer systems due to African swine fever virus infection. The investigated region is situated in the north-eastern part of Armenian Republic and comparatively isolated from other regions of Armenia, and neighbor countries. The majority of pigs in the investigated region were kept on smallholder farms in the rural areas, and usually each farm had several animals. Between 2007 and 2013, there were two disease outbreaks (in 2007 and 2010-2011). After analyzing the statistics concerning the livestock it can be concluded that after the first eruption of disease (2007) a dramatic decrease of the livestock was recorded. After that during the second eruption (2010-2011) the economic losses were not so severe. It has been shown that smallholder farmer systems can partially overcome economic losses and can survive in setting with many uncertainties and uncontrollable risks aroused at ASF epidemics.

**Key Words:** smallholder, epidemic, porcine industry, economic loss, sanitary measures.

**Introduction.** African swine fever (ASF) is a devastating disease of domestic swine which was first described by Montgomery in Kenya in the 1920s (Montgomery 1921). The causative agent of the disease is the African swine fever virus (ASFV) which causes a lethal hemorrhagic fever in domestic pigs. ASFV usually affect pig populations rapidly by direct or indirect contact. ASF is enzootic in most countries of Sub-Saharan Africa including the island of Madagascar (Roger et al 2001). ASFV was also introduced into Caucasus in 2007, and has apparently become endemic among the wild boars. At present there is no treatment or vaccine available, and control is based on rapid laboratory diagnosis and the enforcement of strict sanitary measures (Sanchez-Vizcaino 2006).

The first outbreak of the ASFV in Armenia was registered in 6 August 2007 in north region of the republic which is bordered with Georgia. The source of infection likelihood was the spreading from Georgia. The ASFV could be spread via legal ways or by the contraband traffic of the swine's and by the swine production. Also it can spread via movement through the border of domestic swine's and wild boars. The majority of the first eruptions were registered in the north regions near the border with Georgia. The last officially confirmed eruption of the disease happened in 2010-2011 (FAO 2012). The sequencing of the Georgian isolate of ASF virus revealed immediate relationship with isolates from south-eastern Africa (Mozambique, Madagascar, Zambia) and the affiliation to the genotype II (Rowlands et al 2008).

The aim of this study was to investigate the influence of the ASFV on the population of domestic swine's in the conditions of comparative isolation of the district.

**Material and Method.** Details of the location and date of detection of ASF cases that occurred in the north-eastern region of the Tavush part of the Republic of Armenia for

the period of 2006-2013 were provided by us. In the republic of Armenia, when a farmer suspects a case of ASF in pigs, he notifies the regional veterinary service for confirmation. Notification details include the name of the place where the infected herd is located, an estimate of the total number of animals at risk, the number of animals with clinical signs at the time of diagnosis, mortalities, and the date of onset of clinical signs and the date on which disease were confirmed.

The district of Berd in the Tavush region is situated in the north-eastern part of the Armenian Republic and in the south-east is bordered by the Azerbaijan Republic, having 300 km border with Azerbaijan (Figure 1), but this district is comparatively isolated from the other regions of Armenia. The majority of pigs in investigated region is kept on smallholder farms in the rural areas, and usually contains less than hundred animals.

The geographical area of interest for this study was the north-eastern region of the Republic of Armenia (Figure 1 & 2). Data of 2006 was described as intact population. Incident cases of ASF in domestic pigs identified between summer of 2007 and December 2013 were selected for analysis. Map of this region of the Republic of Armenia showing the location of detected ASF outbreaks in domestic pigs, 1 January 2006 to 31 December 2013.

We assumed that rural settlements and villages were places, where privately owned, backyard pig populations were kept. Data on pig populations in this region we take from the Republic of Armenian State Statistics Service. Pigs population counts were classified as either urban or rural. Urban populations were assumed to reside in cities and urban settlements whereas rural populations were assumed to reside in villages and rural settlements.

We used the information on ASF distribution obtained by the authors during of his visit of the region of North-East Armenia. Occurrence data comprised of confirmed ASF presence derived from both peer-reviewed literature and own data. The statistical processing of materials was carried out using Microsoft Excel software.



Figure 1. The study site, Armenian Republic (the district of Berd).

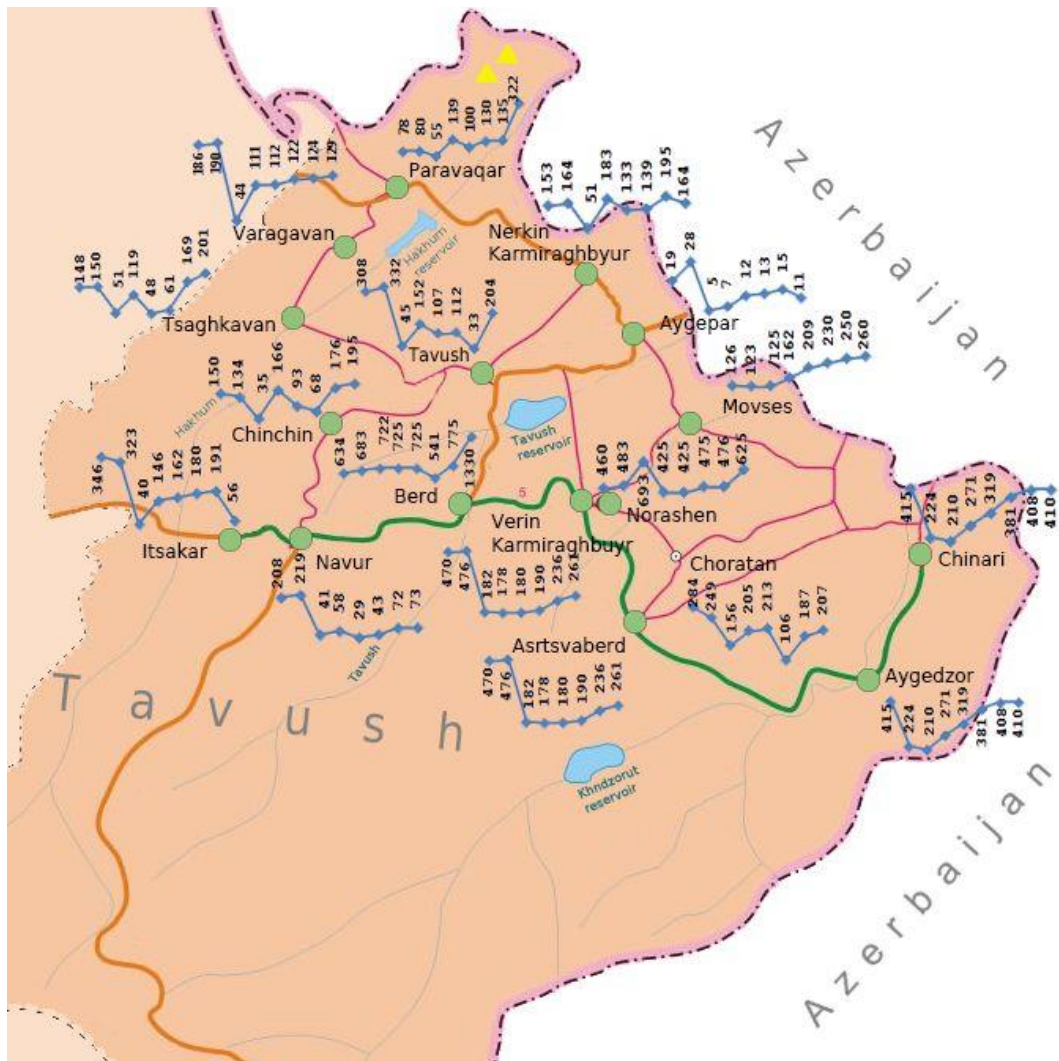


Figure 2. Map of the Berd District with swine populations in villages before and during ASF outbreaks (2006-2013). Triangles – ASFV infected wild boars, first trapped in region.

**Results and Discussion.** The district of Berd is isolated from other Armenian areas and as well as from other swine-breeding districts (Figure 1). This is due to its relief, which is mountainous and wooded, it is impassable and connects with other districts only with two roads and by the factor that the main part of the district is bordered with the Republic of Azerbaijan (Figure 2). In Republic of Azerbaijan the population of swine is not numerous because the population in most professes Islam and the consumption of pork is limited to the number of Christian minority. Also because of hostilities the border between the two countries is closed, so there is no traffic of the products and domestic animals.

For the district of Berd it is typical the maintenance of the swine's in little subsidiary farms where the animals walk freely rummaging through the debris in the daytime and in the evening they come back to the barn. There are also half professional farms where are several dozen of swine's, which are kept in fully enclosed special premises. However, the systems of swine breeding for industrial purposes with high levels of biological protection are absent. There are not many slaughtering enterprises and the slaughtering even in the big farms is mainly carried out in situ.

In the investigating district the virus of ASF was introduced in August of 2007. The epidemic embraced the whole district. As a result, pig breeding was inflicted by a heavy detriment expressed in the reduction of the number of swine's (Figure 2 & 3). In 2007-2008 in the territory of the investigating district were detected the cases of ASF of wild boars (the first case in 11 October of 2007) (Figure 2).

We draw up maps according to our results by data where are mentioned the all rural areas of this district and the average number of the swine's in the area. In the maps those areas are highlighted with red color; in the mentioned years, where registered individual cases of disease or epidemics. From Figure 3 can be depicted that from 2007 to 2013 there were big epidemic eruptions.

As it can be seen in Figure 3, before the disease outbreaks in 2007, the average quantum of the livestock in the 17 areas of the district of Berd was fluctuating within the limits of 4-4.5 thousand individuals. Because the epidemic of ASF was introduced in the district of Berd in 2007 the harms which it caused are became visible in data's of 2008-2009. After analyzing the data statistics of the livestock it can be concluded that after the first eruption of disease (2007) it happened a sharp decrease of the livestock about 2-2.5 times (2008-2009). After that, during the second eruption (2010-2011) the economic losses were not so harmful because of readiness of people who were engaged in swine breeding (partially they limited the free maintenance of swine's in the forests and they changed feeding conditions).

Before ASFV introduction in 2007, pig population in Armenia ranged from 300,000 to over one million individuals, mainly in the north of the country (Beltrán-Alcrudo 2008). About 90% of the pigs in Berd district of Armenia are kept in the backyards, reared in non-professional systems with several individuals/household. Also there are some farms holding a higher number of pigs under full confinement in specialized premises (Beltrán-Alcrudo 2008). The main regional factor contributing to live-pig transactions was local trade, the usage of a live animal market to trade live pigs. Piglets represent the absolute majority of all animals moved. Most movements taking place in the spring time. Usually these pigs are slaughtered during the following Christmas period. These characteristics are generally present in all Armenian regions and also in Georgia and Sardinia (Kukielka et al 2017; Cappai et al 2018). Also, ASFV can survive in pork products (Petrini et al 2019). Commercial porcine production system with high standards of biosecurity just has been implemented in the investigated region. Introduction of the ASFV in the district of Berd in 2007 produced significant loss in the pig population. However, in the second outbreak in 2010-2011 the economic losses were not so severe because of readiness of people, which decreased trade and movements of animals.

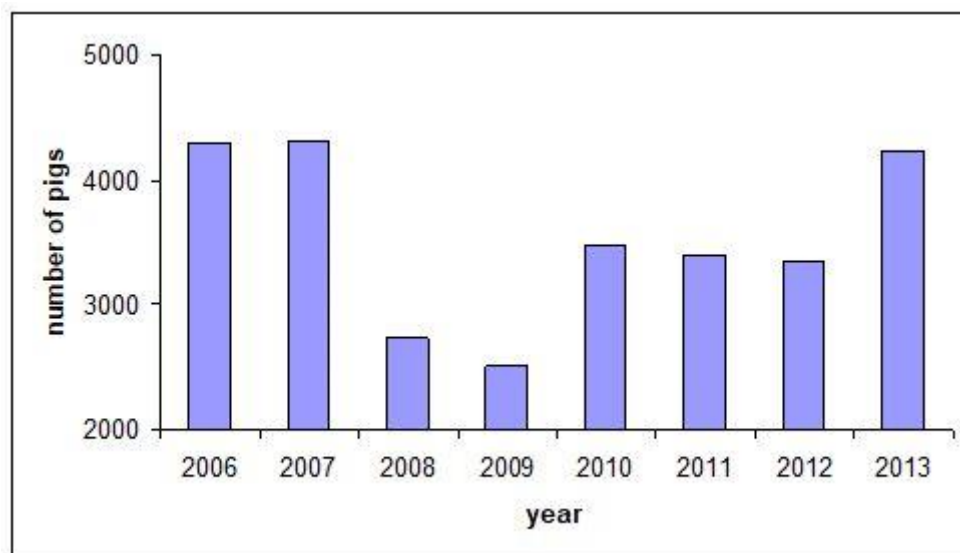


Figure 3. The average number of the swine's in the district of Berd (data obtained in January 2019).

**Conclusions.** Before ASFV epidemic in 2007, the pig population in Armenia amounted up to one million individuals, concentrated mainly in the north region of the country. Concerning the rearing/breeding systems of pigs in Armenia, Berd District, in about 90% of the cases pigs was kept in non-professional management system, namely in household

condition with several individuals/location. The live pig trade is usually performed through local markets, where the majority of traded animals are represented by piglets. The highest live animal movements are taking place in the spring time. In all Armenian regions and also in Georgia, usually these pigs are slaughtered during the following Christmas period. Commercial swine production systems with high standards of biosecurity have been just implemented in the studied region. The ASFV incidence in the Berd District in 2007 resulted significant livestock and implicit economic loss. Concerning the second ASFV outbreak in 2010-2011 produced not so severe economic losses due to actions taken in order to reduce trade and movements of animals.

The ASF cause big economic issues, which is demonstrated by the loss of the livestock. We can conclude that smallholder farmer systems can partially overcome economic losses and can survive in setting with many uncertainties and uncontrollable risks aroused at ASF epidemics. ASF in Armenia has a high economic character, because people are poverty-stricken and depend upon pigs for their livelihood.

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