

Full Length Research Paper

Characteristics of snail farmers and constraints to increased production in West and Central Africa

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Accepted 12 October, 2018

Snail gathering/rearing is an important source of livelihood for rural dwellers in the humid forest and derived savanna zones of West and Central Africa. Recently, declining populations of *Archachatina archachatina* and *Archachatina marginata* species is being observed, with climatic conditions and changes in land use implicated as causal factors. However, these claims are still to be ascertained. A study was carried out to characterize snail farmers, identify constraints to increased snail production and suggest strategies required to conserve edible snail species and sustain livelihoods. Structured questionnaires and focus group discussions were used for data collection in selected locations in Cameroon and Ghana. Descriptive statistics (means and percentages) was used to summarize the data obtained. The results indicate that snail farmers are predominantly women with basic school level of education. Between 42 and 62% of rural income is derived from sale of snails. Causes of declining snail populations were attributed to habitat loss through deforestation, overexploitation, indiscriminate harvesting, climate change - indicated by extremely high temperatures and low rainfall, high dependence on agricultural chemicals (herbicides and pesticides) and lack of training on improved snail husbandry. A holistic approach to biodiversity conservation and capacity building of current and would-be snail farmers is suggested to increase snail supply in markets.

Key words: *Archachatina* spp, non-conventional livestock, climate change, Africa.

INTRODUCTION

Snail is an important source of animal protein in many parts of West and Central Africa (Blay et al., 2004), having good quality protein (69% dry weight) and rich in potassium, phosphorus, essential amino acids and vitamins C and B complex (Baba and Adeleke, 2006, Okpeze et al., 2007). Traditionally, rural folk scout freely in the forest and farmlands to collect snails during the rainy season for sale and domestic consumption. In view of the high quality of protein obtained from snails they have secured high demand in many cuisines both locally and internationally. Other advantages in snail farming over most other livestock include low capital requirement for its establishment

and operation, less demand for professional knowledge, very high fecundity and low mortality, less labor requirement, the animal's noiseless-ness, and availability of ready domestic and international markets, among others (Cobbinah, 1993; Baba and Adeleke, 2006). Recently, the production of snail has not kept pace with demand (Etchu et al., 2008) with different environmental and technical factors implicated. Snail supply from the wild would be further affected by issues of climate variability and change. Climate change is already having a negative impact on Africa through extremely high outdoor temperatures (IPCC, 2007), which are not favorable to snail growth and development. Domestication and intensive management of the edible land snail is inevitable. Research on climate change has focused more in the tropics on crops, less on livestock and little on biodiversity conservation. Change in

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Table 1. Characteristics of snail farmers and marketers.

Characteristics		Percentage (%)
Sex	Male	40
	Female	60
Level of education	Primary and/or secondary	82
Source of snails	Wild	30
	Backyard	4
	Wild and backyard	66
Contribution to Income	Gatherers	42
	Marketers	62
Received training on snail husbandry		28

species abundance can provide useful insights on climate change and drivers of this change. However, there is dearth of information on this in most parts of the tropics. This study was therefore undertaken to identify immediate and remote causes of low production in Cameroon and Ghana.

MATERIALS AND METHODS

The study was carried out in Volta and Greater Accra regions in Ghana and the Southwest region in Cameroon, between August and October, 2009. Greater Accra and Volta regions fall within the humid forest and derived savanna zones and the Southwest region of Cameroon is exclusively a humid forest ecosystem.

Questionnaires were administered in the above-mentioned regions to 120 respondents (60 in each country). Respondents were randomly selected from lists provided by agriculture officers. Questions were designed to provide background information on socio-economic status of the farmers, causes of declining snail population and other production constraints. Farmers were also asked if they had received any advice on snail rearing from agricultural extension officers and non governmental organizations (NGOs) and how this information (if adopted) has changed their production practices. Some claims of causes (e.g. low rainfall and high temperatures) in declining snail population were verified using available secondary data. Climatic data for the past 40 years (1971-2009) for Hohoe District was provided by Ghana Meteorological Service. Data collected was analyzed using SPSS software. Descriptive statistics (means and percentages) provided insights into farmers' perceptions of climate change. The study was exploratory and did not seek to compare findings from the two countries.

RESULTS

Characteristics of snail farmers

Table 1 gives a summary of characteristics of snail farmers/marketers. These farmers were predominantly

females (60%) and have basic primary and/or secondary education (82%). Farmers, mostly women and children cover a distance of between 2 and 5 km from their homes at night to gather snails. Thirty percent of them source snails from the wild, 4% exclusively from backyard rearing and 66% from wild and backyard. Snail farming accounts for 42% of total income of rural farmers and for 62% of income of marketers. An average monthly income of 54,650 francs (US \$ 121.00) is generated by small-scale snail farmers in Cameroon. Such information was not provided by Ghanaian farmers. Eight environmental factors (Table 2) were identified as constraints to increasing snail population in the wild, with deforestation, high dependence of farming operations on agro-chemicals (principally pesticides), and high incidence of pests and indiscriminate harvesting of snails (small and large) as major factors.

Rainfall anomalies (annual rainfall amount minus 40 years average) between 1971 and 2009 are shown in Figure 1. The solid line represents 5 years moving average. The data revealed an alarming decreasing trend in rainfall amount between 1976 and 1986. More frequent extreme rainfall events have been observed since 1977. Between 1980 and 1986, rainfall deficit was recorded in 5 out of 7 years, with severe deficits (drought) in 1977, 1982, 1986 and 1994. The moving average clearly reveals a tendency of experiencing low rainfall amounts in the coming years. Inter-annual variability in rainfall amount varied between 3 and 40%, with high variability characterizing rainfall between late 1980s and 1990s. Farmers' perception of high rainfall variability, decreasing rainfall amounts in Ghana is supported by rainfall data available for one of the test sites. High temperatures were also confirmed by meteorological records (Figure 2). Mean annual temperatures vary between 26°C and 28°C, with a tendency of approaching 30°C in the near

Table 2. Environmental factors implicated for reducing snail population identified by snail farmers.

Factor	Percentage of respondents (%)
Demographic pressure (deforestation)	38
High dependence on agrochemicals	16
High incidence of pests	14
Indiscriminate harvesting	12
Low rainfall	6
Wild fire	6
High temperature	4
Continuous cropping	2

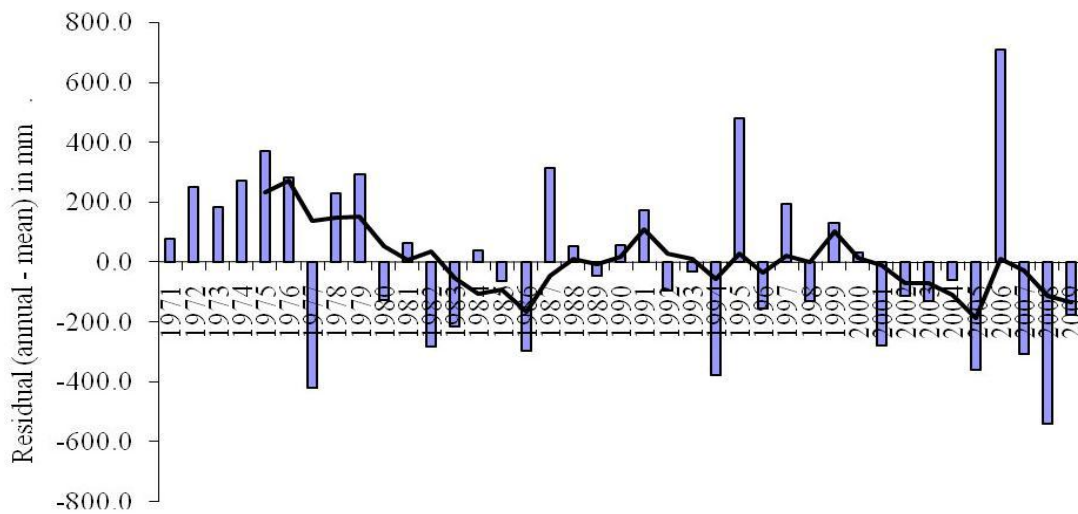


Figure 1. Annual rainfall residuals and moving average (solid line) for Hohoe District (Ghana).

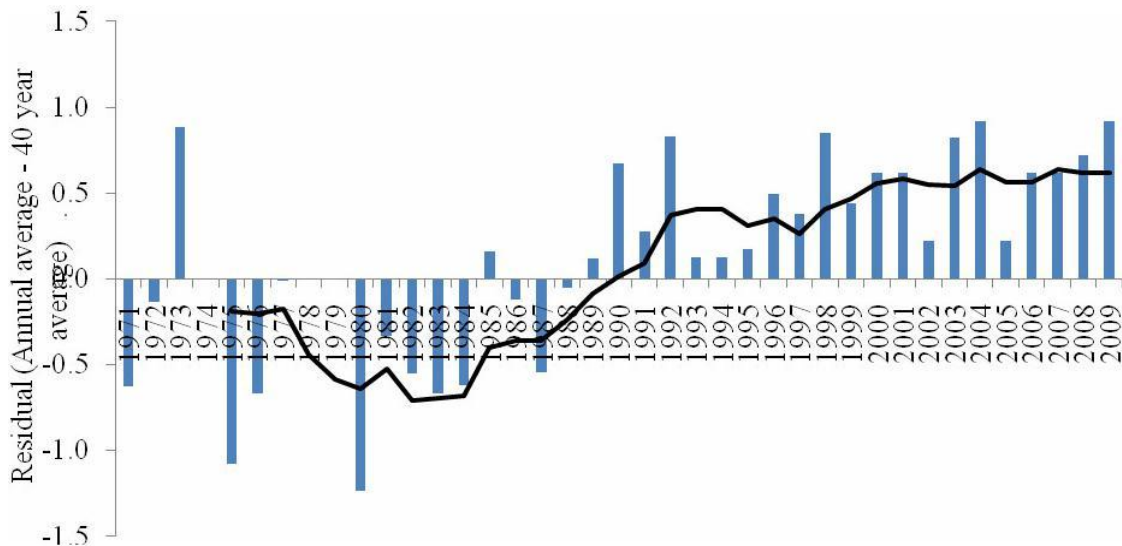


Figure 2. Annual temperature residuals and moving average (solid line) for Hohoe District (Ghana).

future. With respect to intensive snail farming, 71% of respondents identified lack of training of rural farmers on improved management techniques as the major impediment to increased snail supply. All farmers interviewed in Ghana reported feeding of snails to be less of a problem, as the giant snail which they rear is essentially vegetarian and browses on a wide range of leaves. In Cameroon, farmers complained of slow growth rates using local diets. Of all the farmers interviewed, only 28% had received advice from NGOs and agricultural extension officers, and all of them reported low mortalities and increased production.

DISCUSSION

The low dependence of farmers/gatherers on snails from the wild is indicative of the impact of environmental and anthropogenic factors on edible snail populations. In addition, the extremely low percentage of farmers who practice exclusive snail rearing in their backyards (4%) implies that there is potential for improving supply through intensive backyard farming. Significant advances have been made in snail research to establish low-cost housing (Etchu et al., 2008), appropriate stocking densities (Omole et al., 2006) and suitable readily available high quality feeding materials (Agbogidi et al., 2008), all in a bid to improve backyard rearing. Compounded feeds are available in the market in Ghana for enhancing the fattening process, where large scale production is anticipated (Blay et al., 2004).

In Cameroon there is a need to formulate compounded rations as farmers complain of very slow growth rates using local diets. Given the significant contribution of snail farming to the income of rural farmers, much thought need to go into efforts to reduce deforestation, and improve farmers' capacity of intensifying backyard production. Appiah et al. (2009) suggested agro-forestry practices (with snails, bee keeping etc. as components) in view of tropical deforestation in Ghana which endangers community's dependence on forest resources. Agricultural expansion and over-exploitation of forest resources are the fundamental causes of deforestation (Appiah et al., 2009). Because of climate change, new pests have been observed in many farmlands in addition to increasing population of existing ones, which in many cases have developed resistance to certain concentrations of pesticides forcing farmers to use higher doses and/or new formulations. In West and Central Africa, the agricultural sector faces several challenges of which pests and crop diseases are major bottlenecks. Indiscriminate harvesting of snails would reduce the potential number of eggs to be laid, with negative effects on future populations. *A. archachatina* is the most priced species for consumption in Ghana and is becoming rare (Cobbinah et al., 2008). Climatic variables are among the

determinants of growth and survival of living organisms. Land snails prefer humid environments for their optimum performance in the presence of their choice food (Ejidike et al., 2004). Decreasing rainfall and increasing temperatures would alter the conditions required for optimal growth and reproduction. Average body weight gain in *Archachatina marginata* is inversely proportional to temperature and directly proportional to rainfall (Edijike et al., 2004). A sharp decrease has been reported in body weight of *A. marginata* exposed to temperatures > 30°C (Ejidike et al., 2004). Temperatures in West Africa have evolved faster than the global trend, with increases in the range 0.2 to 0.8°C since the end of the 1970s (ECOWAS-SWAC/OECD, 2008). Snail gatherers and marketers adopt measures (regular wetting of their enclosures) to reduce the temperatures their snails are exposed to in order to keep them alive for the market.

Conclusion

Snail farming constitutes a major part of the income (42 - 62%) of rural farmers, who are predominantly women and have limited alternative sources of livelihood. Most of them have attained primary or secondary school education. Environmental factors such as deforestation, increasing temperatures, low rainfall, bush fires, indiscriminate harvesting, high use of agrochemicals and lack of training on intensive snail rearing were identified as impediments to increased snail supply from the wild and in captivity. Efforts should be made to reduce the effects of climate change through the adoption of agro forestry systems, and practices that reduce dependence on agrochemicals, as well as intensify training on improved management practices and the formulation of high quality diets for rapid growth and high nutritional quality.

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