On-farm diversification strategies and improved welfare of the immiserated rural smallholder farmer: Fallacy or realism?†

Lawrence G. Boakye1*, Collins K. Osei2 and Serekye Y. Annor3

Abstract: The promise and role of livelihood diversification has been taken up globally in the pursuit of mitigating risks confronting the immiserated rural smallholder farmer to improve living standards and viewed as paramount to advancing the welfare and prosperity of same. Yet, due to an apparent shift in interest and attention from on-farm to off-farm activities, much has not been documented on the impact of on-farm livelihood diversification strategies. Through the lens of a grasscutter domestication scheme implemented in Ghana by the Ghana Country Programme of ActionAid International, this paper explores the impact of such on-farm strategies on the welfare and livelihood of the immiserated rural smallholder farmer. Employing a focus group discussion to interview the beneficiaries, the paper identifies increased and alternative source of income, improved diet, and source of employment as major benefits of the scheme to report an apparent capacity and

ABOUT THE AUTHORS

Lawrence G. Boakye is an evolving scholar-practitioner passionate about development inside and outside the classroom. He has an unfolding international reputation for scholarship and research leadership in knowledge, evidence and learning for development (K4D), mostly within project management in international development cooperation and agriculture for development domains. Inspired by the relevance and impact of functional development assistance projects on underprivileged populations and grassroots development, and to help create a distinguished high-profile outlet for policy- and practice-relevant reflection for the academic and practitioner alike, he discourses on issues of relevance to international development praxis to share insights and perspectives needful to help do development better. Lawrence holds an MPhil degree from The University of Sydney, Australia and is an alumnus of the prestigious Australia Awards scheme.

Collins K. Osei (Dr.) is a senior lecturer at the Faculty of Agriculture, Kwame Nkrumah University of Science & Technology, Kumasi in Ghana.

Serekye Y. Annor, until his demise, was a Professor at the University of Education, Winneba in Ghana.

PUBLIC INTEREST STATEMENT

Diversifying the livelihood of resource-poor rural smallholders using on- and off-farm strategies is perceived as crucial to boosting their prosperity. An appreciable literature thus abounds promoting the utility of such diversification strategies to building rural agricultural household capacities to improve their welfare and living standards. However, despite the utility of on-farm diversification strategies, research consistently suggests that off-farm diversification strategies serve rural households better in improving living standards, leading to a stronger interest and focus shift from customary on-farm activities to off-farm activities. In contrast, this paper documents that on-farm diversification strategies also come with needful socioeconomic benefits to rural smallholder farmers, making such strategies equally important in attempts at improving the living standards and welfare of same. The paper is thus of importance and relevance to the academic (subject) community and agriculture and rural development community of practice and policy as well as the agriculture for development discourse.
utility of on-farm livelihood diversification strategies to the socioeconomic empowerment of the immiserated rural smallholder farmer. The paper conveys that with further development through investments and improvements for greater operational efficiency, such strategies could have vast potential in building household capacities to improve living standards and welfare of same, and prove useful to advancing rural poverty reduction, and economic growth and development efforts. Implications are discussed.

Subjects: African Studies; Development Studies; Africa - Regional Development; Sustainable Development; Development Policy; Rural Development; Development Theory; Rural Studies

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1. Introduction

Eighty per cent of the world’s extreme poor live in rural areas (FAO, 2019; IEG, 2017) where agriculture, usually in smallholdings, is the dominant activity. Many of such rural smallholder farmers (or rural smallholders—we use this term in this paper to refer to rural farmers who, relying almost exclusively on family labour, grow crops on small plots of land mainly for their sustenance) are almost completely tied to and dependent on their smallholdings for their subsistence. Smallholdings are not necessarily low producing undertakings. However, various forms of risks, e.g., poor access to capital, credit, and improved planting materials; bad weather conditions; poor husbandry practices and technical know-how; and disease and pest outbreak usually confront such smallholdings to play into low productivity and poor financial returns. This leaves such rural smallholder farmers constantly immiserated (immiserated, herein used, means impoverished). Consequently, the situation is such that most of such immiserated rural smallholder farmers produce below thresholds that is barely enough for their sustenance without any surplus to trade for income. In situations where there are surpluses, they are sometimes hardly even enough to generate the needed income for their sustenance.

Such conditions do not augur well for lifting such immiserated rural smallholder farmers out of extreme poverty and hunger to, in turn, improve their standards of living to promote their welfare and that of their households. With farming as the mainstay of most rural economies, the prosperity of rural smallholder farmers depends on strategies that can help them to tackle (withstand or adapt to) shocks associated with the numerous risks that confront them. Economic transformation is generally associated with diversification. Consequently, it is viewed as an outcome of dynamic livelihood adaptation to various constraints and opportunities faced by smallholders at the household level (Ellis, 2000). Diversification, as used here, refers to processes, which are usually but not always directly linked that take place at different levels of the economy (Start, 2001). This means appreciable gains in poverty and hunger reduction, and economic improvement among rural smallholders to address their vulnerabilities to advance their welfare, arguably, is possible with the creation of opportunities that would enable them to diversify their livelihoods. Livelihood diversification, herein used, refers to the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and improve their standards of living (Ellis, 1998) to, in turn, improve their welfare. It could be achieved through on-farm strategies, where the diversification activities take place at the farm level or through off-farm (or non-farm) strategies, where activities take place outside the farm.

However, off-farm diversification strategies are seen to serve rural agricultural households better (see, e.g., Gautam & Andersen, 2016), leading to a wider research interest in such livelihood diversification strategies over on-farm ones (see Basant, 1994). Consequently, much has not been documented on the impact and utility of on-farm diversification strategies in contemporary
Employing a focus group discussion (FGD), we answer this question by exploring the effects of an early-stage grasscutter domestication (or grasscutter farming—we use this term in this paper to refer to the process of rearing the wild grasscutter in captivity) scheme on the welfare of beneficiary rural smallholder farmers in the Asutifi North District of the present-day Ahafo Region of Ghana. The scheme was implemented as an on-farm diversification strategy by Brong Ahafo Regional Programme, Action Aid Ghana to boost the upkeep of immiserated rural smallholder farmers within the District. Our findings confirm that on-farm livelihood diversification strategies such as non-conventional sustainable breeding of wild animals in captivity, despite their associated challenges, are equally crucial and useful in improving the welfare of immiserated rural smallholder farmers. This means with appropriate investments and improvements to remedy or mitigate drawbacks associated with such undertakings to enable greater operational efficiency, on-farm diversification strategies could be a viable option of immense benefits and vast potential to build the capacity of immiserated rural smallholder farmers to stabilise and improve their income, and food consumption as well as to aid rural poverty and hunger reduction, and economic transformation efforts. Consequently, we generate and highlight significant insights with meaningful implications to uphold the promise and role of on-farm diversification strategies in improving living standards and welfare of the immiserated rural smallholder farmer. By so doing, not only do we document knowledge to extend the extant body of knowledge on rural livelihood diversification strategies but particularly so on-farm strategies, we also convey key insights and perspectives to inform contemporary and future research directions as well as policy and practice needful for rural poverty and hunger reduction, and rural agriculture and economic development.

Below, we briefly describe the grasscutter and the reasons for grasscutter domestication after which we elaborate on the study by first presenting an overview of the grasscutter domestication scheme to provide some clarity to the information presented in this paper. We follow this precis with a background information on the study area before we detail out our data collection and analysis method. A description of the demographics of the participants of the study concludes this section. The subsequent section presents the results of the study. We discuss the results in the penultimate section and finally draw conclusions to close the paper. We also outline the plausible limitations of the study and directions for further research in the final section.

2. The grasscutter

The grasscutter (Thryonomys swinderianus), which occurs naturally only in Africa, is the second-largest rodent of Africa’s grasslands (Adu et al., 2017; Menz, 2015). Also known as the cane rat, it is a widely distributed monogastric herbivore in West and Central Africa with a wide nutritional intake, which makes them relatively easy to feed in captivity in that they do not need to be fed the same foods that could be used for human consumption, as do poultry and pigs (Jori et al., 1995; Menz, 2015).

The grasscutter is generally culturally accepted as a more favourable protein source than most domestic livestock (Menz, 2015). Compared to the meat of other animals such as the rabbit, grasscutter meat, traditionally called “bushmeat”, is very low in cholesterol and has a very high mineral (e.g., iron, calcium and phosphorous) content compared to beef, mutton, and chevon (Adu et al., 2017). Its meat is thus highly sought after and valued for its savoury taste and tenderness, rendering it a good source of animal protein of high biological value in great demand not only in African urban centres but also in major global markets for Africans living in the United States and Europe (Menz, 2015; Owen & Dike, 2012). Consequently, Adu et al. (2017) assert that the economic return on rearing the grasscutter in captivity is comparable to that of a cow, much higher than most livestock species, and only lower than that of the pig.
2.1. Why grasscutter domestication?

In Africa, the unsustainable, illegal hunting of wild animals for food, commonly referred to as the bushmeat crisis, causes multiple problems for ecosystems and human health (Menz, 2015). Given the rapid expansion of human population densities and the lack of management of bushmeat hunting so deeply embedded in rural African lifestyles such that its complete elimination is considered unrealistic and a loss of cultural practice, the potential for, e.g., overharvesting and driving populations of native species to local extinction, is a major threat to biodiversity—that part of the natural capital, which underpins the livelihoods of many rural folks (see, e.g., Davies, 2002; Menz, 2015). Domestication of desirable heretofore wild native species of promise thus offers one solution to regulating unsustainable hunting of wild animals for human consumption to regulate biodiversity loss and advance sustainable consumption and production (SCP) efforts.

The grasscutter is considered an agricultural pest (cf. Adu et al., 2017), yet it commands a highly valued status due to its:

- Relatively short gestation period like that of other farmed animals such as sheep and pigs but shorter than cows and the quality of its meat, whose price can even quadruple beef (e.g., Jori et al., 1995; Menz, 2015).
- Hardy nature and low associated cost of rearing it in captivity, which is even possible within a limited space at the backyard by smallholder and landless farmers owing, perhaps, in part to its variable diet adaptability properties (e.g., Jori et al., 1995; Menz, 2015; Owen & Dike, 2012).
- Overall profitability in propagating the animal in captivity (e.g., Adu et al., 2017).

In consequence, the animal is a dominant candidate for non-conventional sustainable domestication of wild edible species, which is critical in efforts to combat Africa’s bushmeat crisis to (1) advance SCP efforts; (2) ensure environmental conservation; and (3) bring into check health concerns arising from human exposure to a plethora of deadly zoonotic viral diseases. Such economic potential of the grasscutter thus underscores why many development entities focused on poverty reduction are promoting its domestication and production, particularly within countries in the West African sub-region where bushmeat is a delicacy (Adu et al., 2017).

3. The study

With an objective to generate insights to help ascertain whether on-farm livelihood diversification strategies could indeed improve the welfare of the immiserated rural smallholder farmer, we pursued an exploratory research approach where we assessed the effect of a real-world on-farm diversification scheme on its beneficiaries. This scheme, which involved non-conventional domestication of the wild grasscutter was implemented in the Asutifi North District of Ahafo Region, Ghana by the Brong Ahafo Regional Programme of ActionAid Ghana. Our choice for an exploratory case study approach was influenced by two reasons. First, an exploratory study is particularly useful in discovering important causal relations, which could be tested through further research (Antonakis, 2017). Second, case studies provide the most flexibility in retrospective applications to investigate contemporary phenomena from programme evaluations to exploratory resource examinations to even people’s perceptions of their needs in specific situations in depth and within real-life contexts (Dawidowicz, 2011; Yin, 2009; Zucker, 2009).

3.1. Overview of the grasscutter domestication scheme

The majority of the inhabitants of the Asutifi North District obtain their livelihood from agriculture-related activities, where they produce enough to feed themselves and depend on their harvests to earn income for other household expenditures like healthcare, clothing, and payment of school fees of their wards. Poultry farming and animal husbandry practices are not very popular among the smallholder farmers. Such heavy reliance on farm (crop) produce alone exposes the farmers to a lot of risks, especially crop failure and fluctuating market prices; the latter is a common phenomenon as the need for money often compels the farmers to sell a greater portion of their
farm produce immediately after harvest when prices are still very low. More so, with an increasing cost of animal meat and fish in the District, which is influenced in part by the influx of mining operations, farmers find it difficult to include the necessary animal protein in their diet. Hence, with their staple food been predominantly plantain- and maize-based, their meals lack the necessary protein and other nutrients critical to ensuring healthy growth and development to present serious threats to their growth and well-being, especially among children and pregnant women.

The Brong Ahafo Regional Programme, ActionAid Ghana, realising that poultry farming and animal husbandry practices were unpopular activities among the smallholder farmers and aiming to advance the welfare of farming households within the District, implemented as parts of its development programme in the District, a grasscutter domestication scheme as a livelihood diversification strategy to provide an alternative source of income; increase farmers’ access to and utilisation of animal meat to meet dietary requirements to promote healthy growth and well-being; create further employment for the people in the District, especially women and the youth; and attract the youth who were not interested in crop farming into agriculture.

The scheme, which consisted of the under-listed components started with 12 farmers—five (5) females and seven (7) males—who were selected from 12 communities in the District, namely Koforidua, Donkorkrom, Gambia No. 1, Gambia No. 2, Yaw Brefo, Dadiesoaba, Mehame, Kenyasi No. 3, Sienchem, Ohiatua, Hwidiem, and Kojokrom.

• Sensitisation, selection and training of farmers.
• Training of agricultural extension agents (AEAs) of the District Department of Agriculture to build their capacity to monitor and backstop beneficiary farmers.
• Provision of financial support to the beneficiary farmers for the construction of appropriate housing units for the grasscutters.
• Facilitating the supply of initial breeding stock of four (4) females and one (1) male for each of the beneficiaries.

The farmers entered into a three-year agreement thus. Each female animal was expected to litter at least once at the end of the first year with an expected average litter size of three, which with four (4) females work out to 12 young animals per farmer. Each farmer was required to keep half of the young animals, i.e., six (6) and release the remainder to be given out to other farmers who became interested and were subsequently drafted into the scheme. The new beneficiaries were expected to do the same when the animals they receive litter.

At the time of the study, there was a total of 20 farmers—11 females and nine (9) males—involved in the scheme with two communities, Ntotroso and Kensere, as the new communities from where the additional beneficiaries came from.

3.2. Materials and method

3.2.1. Study area

The study was carried out in the present-day Asutifi North District (Figure 1), Ahafo Region, Ghana. The District, found in the moist semi-deciduous forest belt with its land being water-logged in many places, is located between latitudes 6°40’ and 7°15’N and longitudes 2°15’ and 2°45’W. It lies within the wet semi-equatorial zone and is marked by double rainfall maxima. The District shares boundaries with Sunyani Municipality to the North, Tano South District to the North East, Dormaa East District to North West, Asutifi South District to the West, Asunafo North and South Districts to the South West, and Ahafo Ano South and North Districts to the South East. With a total land surface area of 1,500 sq. km and land size of 936.3 sq. km, the District, which is predominantly rural, is one of the smallest in the Ahafo Region; nearly seventy per cent (67.8%) of the population is rural.
Human activities, notably farming and lumbering businesses, and occasional bush fires, have disturbed the vegetation of the District, transforming the forest in some areas into a derived wooded savannah. Such transitional zones could be observed along Kenyasi to Goamu-Koforidua. That notwithstanding, there are large areas of forest reserves. These include Biaso shelter belt, Bia Tam, Asukese, Goa and Desiri Forest Reserves. These forest reserves together cover a total of about 475.6 sq. km, which represents 31.7% of the entire land surface area of the District.

The economy of the District is mostly agrarian; most of the inhabitants are peasant farmers who largely depend on rudimentary methods of farming. Cocoa, coffee, oil palm and cashew are the major cash crops with plantain, cassava, cocoyam, and maize as food crops. However, the waterlogged nature of the land presents viable opportunities for fish and rice farming.

Of the employed population, about 58.0% are engaged as skilled agricultural, forestry and fishery workers, 11.2% in service and sales, 10.4% in craft and related trade, and 6.5% are engaged as managers, professionals, and technicians.

As high as 66.1% of households in the District are engaged in agriculture. The distribution of agricultural households by locality shows there are more households (80.2%) who are into agriculture in the rural areas than the urban areas. Most households (64.9%) are involved in crop farming with poultry (chicken) as the dominant animal reared in the District.

There are two paramountcies, namely Kenyasi No.1 and Kenyasi No.2 traditional councils, and one divisional council, i.e., Ntrotoso, within the District. The indigenes are predominantly Akans who speak mainly the Asante Twi language. However, there are some minor ethnic groups—Ewes, Wangaras, Dagombas and Kusase—which constitute about 35.0% of the population.

The District also has mineral deposits, especially gold, which presents opportunities for growth. The operations of Newmont Ghana in the area provide employment opportunities for the inhabitants as well as tourism opportunities, particularly for individuals interested in gold exploration. The quarry waste from mining operations also provides an avenue for potential entrepreneurs to venture into quarry business.
3.2.2. Data collection and analysis
We used a focus group discussion (FGD) to source primary data for the study. In determining the sample size from which to draw participants for the survey, we purposively included all the 20 beneficiary smallholder farmers of the intervention owing to the relatively small size of the sample population. However, of the 20 beneficiaries, 17 were available to participate in the discussion.

Using a semi-structured approach to aid follow-ups to responses where necessary, the investigator stimulated the topic and discussion (see Patton, 1990), asking the discussants to freely list and/or describe the benefits they have derived from the grasscutter domestication scheme or the impact it has had on them until data saturation was reached with no new ideas emanating from the discussion (see Francis et al., 2010). The FGD was conducted using a facilitator, the first author of this paper, to lead the discussion and two recorders who took notes of the discussion; the facilitator took notes as well. For ethical purposes, the purpose of the study was explained to the participants and their consent was sought for the FGD; no participant contributed to the discussion under compulsion.

We obtained secondary data in the form of details on the scheme, as presented in Section 3.1 above, from archived project documents such as concept notes and reports on the scheme from the office of the Brong Ahafo Regional Programme, ActionAid Ghana, and the then Asutifi District Department of Agriculture.

In its most common parlance, effect refers to the impact or aftermath of an event, activity, or intervention. Consequently, in analysing the data, we manually reviewed the notes from the FGD using descriptive statistics—frequency tables and percentages—to identify and categorise the effects of the scheme as described by the beneficiaries into themes.

3.2.3. Demographic details of study participants
The characteristics of the participants of the study are presented in Table 1. Despite reportedly low female-technology adoption rates (see, e.g., Theis et al., 2018), the scheme did attract and create further employment for the women within its operational area. It was female-dominated with the majority (58.8%) of the beneficiaries been females. This perhaps presents further opportunities for research as it suggests that on-farm livelihood diversification strategies through, e.g., non-conventional sustainable domestication of grasscutters and possibly other wild animals, might have the capacity to attract more

| Variable                        | Frequency |
|---------------------------------|-----------|
| Sex/Gender                     |           |
| Male                            | 7 (41.2)* |
| Female                          | 10 (58.8) |
| Total                           | 17 (100.0)|
| Age distribution (in years)     |           |
| 40 and below                    | 3 (17.7)  |
| 41–45                           | 4 (23.5)  |
| Above 45 years                  | 10 (58.8) |
| Total                           | 17 (100.0)|
| Educational level               |           |
| No formal education             | 5 (29.4)  |
| Basic                           | 6 (35.3)  |
| Secondary                      | 2 (11.8)  |
| Post-secondary                 | 4 (23.5)  |
| Total                           | 17 (100.0)|

*Percentage in parenthesis
women into agriculture as well as to empower those already in agriculture to improve their productivity and enhance their financial returns to, in turn, spur rural poverty and hunger reduction as well as rural agriculture and economic transformation efforts.

Contrary to one of the objectives of the scheme to attract the youth who were not interested in crop farming into agriculture, the scheme was largely patronised by the elderly; 82.3% of the beneficiaries were above 41 years of age. This might be attributable to two reasons. The first is the “get rich quick syndrome” pervading through modern-day society so torridly that it has captivated a high percentage of the youth who always yearn for immediate and higher returns on investment. The second reason perhaps has to do with the propagation and consequent perception of agriculture as a degrading, old-fashioned and unprofitable activity that primarily involves producing enough to eat for subsistence; such propagation is evident through, e.g., farmer parents telling their wards that they would end up like them or have no option than to help them on the farm should they fail to do well in school. The result is that the modern-day youth sees agriculture, which happens to be the prime sustenance activity for many rural dwellers, as a dirty and derogatory venture of little gratification and interest. Such perception somehow explains and supports the wider interest in off-farm diversification strategies in comparison to on-farm ones (see Basant, 1994).

Approximately 71.0% of the beneficiaries had some form of formal education. This supports the credence that educated farmers—those who can read, understand, and analyse issues—are more capable and likely to adopt modernisation in agriculture or innovative strategies in agriculture and food production, thereby corroborating an established positive correlation between the level of education of farmers and the speed with which they pick up an innovation (see, e.g., FAO, 1989).

4. Results

Overall, our results indicate that the scheme generated a marked positive effect on the beneficiaries. Not only did it generate economic benefits for them, but it also resulted in some positive impact on their communities (social benefits). We present these socioeconomic impacts in Table 2.

| Nature of Impact                                      | Frequency*          |
|------------------------------------------------------|---------------------|
|                                                      | Yes | No  |
| Increased income                                     | 14 (82.4)^a         | 3 (17.6) |
| Alternative source of income                         | 13 (76.5)           | 4 (23.5) |
| Improved diet                                        | 11 (64.7)           | 6 (35.3) |
| Source of employment                                 | 10 (58.8)           | 7 (41.2) |
| Improved ability to make purchases and pay school fees | 10 (58.8)           | 7 (41.2) |
| Reduction in the incidence of burning bushes to hunt for wild grasscutters | 8 (47.1) | 9 (52.9) |
| Derivation of pleasure and gifts                    | 7 (41.2)           | 10 (58.8) |
| Increased assets and savings                         | 7 (41.2)           | 10 (58.8) |
| Tourism                                              | 5 (29.4)           | 12 (70.6) |
| Formation of Grasscutter Farmers’ Association        | 3 (17.6)           | 14 (82.4) |
| Popularity                                           | 1 (5.9)            | 16 (94.1) |
| Regular attendance to meetings                       | 1 (5.9)            | 16 (94.1) |

*Percentage in parentheses
The data (percentages) presented to one decimal place in the table should neither be interpreted that such precision is meaningful nor construed as an excessive precision. It is thus presented to avoid too many digits, which can swamp readers, overcomplicate the story and obscure the message the data conveys (see Cole, 2015). Besides, in practice, percentages are usually given alongside their corresponding frequencies to render precision less critical since the exact values can be calculated (Cole, 2015) just as it is presented here as well as in Table 1.

4.1. Economic impact
The major benefits we identified were in terms of income generation at the household level. Whilst 82.4% of the beneficiaries indicated that there has been an increase in their income following the scheme, 76.5% pointed out that through the sale of matured grasscutters, the scheme has served as an alternative source of income for them. Consequently, we gathered that the beneficiaries were now able to save more; 41.2% of them alluded to increased savings and assets, which might be as a result of, e.g., increased cash inflow and reduction in the purchase of animal protein for their diets in the form of meat for consumption at the household level. This has created a ripple effect on the beneficiaries as they now have enhanced capacities to purchase necessities and other needs for the household; 58.8% of them disclosed improved ability to make purchases and pay school fees as one major benefit they have derived from the scheme. We also identified benefits in terms of improved diet at the household level and source of employment, which stood at 64.7% and 58.8% of the beneficiaries, respectively.

4.2. Social impact
We established that the scheme has been able to help to reduce the incidence of setting fires in bushes to hunt for wild grasscutters, which, if not well controlled, can degenerate into bush fires to destroy farms and other properties. Almost half (47.1%) of the beneficiaries revealed that the scheme has contributed to reducing the incidence of bush fires within their communities. This is as evinced through a comment of one of the beneficiaries thus.

> There has been a remarkable reduction in the incidence of bush fires within the District following the rearing of grasscutters at homes.

Additional benefits we identified include the derivation of pleasure from rearing grasscutters, and opportunities for tourism and tourism-related activities. Whilst 41.2% of the beneficiaries indicated that they were amused with rearing the animals at home since they are mostly wild and enjoy doing so, quite a small percentage of them, i.e., 29.4%, mentioned that rearing grasscutters have made their communities popular with numerous visitors to the District coming in to see the animals been domesticated as conveyed through the statement below; one beneficiary even commented that domesticating grasscutters has made him popular within his community.

> Grasscutter farming has made us popular in our community as a result of the numerous visitors who come to see our animals.

Yet another benefit of the scheme, remarked by a handful of the beneficiaries, is the formation of a farmer-based organisation (FBO) within the District to facilitate further development of the scheme and their farming business at large through, e.g., enhanced farmer-to-farmer interactions as well as interactions with the Department of Agriculture and other entities within the District that support agriculture; 17.6% of the beneficiaries alluded to such benefit.

5. Discussion
We find evidence to promote the credence that on-farm livelihood diversification strategies such as non-conventional sustainable breeding of wild animals in captivity (1) has positive attributes in boosting the welfare of the immiserated rural smallholder farmer to help to lift him/her out of poverty, and (2) could prove useful to rural agricultural development and economic transformation efforts. Contrary to the shift in interest and focus of livelihood diversification strategies away from customary on-farm activities to off-farm strategies (see, e.g., Basant, 1994), our findings evince
that the welfare of the immiserated rural smallholder farmer can equally be enhanced by diversifying on-farm portfolios to include breeding wild animal species in captivity but particularly so small animals such as the grasscutter. This is reflected in, e.g., the increased income, assets, and savings; alternative source of income; and source of employment benefits indicated by the beneficiaries to have been derived from the scheme as shown in Table 2.

Diversifying rural smallholder livelihoods through farm-level breeding or domestication of (wild) animals would facilitate quality control and planned production availability of wholesome meat under controlled on-farm conditions. This has the potential to encourage consumers to purchase meat for animal protein from the farm rather than from poachers who deliberately cut down and set fires to bushes or even use poisonous substances in some cases to hunt for wild animals to sell as a game. It would thus help to prevent or reduce the risk of consuming contaminated meat from wild animals that might have been hunted using poisonous chemicals. Accordingly, both the rural smallholder farmer and rural consumer would be assured of improvement in the nutritional strength of their diets through availability and regular consumption of wholesome meat rich in animal protein, as illustrated by the improved diet benefit in Table 2. This would, in turn, help to promote healthy growth and development among rural folks, especially children and pregnant women, and augment contemporary nutrition-sensitive agriculture efforts being promoted by the Food and Agriculture Organisati on of the United Nations and other development institutions to, among others, maximise agriculture’s contribution to nutrition—to make food more available and accessible; more diverse and production more sustainable; and more nutritious (see, e.g., FAO, 2014a, 2014b).

More so, hunting and handling bushmeat exposes humans to a plethora of genetically highly divergent viruses (Peeters et al., 2002). Consequently, with unregulated and unsustainable bushmeat trade on the increase in Africa in recent decades (see, e.g., Menz, 2015; Peeters et al., 2002) on the one hand, and bushmeat consumption increasingly linked to deadly diseases such as HIV/AIDS and Ebola (Wilkie & Carpenter, 1999) on the other hand, humans are more than ever exposed and at a higher risk to the emergence of new zoonotic infections. A case in point is the present-day respiratory disease recognised in December 2019 and subsequently named Coronavirus Disease 2019 (COVID-19) (see Fauci et al., 2020). Caused by the novel SARS-CoV-2 virus believed to have jumped its species barrier at a live and wet animal market in the city of Wuhan in Hubei Province of China (see, e.g., Hanscheid et al., 2020), COVID-19 has brought the world to a standstill with unprecedented infections and deaths leading to disruptions and socioeconomic crises arising from lockdowns and extensive mandatory quarantines of countries and cities across the globe, respectively. Such novel zoonotic threats to humanity and global health with attendant negative social and economic impact underscore the need and utility in rearing non-conventional wild animal species such as the grasscutter in captivity to, inter alia, increase food safety.

Further, the rising demand and unsustainability of bushmeat hunting and consumption leads to a further depletion of game in ever-dwindling hunting areas (e.g., Jori et al., 1995); endangers that natural capital, i.e., biodiversity, underpinning the livelihoods of many rural people (e.g., Davies, 2002); and ultimately aggravates environmental degradation and extinction of valuable wild animal species. This makes on-farm livelihood diversification strategies such as the establishment of sustainable grasscutter farms equally important to the natural environment. As our data and multiple research (e.g., Jori et al., 1995; Menz, 2015) suggest, grasscutter farming possesses environmental-related advantages such as a reduction in poaching and the incidence of (bush) fire outbreaks arising from uncontrolled fires set deliberately for hunting game that often spirals out of hand to cause destruction to farms and other properties among rural folks, thereby facilitating wildlife, forest, and environmental conservation efforts. This means on-farm captive production of grasscutters as a reliable, readily available food source, be it for commercial purposes or not, could whilst promoting conservation of the grasscutter and other bushmeat species where it is overhunted, protect local vegetation and savannah habitats under threat from intentional bushfires organised during small bushmeat hunting expeditions (e.g., Jori et al., 1995; Menz, 2015). Further, research, e.g., Jori et al. (1995) suggests that grasscutter farming has
the capacity to moderate the bycatch of other target species through the poisoning of water sources and capture via snares that do not discriminate between species.

Additionally, the formation of an FBO, as identified as another benefit derived from the scheme, also comes with its attendant advantages that could help to promote both individual and collective rural smallholder welfare, growth, and development as well as that of the rural community and economy at large. Such associations and interactions arising thereof foster unity of purpose among members, which is necessary and crucial to strengthening negotiations with both public- and private-sector bodies in anything from purchasing farm inputs and requesting support to advancing farming businesses and requesting developmental services for the community. They also foster and strengthen unity among community members for overall community development through, e.g., regular meetings that provide an avenue to deliberate on issues of concern to economic transformation and growth at both individual or household and community levels. Further, such associations could also be used as a platform to resolve disputes and conflicts faster and better at the local level.

It is worth noting that not all on-farm livelihood diversification strategies have the capacity to facilitate tourism. But when and where it does, as is the case of the grasscutter domestication scheme herein reported, which is probably because grasscutters are conventionally wild animals hunted as game, it comes with additional unintended benefits. For example, an influx of visitors into rural communities to see and learn how the animals are being domesticated could go beyond a mere attraction to the animals to, as an economic growth contributor, generating tremendous rewards to foster rural economic growth and transformation. Whilst this has the capacity to generate extra income through the creation of further employment opportunities for the rural economy, such an influx of tourists would touch and impact other activities, ventures and/or industries within the locality both directly and indirectly through, e.g., financial spending by tourists, thereby generating far-reaching positive consequences for progress, growth and development of rural folks and economies.

Moreover, with an improved capacity of the rural smallholder through on-farm diversification strategies to, in addition to the afore-mentioned positive impact, educate their children, and afford basic and other household needs, opportunities would abound to lift immiserated rural smallholder farmers and their entire households out of extreme poverty and hunger, thereby contributing to helping them to thrive in the countryside. This could further help to reduce rural-urban migration and its attendant effects such as over-population, excessive pollution, and excessive stress on amenities in urban areas.

Notwithstanding the promise of captive propagation of the grasscutter, domesticating the animal and all wild animals at large comes with its own challenges, which presents opportunities for investments and improvements in husbandry practices and perhaps in genetic factors for further development of the heretofore niche of breeding non-conventional wild animal species in captivity. Hence, our data, as reported in Table 2, might likely suggest an apparent dissatisfaction with the grasscutter domestication scheme through the “no” responses recorded in the FGD. This should however not be construed as such since research, e.g., Jori et al. (1995) has documented that factors such as exposure to weather, predators, insufficient shelter and inadequate water provision based on the inaccurate belief that the grasscutter obtains necessary water requirements solely from food sources as well as the general lack of background knowledge regarding the biology of animal inhibit growth and reproductive efficiency of grasscutters reared in captivity to hinder productivity and profitability in their domestication.

More so, domesticated grasscutters fed on forage alone do not do well compared to those living in the wild probably because those living in the wild normally obtain balanced nutrients from a variety of feeds including forages, tuber, grains, nuts, herbs, etc., in their natural habitat, which means the feed of grasscutters being reared in captivity must be well balanced in nutrients to enable good health,
Table 3. Reasons for apparent dissatisfaction with the grasscutter domestication scheme (n = 17)

| Nature of Challenge                              | Frequency* |
|-------------------------------------------------|------------|
| Financial constraints                           | 7          |
| Sexually inactive males                         | 5          |
| Lack of refresher training and poor backstopping| 5          |
| Death due to, e.g., smoke, and cold             | 3          |
| Lack of adequate housing facilities             | 2          |

*Based on multiple responses

growth, and productivity for maximum returns (e.g., Owen & Dike, 2012). Further, husbandry practices employed in the captive propagation of grasscutters impact not only the health and growth but the productivity of the animals and even their litter as well to affect their physiological potential to produce offspring. Consequently, we found that the apparent dissatisfaction with the scheme as evinced by our data stems from factors comparable to the aforementioned, which militated against maximum benefit realisation from the scheme. These factors are presented in Table 3.

Another plausible reason for the apparent dissatisfaction might emanate from how long a beneficiary had been involved in the scheme. It is unlikely that all the beneficiary farmers started rearing the grasscutters at the same time. Consequently, they might have been at different stages in propagating the animal. Whilst, e.g., old beneficiaries might have had their animals litter severely or at least once to realise nutritional or financial benefits or both through consumption and sale of some of the litter and/or their foundation stock, new beneficiaries might have still been nurturing their stock in preparation for their first litter. Hence, all the beneficiaries could not have benefited equally from the scheme at the time of the study. Yet another plausible reason for the apparent dissatisfaction might stem from theft. Owing to the relatively high demand for the meat of the animal as explained in Section 2 of this paper, it is likely that thieves might steal the animals to sell them off for financial gains.

5.1. Implications of research

Generally, our findings reinforce the substantial evidence (e.g., Barbier & Mahoney, 2009; Ellis, 2000; Yaro, 2006) that abound promoting mainstream livelihood diversification as a definitive risk management and rural livelihood improvement strategy of great promise in advancing prosperity for the immiserated rural smallholder farmer. More specifically, it confirms that on-farm livelihood diversification strategies like non-conventional sustainable breeding of wild animals in captivity are equally crucial to the sustenance of the immiserated rural smallholder farmer since, in spite of operational challenges associated with domesticating wild animals, they appear a viable option with an ability to build the capacity of the immiserated rural smallholder farmer to stabilise and improve their income, and food consumption to, in turn, improve their welfare. This means with remedied or moderated operational risks to enable greater operational efficiency of such on-farm schemes, they could have a vast potential to generate immense benefits for the immiserated rural smallholder farmer and advance rural poverty and hunger reduction and economic transformation efforts to bring rural immiseration into check.

We thus contribute to knowledge as follows. Empirical studies consistently show that diversification to off-farm livelihood strategies enables households to have better incomes, enhance food security, increase agricultural production by smoothing capital constraints, and cope better with environmental stresses (cf. Gautam & Andersen, 2016). Such research has generated a strong and wider interest in off-farm diversification strategies to promote a shift in focus away from customary on-farm activities to off-farm strategies in livelihood diversification efforts.
since the early 1990s (see, e.g., Basant, 1994). Consequently, although equally important to mitigating risks and enhancing better productivity and financial returns to improve the welfare of the rural smallholder farmer, the impact and utility of on-farm diversification strategies is not yet fully exploited in literature. Issues regarding how to achieve it, the challenges associated with its operationalisation and with what to achieve it seems missing. Accordingly, by exploring a farm-level non-conventional breeding of wild animal species in captivity scheme to (1) document the likely impact that on-farm livelihood diversification strategies could have on the immiserated rural smallholder farmer and economy; and (2) show how it could be achieved, e.g., through domesticating the heretofore wild grasscutter, we have attempted to fill this gap by showing that the rural smallholder farmer could equally be better-off by diversifying his/her on-farm portfolio to include propagating small (non-conventional) animals in captivity—which is generally done by same solely for household consumption—for sale.

This is important for two reasons. First, animal husbandry practices and the sale of livestock for immediate financial needs by rural farmers are better for small animals which mature faster and sell faster than medium (e.g., sheep and goats) and larger (e.g., cattle) ones (Annor & Djang-Fordjour, 2007). As a result, insofar as the rural smallholder farmer rear small animals not only for household consumption but also to supplement income, the income from the production of such animals could be more regular, quicker, and perhaps even higher when compared to what s/he might earn when engaged in off-farm wage-based activities. More so, low household incomes in rural areas the world over have been attributed to factors such as high reliance on food crop agriculture and low monetisation of the rural economy (Ellis & Freeman, 2004). This necessitates the need for the rural smallholder farmer to engage in a diverse portfolio of activities to mitigate as much risks as possible for enhanced livelihood and improved welfare. We thus generate enough evidence to buttress Annor and Djang-Fordjour’s (2007) disclosure that any poverty intervention programme that is likely to add new species of small animals to the production system is likely to succeed and improve the income level of the rural smallholder farmer.

Second, owing to a wide variation between livelihood activities and professional vocation development, off-farm diversification in rural areas is transitory and thus has a low impact on welfare (Dzanku, 2015). Consequently, we argue, based on the positive attributes of on-farm diversification strategies herein reported that improved livelihood and welfare of the immiserated rural smallholder farmer can only be realised when policy measures do not inhibit or disregard on-farm livelihood diversification strategies entirely. Rather, whilst making efforts to develop them further through investments and improvements for greater operational efficiency, policy measures should consider such on-farm strategies in tandem with off-farm ones to facilitate better interventions needful for rural agricultural and economic development. That way, new niches around on-farm diversification strategies to propagate non-conventional animal species such as the grasscutter to increase food safety and reduce the pressure on wildlife and negative environmental impacts to preserve biodiversity could be exploited for maximum gains and impact. This could (1) aid poverty and hunger reduction, rural agriculture and economic growth and development, as well as wildlife, forest, and biodiversity conservation efforts; and (2) help to regulate the unsustainable, illegal hunting of wild animals for food to advance sustainable consumption and production efforts deemed critical to reducing increased pollution and depletion of natural resources to accelerate economic growth and human development in Africa and the world at large.

6. Conclusion

Employing an interview-based qualitative research approach by way of a focus group discussion, we have explored the impact of on-farm livelihood diversification strategies on the welfare of the immiserated rural smallholder farmer using a real-world grasscutter domestication scheme implemented in Ghana by one of the international non-governmental organisations (INGOs) operating in the country to create foundations and opportunities for growth and development of underprivileged populations. We have disclosed that such diversification strategies are equally powerful tools, which generate opportunities and impact with plausible far-reaching consequences to induce
socioeconomic benefits necessary to advance the welfare and prosperity of the immiserated rural smallholder farmer as well as to advance rural agriculture and economic growth and development. We further document that with further development through appropriate investments and improvements in basic production parameters for greater operational efficiency and economic exploitation of rearing wild animal species in captivity, on-farm livelihood diversification efforts like the non-conventional sustainable domestication of animals such as the grasscutter could be definitive economic transformation measures of great promise for the immiserated rural smallholder farmer, which provides tremendous rewards in the pursuit of (1) improving productivity to enhance rural farm income to reduce extreme poverty and hunger to, in turn, boost the welfare and prosperity of same; and (2) promoting economic growth and transformation of rural economies.

We thus generate insights and perspectives from practice in Ghana for policy and practice in Ghana and elsewhere, where agriculture is the mainstay of rural areas, on the positive attributes of grasscutter domestication as well as the promise and role of on-farm livelihood diversification strategies to the survival of the immiserated rural smallholder farmer. When such insights and perspectives converge with similar ones from other developing economies as well as with here-tofore off-farm insights that have mostly dominated literature, the body of knowledge on livelihood diversification is enriched. This has the capacity to inform decision-making and strategising by policy shapers and activists, development practitioners and institutions including INGOs to augment country or sectoral strategic plans on poverty and hunger reduction to (1) advance the prosperity of the immiserated rural smallholder farmer; and (2) create an enabling environment through investments and improvements in sustainable practices that foster rural (agricultural) development and economic transformation.

6.1. Limitations of research

The research herein reported is not without limitations, which when overtly discussed, is not only useful for contextualising the results of the study but also essential to its trustworthiness (see Elo et al., 2014). We thus outline and address two apparent limitations of the research.

First, the research is thematically and contextually limited to a farm-level domestication of the wild grasscutter scheme. Whilst this represents a definite drawback to limit the generalisability of the study to on-farm livelihood diversification strategies, its effects are somewhat mitigated by the aim of this paper, which was to use the grasscutter domestication scheme, a real-world example of an on-farm non-conventional breeding of wild animal species in captivity, to scrutinise and clarify whether on-farm livelihood diversification strategies could indeed improve the welfare of the immiserated rural smallholder farmer in the social world. Consequently, given such focus of this paper, the many insights, and perspectives it generates about on-farm livelihood diversification strategies offer a utility to theory, policy and practice that clearly outweighs such limitation.

The second plausible limitation emanates from the standpoint of the small sample size of the research. However, as already mentioned, the aim of the paper was to use the grasscutter domestication scheme to ascertain whether on-farm livelihood diversification strategies are worthwhile to improving the welfare of the immiserated rural smallholder farmer, rather than elucidate any proportionate relationships among the effects of such on-farm strategies which could be a focus for further studies. The issue of the sample size being small in such a research framework thus has little bearing on the basic logic of the research.

Further, in using interview-based qualitative research for a case study impact assessment, it is prudent to factor in all the beneficiaries of the scheme to be able to realistically discover whatever effect arises from the scheme and account for such being as they are, no matter how partial such account is (see Crouch & McKenzie, 2006). The small sample size of our research, which nonetheless included all the 17 beneficiaries who were available to participate in the study out of a total of 20, thus enabled the lead researcher (the first author) to
get immersed in the research field to establish continuing, fruitful relationships with respondents to address the research problem in its naturalistic settings (see Crouch & McKenzie, 2006). More so, data adequacy is best appraised with reference to features that are intrinsic to the study at hand (Vasileiou et al., 2018). Hence, should one situate sample size sufficiency within the broader context of data adequacy of our study, one would find that the sample size of 17 out of a population of 20 for an early-stage scheme is representative enough.

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Author details
Lawrence G. Boakye1
E-mail: lawrence_bookye@yahoo.com
ORCID ID: http://orcid.org/0000-0001-6864-3262
Collins K. Osei2
E-mail: clkeasei@yahoo.com
Serekye Y. Annon1
1 Independent Scholar & Development Professional, Kumasi, Ghana.
2 Faculty of Agriculture, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
3 College of Agriculture Education, Asante-Mamppong, University of Education, Winneba, Ghana.

Declarations of interest
The authors declare no competing interests of interest.

Ethical declaration
The authors declare that ethical procedures were duly followed in undertaking this study. The purpose of the study was explained to the beneficiaries of the scheme and their consent sought for the focus group discussion. No beneficiary contributed to the discussion under compulsion.

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Notes
1. Formerly Asutifi District.
2. Brong-Ahafo Region was recently split through a referendum in December 2018 into 3 separate regions - Bono, Bono East and Ahofu.
3. The information in this sub-section was extracted from the latest Asutifi North District Analytical Report from the Ghana Statistical Service, https://www-ndpcstat1.c3s.amazoneaws.com/CACHESPUBLICATIONS/2016/06/06/asutifi
+north+2016/HC.pdf (accessed 23-Jun-2019)

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