

Modelling the impact of insecurity on human existence and agricultural activities

Grace O. Agaba

Department of Mathematics/Computer Science, Benue State University, Makurdi, Nigeria
E-mail: gagaba@bsum.edu.ng, omecheagaba@gmail.com

Abstract

Food constitutes one of the basic necessities of life and the availability of food supply to all and sundry provides the pedestals upon which human security is defined. In addition, the general quest for global development and advancement are often crippled in a society governed by food scarcity or insecurity. The cases of food and nutritional insecurity seems to be a worldwide challenge calling for urgent interventions, especially in this advent of banditry and herdsmen-farmers conflicts, a devastating state with enormous negative impacts on both human lives and the environs. This paper uses the concept of dynamical systems to derive a mathematical model that evaluates the impact of herdsmen/bandits attacks on the lives of farmers and their agricultural activities. The analytical outcome of the model is supplemented with numerical simulations using MATLAB mathematical applications. The results show that there exist significance influence of the exposure rate of the susceptible and the sponsoring of herdsmen attacks by some elites on the lives of farmers and the low engagement in agricultural activities. In addition, the number of migrants (including those that escape the nest of herdsmen with or without injury) increases in search for treatment and/or safety in nearby communities. The analysis of some of the model parameters also provided useful information about the system dynamics leading to possible measures in curtailing insecurity for harmonious living among herdsmen and farmers.

Keywords: Modelling, Agriculture, Herdsmen, Insecurity, Dynamical systems, Analysis

1. Introduction

The peaceful symbiotic relationship between farmers and herdsmen and the safe environment required for carrying out farming activities have been compromised over the years by the activities of herdsmen, such as destruction of crops by their cattle, indiscriminate bush burning, banditry, female sexual harassment, and the negative habits of farmers extending their farming boundaries to livestock routs and in some cases stealing or rustling of cattle (Moritz, 2003; Nzeh, 2015; Ogebe *et al.*, 2019; Omawumi, 2016). The conflict of herdsmen and farmers springs mostly from land disagreements. According to Ndubuisi (2018), the conflicts between farmers and herdsmen emanate from the unauthorized encroachment of some herdsmen into farmlands which over the years degenerated into violence and physical war involving the usage of weapons such as guns, spears, daggers, bows and arrows among others. These farmlands were in some cases initially not cultivated by the farmers thereby giving room for herdsmen using the pasture to feed their livestock but with the enormous demands for agricultural produce the available pastureland have been reduced drastically thereby compelling herders to encroach into farmlands that do not belong to them (Adeleke, 2018; Akorede, 2018; Ismaila and Bibi, 2015).

These conflicts are not limited to Nigeria as they span to several African countries such as Cameroon, Tanzania, Sudan and Kenya (Mwanfupe, 2015). In Nigeria, Farmers and herdsmen crises have spread across the entire states of the country with enormous impacts on the economic, socio-psychological and physical well-being of the people leading in most cases to loss of lives, the destruction of properties and migration of several people (Adeleke, 2018; Aliyu, 2018; Bello, 2013; Ndubuisi, 2018; Moritz, 2003; Ofuoku and Isife, 2009). According to Aliyu (2018) the effects of these conflicts also include soil erosion, poisoning of water and displacement of farmers and pastoral problems aside the loss of lives, animals and farm crops. Idowu (2017) and Okoro (2018) further states that most displaced people as a result of farmers and herdsmen conflicts are left at the care of their relatives, Internally Displaced Persons (IDPs) camps where they struggle to rebuild their lives again.

It is alarming that some individuals collaborate with herdsmen engaging in the act of banditry by sponsoring their activities to enact violence for personal gains and pursuit even when these violence lead to the loss of many lives and properties. According to the news reported by the media, in September 2016, the Civil Liberties Organisation (CLO) accused the President of sponsoring the activities of herdsmen that led to the loss of several lives and properties in Enugu State because of the type of weapons used in the process and the delayed intervention from the President (Vanguard News, 2016). Whereas, the Benue Youth Forum opined that those calling for the declaration of state of emergency in Benue 2018 were the sponsors of herdsmen's violent activities (Daily Post Nigeria, 2018). The military affirm that the persisting killings of several indigenes in the States by herdsmen were sponsored by some elites (Punch Newspapers, 2018; Sahara Reporters, 2019; Vanguard News, 2023). In addition, the President's speech during the democracy day of May 2018 assuring Nigerians that the security agencies would hurt down the culprits of such attacks and their sponsors to face the wrath of the law (Premium Times News, 2018) indicates that most herdsmen activities derive their strength from sponsorship.

Furthermore, most of these conflicts resulting to violence occur in rural farming communities crippling the agricultural activities of farmers thereby affecting food production and distribution across the country. Consequently, with much decline in food production due to loss of lives, destruction of farm crops and properties and the migration of affected individuals, millions of Nigerians are subjected to food insecurity which also calls for urgent interventions (Adeyeye, 1992; Alao *et al.*, 2019; Brinkman and Hendrix, 2011; World Bank, 1986). This paper seeks to develop a mathematical model to describe the dynamics of farmers-herdsmen conflict and its impact on human lives and agricultural activities and how it can be significantly minimize, by considering some vital control measures, for harmonious living.

2. Model derivation

Considering a closed population comprising of farmers who are susceptible to the attacks and activities of herdsmen through contact exposure gives the following model equation.

$$\begin{aligned}
S' &= bN - \frac{\beta SH}{N} + \omega E + qM - (\mu + m)S \\
E' &= \frac{\beta SH}{N} - (\alpha + \omega + \mu + r)E \\
H' &= rE - \mu H \\
M' &= mS + \alpha E - (q + \mu)M \\
X' &= \phi\left(1 - \frac{X}{K}\right)X - \eta\tau X
\end{aligned} \qquad (1)$$

where $N = S + E + H + M$ is a constant population. S denotes the susceptible farmers, E represents the exposed farmers to herdsmen/bandits, H stands for the herdsmen/bandits, M represents the individuals that are removed from the population as a result of relocation either in search of treatment or safety in nearby communities and X is the amount of plant cultivated on the land and assumed to grow logistically with ϕ and K denoting the growth rate of the plant and carrying capacity of the cultivated land respectively. The parameter η is the rate at which the plant is removed or dies as a result of natural or external impacts τ such as chemical application, poor management, bush burning etc.

The human population is considered to have an annual incremental rate b and natural death rate μ assumed to be the same. They interact with or come in contact with herdsmen/bandits at the rate β while some of these individuals are considered to collaborate with herdsmen sponsoring their violent and banditry activities that engender loss of lives and properties at the rate r. The parameter α denotes the rate at which the exposed individuals with injuries escape from their attackers while ω is the proportion of the exposed individuals that escaped from the hostage of the herdsmen/bandits without sustaining any injury. As a result of the insecurity of the environs, the people migrate to other communities at the rate m whereas, q is the rate at which the migrants returns to their homeland or original aboard when there seems to exist a peaceful or secured atmosphere for habitation.

Realistically, the production of X is considered to hinge upon the availability of human resources (farmers). Hence, the space of cultivated land or the amount of agricultural yield is generally affected negatively by the increasing number of farmers killed by herdsmen/bandits' attacks. Consequently, the agricultural production rate is thus mathematically represented as

$$\phi_n = \phi(\mu_\beta) = \phi - \frac{c_1\mu_\beta}{1 + \mu_\beta} \quad \text{where} \quad \mu_\beta = \mu(\beta) = \mu + \frac{c_2\beta}{1 + \beta}$$

In addition, government interventions through military interceptions also lead to many death cases within such military combats with herdsmen thereby influencing the death rate of herdsmen at the rate ε. Therefore,

$$\mu_\varepsilon = \mu(\varepsilon) = \mu + \frac{c_3\varepsilon}{1+\varepsilon}$$

Similarly, as already established in previous section, the activities of herdsmen/bandits affect human resources greatly such as loss of lives, injuries of several individuals with a few escaping their nest without hurt aside the destruction of properties and cultivated farmlands. The individuals that sustained injuries are taken to nearby safe locations for treatments (in most cases they are hospitalized during the whole recovery period) and the number of those that returned after certain period of time is assumed relatively to the total number of migrants. Consequently, the model equation (1) becomes

$$\begin{aligned}
S' &= bN - \frac{\beta SH}{N} + \omega E + qM - (\mu + m)S \\
E' &= \frac{\beta SH}{N} - (\alpha + \omega + \mu_\beta + r)E \\
H' &= rE - \mu_\varepsilon H \\
M' &= mS + \alpha E - (q + \mu)M \\
X' &= \phi_n\left(1 - \frac{X}{K}\right)X - \eta\tau X
\end{aligned} \qquad (2)$$

with the initial conditions: $S > 0, E \geq 0, H \geq 0, M \geq 0, X \geq 0$ where

$\mu_\varepsilon = \mu(\varepsilon) = \mu + \frac{c\varepsilon}{1+\varepsilon}$, $\mu_\beta = \mu(\beta) = \mu + \frac{c\beta}{1+\beta}$, $\phi_n = \phi(\mu_\beta) = \phi - \frac{c\mu_\beta}{1+\mu_\beta}$, $q = hm$ with $0 \leq h \leq 1$ and assuming

that $c_1 = c_2 = c_3 = c$. The system of equations (2) is defined within the feasibility region

$$\Gamma = \{0 \leq S, E, H, M \leq N, 0 \leq X \leq K\}$$

3. Steady states and their stability analysis

3.1 Steady states of the model

The analytical analysis of the model equation generates three steady states with one being a trivial case thereby implying that the system has only two realistic steady states. In the absence of herdsmen/bandits, $H = 0$, two steady states free of their activities leading to insecurity were obtain as ψ_0 and ψ_1 representing the trivial and normal (realistic) situations respectively. They are defined as

$$\psi_0 = \{S^*, 0, 0, M^*, 0\} \quad \text{and} \quad \psi_1 = \{S^*, 0, 0, M^*, X^*\}$$

where $S^* = \frac{N(q+\mu)}{q+\mu+m}$, $M^* = \frac{Nm}{q+\mu+m}$ and $X^* = K\left(1 - \frac{\eta\tau}{\phi_n}\right)$ with $\frac{\phi_n}{\eta\tau} > 1$

The third steady state is the endemic state, $\psi_2 = \{S^*, E^*, H^*, M^*, X^*\}$ representing a state of insecurity obtain when $H > 0$.

$$S^* = \frac{N\mu_\varepsilon(\alpha+\omega+\mu_\beta+r)}{\beta r}, \quad E^* = \frac{\mu_\varepsilon H^*}{r}, \quad H^* = \frac{N[\beta r(q+\mu) - \mu_\varepsilon(\alpha+\omega+\mu_\beta+r)(q+\mu+m)]}{\beta[(q+\mu)(\mu_\varepsilon+r)+\alpha\mu_\varepsilon]},$$

$$M^* = \frac{Nm\mu_\varepsilon(\alpha+\omega+\mu_\beta+r) + \beta\alpha\mu_\varepsilon H^*}{\beta r(q+\mu)} \quad \text{and} \quad X^* = K\left(1 - \frac{\eta\tau}{\phi_n}\right)$$

with $R_x = \frac{\phi_n}{\eta\tau} > 1$ and $R_0 = \frac{\beta r(q+\mu)}{\mu_\varepsilon(\alpha+\omega+\mu_\beta+r)(q+\mu+m)} > 1$. Hence, the endemic feasibility region is defined as

$$f_r = \{R_x, R_0\} > 1.$$

3.2 Stability analysis

In the stability analysis of the model, the Jacobian matrix of (2) is obtain and the simplification gives

$$J = \begin{bmatrix} -\frac{\beta H^*}{N} - (\mu + m) & \omega & -\frac{\beta S^*}{N} & q \\ \frac{\beta H^*}{N} & -(\alpha + \omega + \mu_\beta + r) & \frac{\beta S^*}{N} & 0 \\ 0 & r & -\mu_\varepsilon & 0 \\ m & \alpha & 0 & -(q + \mu) \end{bmatrix}$$

Consequently, for the trivial steady state $\psi_0 = \{S^*, 0, 0, M^*, 0\}$ the Jacobian matrix becomes

$$J_{\psi_0} = \begin{bmatrix} -(\mu + m) & \omega & -\frac{\beta S^*}{N} & q \\ 0 & -(\alpha + \omega + \mu_\beta + r) & \frac{\beta S^*}{N} & 0 \\ 0 & r & -\mu_\varepsilon & 0 \\ m & \alpha & 0 & -(q + \mu) \end{bmatrix}$$

which simplifies to the following upper triangular matrix

$$J_{\psi_0} = \begin{bmatrix} -(\mu + m) & \omega & -\frac{\beta S^*}{N} & q \\ 0 & -(\alpha + \omega + \mu_\beta + r) & \frac{\beta S^*}{N} & 0 \\ 0 & 0 & a_x & 0 \\ 0 & 0 & 0 & a_x a_y \end{bmatrix}$$

where $a_x = \frac{\beta r S^*}{N} - \mu_\varepsilon(\alpha + \omega + \mu_\beta + r)$ and $a_y = \mu(q + \mu + m)(\alpha + \omega + \mu_\beta + r)$. Hence the eigenvalues are $k_1 = -(\mu + m)$, $k_2 = -(\alpha + \omega + \mu_\beta + r)$, $k_3 = a_x$ and $k_4 = a_x a_y$.

Since $a_y > 0$, it implies that the steady state ψ_0 is locally and asymptotically stable if and only if $a_x < 0$ meaning

$$R_0 = \frac{\beta r(q + \mu)}{\mu_\varepsilon(\alpha + \omega + \mu_\beta + r)(q + \mu + m)} < 1$$

Similarly, from the Jacobian matrix, J the steady state $\psi_1 = \{S^*, 0, 0, M^*, X^*\}$ gives

$$J_{\psi_1} = \begin{bmatrix} -(\mu + m) & \omega & -\frac{\beta S^*}{N} & q \\ 0 & -(\alpha + \omega + \mu_\beta + r) & \frac{\beta S^*}{N} & 0 \\ 0 & r & -\mu_\varepsilon & 0 \\ m & \alpha & 0 & -(q + \mu) \end{bmatrix}$$

which has the same entries as J_{ψ_0}. Therefore, the steady state ψ_1 is locally and asymptotically stable if and only if $a_x < 0$ which is same as $R_0 < 1$. This affirms that there are only two realistic steady states: a steady state when $R_0 < 1$ and another when $R_0 > 1$.

Finally, the stability analysis of the endemic steady state $\psi_2 = \{S^*, E^*, H^*, M^*, X^*\}$ gives the following upper triangular matrix after simplifying the matrix J,

$$J_{\psi_2} = \begin{bmatrix} -g_1 & \omega & -\frac{\beta S^*}{N} & q \\ 0 & -g_2 & \frac{\beta S^*}{N}(\mu + m) & \frac{\beta H^* q}{N} \\ 0 & 0 & -g_4 & \frac{\beta H^* qr}{N} \\ 0 & 0 & 0 & -g_5 \end{bmatrix}$$

with $g_1 = \frac{\beta H^*}{N} + \mu + m,$ $\quad g_2 = \omega(\mu + m) + g_1(\alpha + \mu_\beta + r),$

$$g_3 = \left(\frac{\beta H^*}{N} + \mu\right)(q + m) + m^2, \quad g_4 = \frac{\beta H^*}{N}\mu_\varepsilon(\alpha + \mu_\beta + r),$$

$$g_5 = \frac{\beta H^*}{N}\frac{\beta S^*}{N} g_1 qrm(\mu_\beta + r) + g_4[g_3[\omega\mu + g_1(\mu_\beta + r)] + mg_1(m\omega + \alpha g_1) + \mu qm\omega],$$

where $g_i > 0$, $i = 1, 2, \ldots, 5$. Also, note that at the endemic steady state $a_x = 0$ since $S^* = \frac{N\mu_\varepsilon(\alpha + \omega + \mu_\beta + r)}{\beta r}$.

Consequently, the eigenvalues are: $k_1 = -g_1$, $k_2 = -g_2$, $k_3 = -g_4$, $k_4 = -g_5$, which indicates that the endemic steady state ψ_2 is always stable whenever it exists.

4. Results and discussion

The paper did some numerical simulations of the model equation using MATLAB application, in order to certain numerically the impact of farmers-herdsmen conflict on human lives and agricultural produce, to supplement the analytical results. Primarily, the stability analysis determining the feasibility region of the model using the estimated parameter values was carried out and the outcome is captured by Figure 1 showing the various regions wherein the dynamics of the model is stable and unstable.

The dynamics of the model generated by the numerical simulations affirm the analytical results obtained from the model analysis in the previous section. The basic reproduction number, R_0 when less than one generates a steady state free of insecurity, ψ_1 as shown in Figure 2a while for R_0 greater than one the dynamics of the model tend to a stable insecurity steady state as shown in Figure 2b.

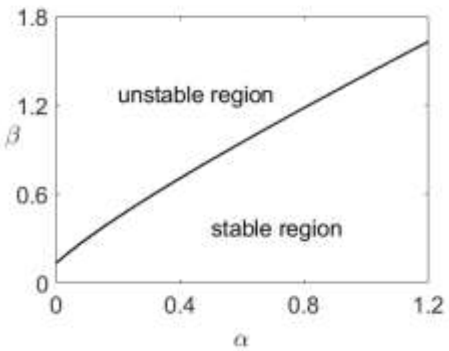

Figure 1: Stability analysis of the model equation indicating the various stability regions. Parameter values used are $\mu = 0.014$, $m = 0.032$, $\omega = 0.036$, $\varepsilon = 0.0052$, $r = 0.027$, $c = 0.58$, $q = 15\%$ of m.

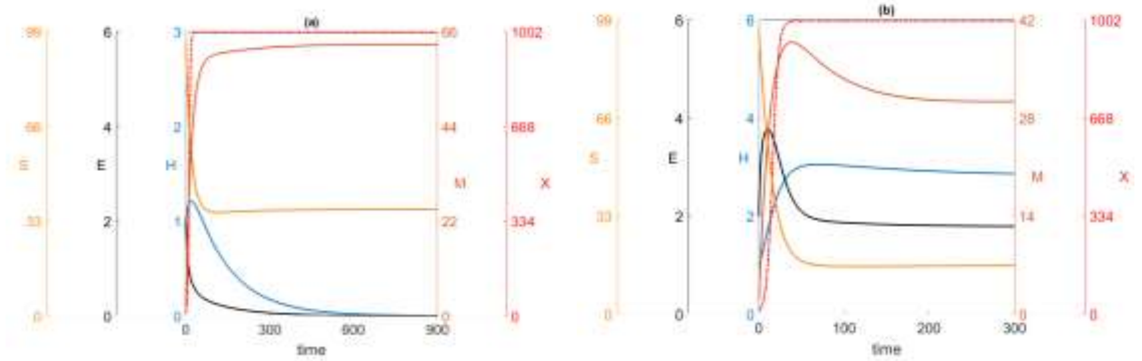

Figure 2: Dynamics of the model (a) insecurity-free steady state, $R_0 < 1$, $\beta = 0.185$ (b) insecurity endemic steady state, $R_0 > 1$, $\beta = 1.85$. Parameter values used are $b = 0.014$, $m = 0.032$, $\alpha = 0.028$, $\omega = 0.036$, $\varepsilon = 0.0052$, $r = 0.027$, $\phi = 0.45$, $\eta = 0.016$, $\tau = 0.032$, $c = 0.58$, $K = 10^3$, $q = 15\%$ of m, , $N = 100$.

Furthermore, the paper inspect the effects of some parameters of the model on the dynamics in order to ascertain their impacts and thereby derive possible control measure to cushion the effects of the state of insecurity on human lives and the environs. Figure 3 captures the outcome obtained using the parameter α, the rate at which exposed individuals escape the attacks of herdsmen with some level of injury and are relocated to nearby communities for treatment and their safety. The results indicate that as the rescue number increases, the number of migrants increases significantly while the susceptible become cautious and therefore reduces their contacts with the herdsmen and consequently, the endemic insecurity steady state tend to an insecurity-free steady state.

In addition, the outcome for increasing number of individuals escaping the attacks of herdsmen without any hurt, ω plays similar role with the impact examined when increasing number of injured individuals escape the nest of herdsmen for treatment and safety, α. The result is shown in Figure 4 indicating that the insecurity endemic steady state will eventually become insecurity-free steady state when increasing number of unhurt individuals escape from the attacks of herdsmen.

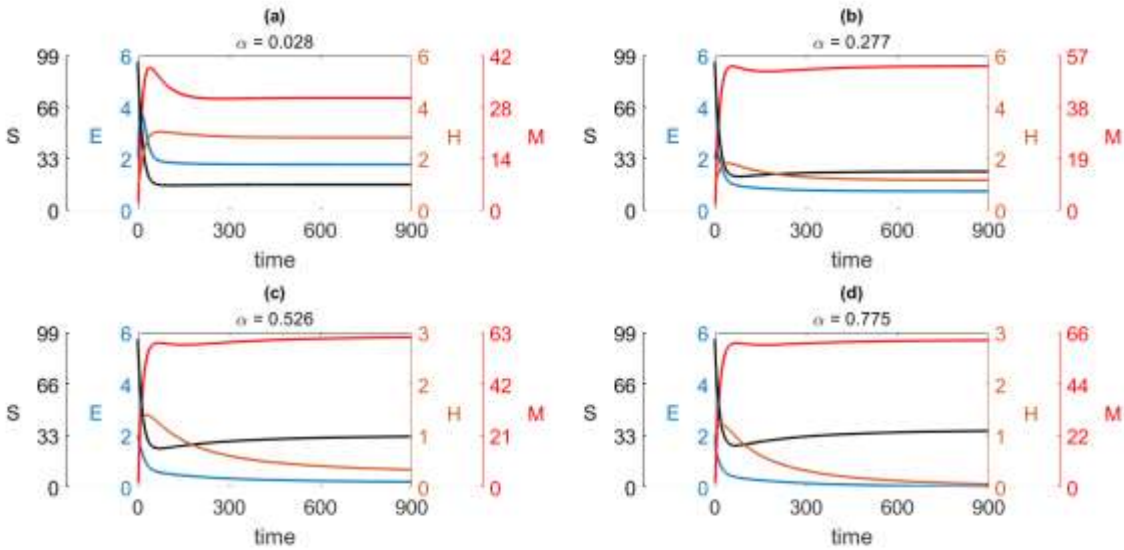

Figure 3: Model dynamics showing the impact of increased injured individuals using the same parameter values in Figure 2 for an insecurity endemic steady state where $\beta = 1.85$.

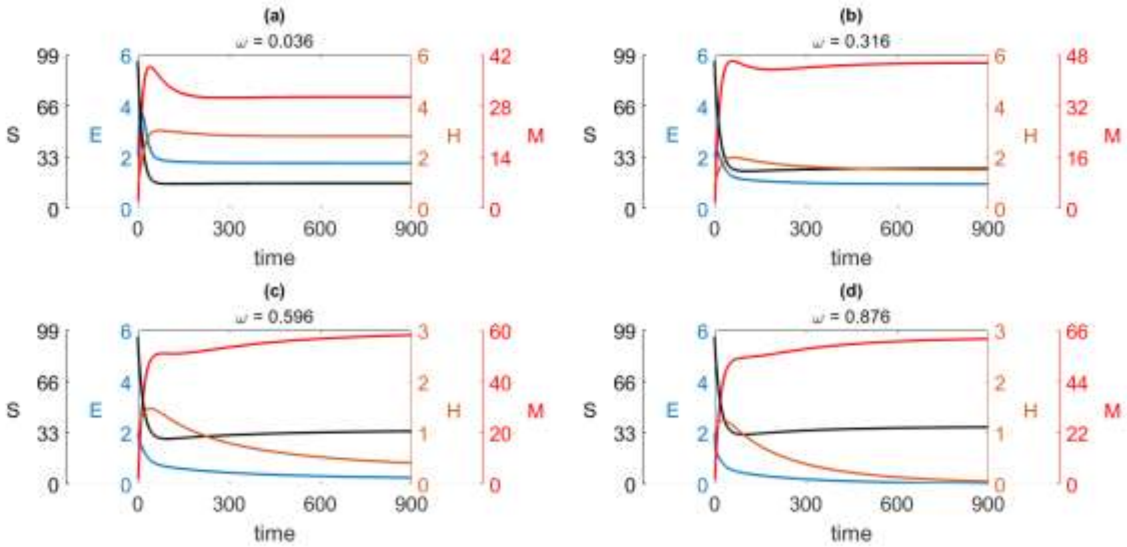

Figure 4: Model dynamics showing projection of expected results when increasing individuals seem to escape from herdsmen attacks unhurt using the same parameter values defined in Figure 3.

Figure 5 captures the numerical outcome of the model analysis showing the impact of sponsoring those violent activities of herdsmen and banditry on the dynamics. The results indicate that if the rate at which sponsors interact and support the activities of herdsmen leading to loss of lives and properties are drastically minimized the insecurity endemic state will become an insecurity-free steady state. Therefore, this portray that the security of the people also depends on the overall harmonious living environment encouraged by the elites in the society.

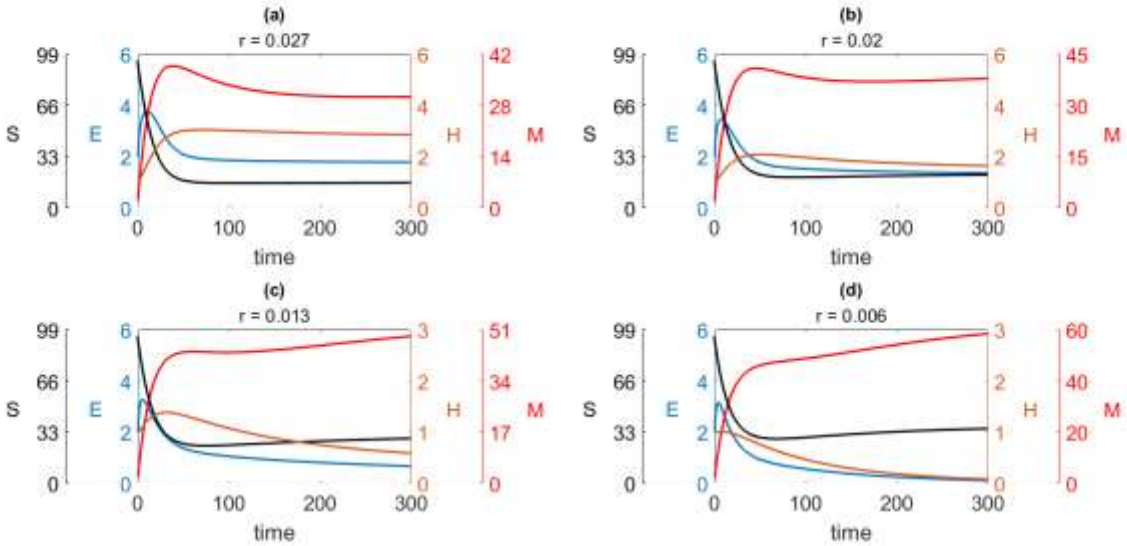

Figure 5: Model dynamics showing the influence of sponsors of herdsmen attacks on the dynamics still using the same parameter values as defined in Figure 3.

The numerical simulation also evaluates the impact of farmers-herdsmen conflicts on agricultural production and observed that as the contact rate between farmers and herdsmen increases, leading to increasing number of death and migrants, the production rate decreases. Similarly, it shows decreasing number of farmers reduces cultivation rate whereby the production of crops suffers greatly. A pictorial representation of the result is shown in Figure 6.

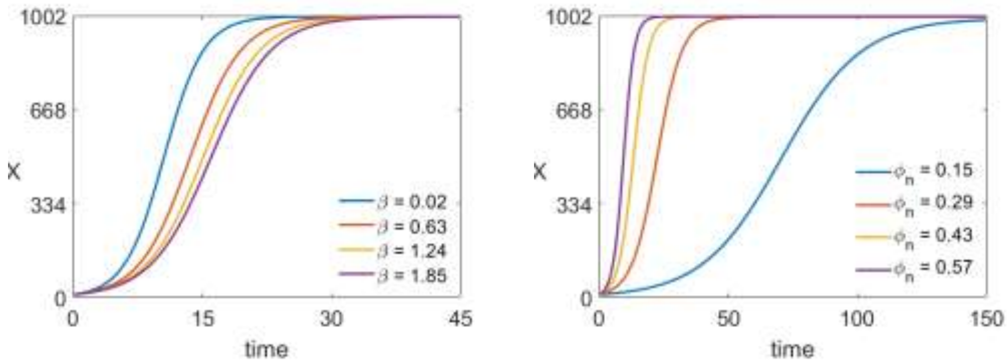

Figure 6: Showing the influence of farmer/herdsmen conflict on crop yield. Parameter values used are as defined above in Figure 3.

5. Conclusion

The enormous impact of farmers-herdsmen conflicts on human lives and the environs is a great concern that necessitated this research work. The paper evaluated the impact of insecurity emanating from farmers-herdsmen crises on human existence and agricultural activities through the application of mathematical concepts and techniques. A mathematical model representing real life scenario was derived and the analyses of the system of equations were carried out both analytically and through numerical simulations. The findings indicate that the lives of the people (farmers) and their agricultural activities are endangered when the exposure rate to herdsmen/bandits' attacks is on a high scale and also when these actions or attacks ride on the sponsorship from some elites in the society.

Consequently, as control measures, it is recommended based on the findings of the study that governmental and non-governmental agencies engage in awareness campaigns within affected areas to enlighten the people on minimizing their exposure rate and also to establish cordial existence between herdsmen and farmers. Furthermore, it is desired and expected that those in government strengthen their interventions against herdsmen activities leading to the loss of lives and the destruction of both properties and agricultural activities. More importantly, the perpetrators and sponsors of such devilish acts be made to face the wrath of the law.

References

Adeleke, M. (2018), The Increasing Spate of Killings in Nigeria: Cases, Causes and the Needful, *African Development*, 2 (2), pp.32-45.

Adeyeye, V.A. (1992), An assessment of Food Security in Nigeria. Final Report of a Study Commissioned by FAO, Rome.

Akorede, O.P. (2018), Implications of Farmers-Herdsmen Conflicts on Nigeria's Cohesion, *Journal of Multidisciplinary Studies*, 7 (3), pp.22- 45.

Alao, D.O., Shaibume, B., Ogunwemimo, T., Alao, E.M., and Ogunwemimo, I. (2019), Herdsmen/Native Farmers' Violence in Benue State and Food Security in Nigeria, *Mediterranean Journal of Social Sciences*, 10(6). Doi: 10.36941/mjss-2019-0077

Aliyu, M.K., Ikedinma, H.A., Akinwande, A.E (2018), Assessment of the Effect of Farmers-Herdsmen Conflicts on National Integration in Nigeria. *International Journal of Humanities and Social Science*, 8(10), *doi:10.30845/ijhss.v8n10p13*

Bello, A.U. (2013), Herdsmen and Farmers Conflicts in North-Eastern Nigeria: Causes, Repercussions and Resolutions, *Academic Journal of Interdisciplinary Studies Published by MCSER-CEMAS-Sapienza University of Rome*, 2(5). Doi:10.5901/ajis.2012.v2n5p129

Brinkman, H.J. and Hendrix, C.S. (2011), Food Insecurity and Violent Conflict: Causes, Consequences, and Addressing the Challenges. Occasional Paper 24. Rome: World Food Programme.

Daily Post Nigeria (2018), Herdsmen attacks: Benue youths reveal those allegedly sponsoring killings. Published on 13th January, 2018 by John Owen Nwachukwu, https://dailypost.ng/2018/01/13/herdsmen-attacks-benue-youths-reveal-those-allegedly-sponsoring-killings/, accessed online on 6th November, 2023.

Idowu, A.O. (2017), Urban violence dimension in Nigeria: Farmers and herders onslaught. *AGATHOS International Review*, 8(14), pp.187-206.

Ismaila, A.B., and Bibi, U.M. (2015), An assessment of farmer - pastoralist conflict in Nigeria using GIS. *International Journal of Engineering Science Invention.* 4 (7), pp.23-33.

Moritz, M. (2003), The demise of the nomadic contract: arrangements and rangelands under pressure in the far north of Cameroon. *Nomadic Peoples*. 6 (1), pp.127-146.

Mwamfupe, D. (2015), Persistence of farmer - herder conflicts in Tanzania. *International Journal of Scientific and Research Publications*, 5 (2), pp.1- 8.

Ndubuisi, C.I. (2018), A critical analysis of conflicts between herdsmen and farmers in Nigeria: Causes and socioreligious and political effects on national development. *HTS Teologiese Studies/Theological Studies* 74(1), a5065. https://doi.org/ 10.4102/hts.v74i1.5065.

Nzeh, E. (2015), The effects of migration by nomadic farmers in the livelihoods of rural crop farmers in Enugu state, Nigeria. *Global Journal of Science Frontier Research*. 15 (3), pp.45 – 56.

Ofuoku, A.U., and Isife, B. I. (2009), Causes, effects and resolutions of farmers-nomadic cattle herders conflict in Delta state, Nigeria. *International Journal of Sociology & Anthropology,* 1(2), pp.47-54.

Ogebe, F.O, Abah, D. and Ligom, L.S. (2019), Land Use Conflict between Farmers and Herdsmen in Gwer West Local Government Area of Benue State, Nigeria. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 12(1)(3), pp.23-31. *www.iosrjournals.org*

Okoro, J.P. (2018), Herdsmen-Farmers Conflict: Implication on National Development (Nigeria in Perspective). Presented at the 1st International Conference of Social Sciences (ICOSS'2018). Theme: "Imaged or Imagined: Africa and the Contemporary World – Issues in Security, Governance and Sustainable Development" National Open University of Nigeria. 25th – 27th June, 2018.

Premium Times News (2018), Democracy Day: Buhari pledges to deal with culprits, sponsors of herdsmen, farmers clashes. Published 29th May, 2018 by Samuel Ogundipe, https://www.premiumtimesng.com/news/top-news/270145-democracy-day-buhari-pledges-to-deal-with-culprits-sponsors-of-herdsmen-farmers-clashes/, accessed online on 6th November, 2023.

Punch Newspapers (2018), Benue: Killer herdsmen are sponsored, says military. Published 27th April, 2018, https://punchng.com/benue-killer-herdsmen-are-sponsored-says-military/, accessed online on 6th November, 2023.

Sahara Reporters (2019), 'Defeated Politicians In 2019 Elections Sponsoring Bandits, Herdsmen as Revenge' Says Buratai. Published 15th May, 2019, https://saharareporters.com/2019/05/15/defeated-politicians-2019-elections-sponsoring-bandits-herdsmen-revenge-says-buratai/, accessed online on 6th November, 2023.

Vanguard News (2023), Army sponsoring herdsmen to attack Enugu community-IPOB alleges. Published 3rd January, 2023, https://www.vanguardngr.com/2023/01/army-sponsoring-herdsmen-to-attack-enugu-community-ipod-alleges/, accessed online on 6th November, 2023.

Vanguard News (2016), Enugu Herdsmen Attack: CLO accuses Buhari of sponsoring killings. Published 1st September, 2016, https://www.vanguardngr.com/2016/09/enugu-herdsmen-attack-clo-accuses-buhari-sponsoring-killings/, accessed online on 6th November, 2023.

World Bank (1986), Poverty and Hunger; Issues and Option for Food Security in Developing Countries. A World Bank policy study, Washington.