FOOD SECURITY: ECO-FRIENDLY STRATEGIES FOR MITIGATING GREEN HOUSE GASES FROM LIVESTOCK PRODUCTION

UDUAKOBONG OKON (Ph.D)
Department of Vocational Education,
(Agriculture Unit),
University of Uyo,
Akwa Ibom State.

And

GODWIN U. UKPONG
Federal college of Education (Technical),
Omoku,
Rivers State.

Abstract

Livestock farming is a source of basic necessities of man, income, clothing and shelter. Its production has a negative effect on man, his environment and economy. This paper examined food security and processes of greenhouse gases emission from livestock farms. Greenhouse gases have been seen as one of the causes of climate change with consequences on food security and environment. Eco-friendly livestock farming strategies are hereby proposed to reduce greenhouse emission and prevent protein crisis. The strategies include; proper stock control, proper diet management, good soil conservation techniques, effective manure management and continuing education of the farmers. It is concluded that to enhance food security, livestock farming methods that negate the environmental sustainability should be avoided and deliberate policy should be designed to combat greenhouse gases emission thereby positively influencing climate change.

Keywords: Greenhouse gases, climate change, eco-friendly farming

Climate variables have been indicating changes. In Nigeria, the 2012 flood of some parts of the country is still fresh in the minds of the affected people and discourse amongst scholars and environmentalists. Variances in climate observation are indicators of environment being highly stressed. Anyadike, (2009) posited that human activities of exploration and exploitation are responsible for environmental degradation Livestock production is an aspect of agriculture which involved the rearing of farm animals for

socio-economic purposes. It accounts for about 40% global agricultural outputs providing for about 1.3 billion people. It is a sole source of animal protein in addition to employment, raw materials and value chain products. Steinfeld, Gerber, Wassenaar, Castel, Rosale and de Haan (2006) observed that livestock is a sole source of animal protein through meat milk and eggs. They further reported that livestock utilizes about 70% fodder and 30% grains, this feeding pattern contributes to the degradation, deforestation and soil compartment which lead to the production of CO_2 and other greenhouse gases. International Protocol on climate change (IPCC, 2010) and Food and Agricultural organization (FAO, 2000) remarked that livestock contributes the highest than any other aspect of agriculture to greenhouse gases. Animal belching, manure and Urine are added sources too (United States Environmental Protection Agency USEPA, 2007).

To meet the protein demand of man means that livestock farming should be carried out with future and environment sustainability consciousness, to mitigate recent issues of flooding, incessant unexpected rainfalls, harsh weather conditions, land use and food shortage which are related to climate change due to Green House Effect (GHE).This implies sustainable livestock farming activities through adoption of Eco-friendly farming strategies. These strategies seem to improve higher protein production and economic returns to the farmers as well as reduce GHE.

Food Security

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs, and their food preferences are met for an active and healthy life.(World Food Summit, 1996) . Food security implies availability, accessibility, utilization and stability of food for the citizens of particular household, community and nation. Household food security involves a situation in which all members of the household have access to sufficient, safe and nutritious food at all times to meet their dietary needs and food preference for active and healthy life (Naire,1998) In its simplest form food security is being defined as the access to food at all times (Idachaba,2004). Davies (2009) opined that food security is the possession of the means by the people to acquire and reasonable continuity and consistency in its supply. Availability of food alone does not seem to sufficiently explain the attainment of food security in a country .Food can be available in a country because of effective agricultural policy, good harvest in a particular year or massive importation of food (Ojo and Adebayo, 2012). The overall availability of food is affected by changes in agricultural yields as well as by changes in arable land. Changes in food production, together with other factors, are likely to impact food prices and will affect the ability of poor households to access food. Ojo and Adebayo, (2012) affirmed that food security in addition to other aspects mentioned must include, hygiene and safety of food to protect the health of the people.

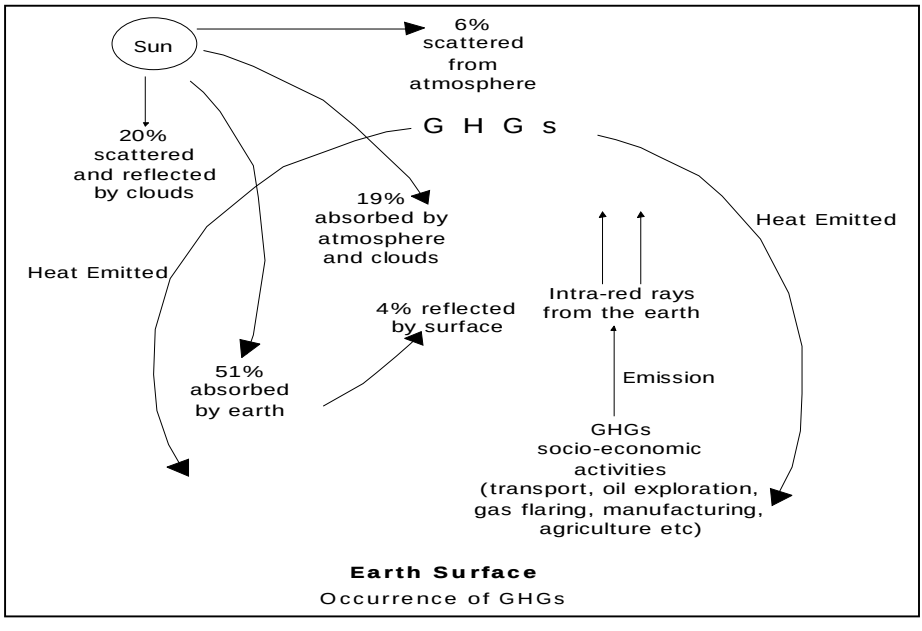
Food insecurity also hand implies unavailability of food to the people due to one or more factors, amongst the factors are poor knowledge of nutrition, low consumption , inadequate fund, poor implementation of agricultural policies, environmental degradation, food importation and use of food as instrument of politics Haile, (2005). Haile also identified low agricultural productivity, lack of agricultural policies, poor infrastructure, high cost of transport, lack of appropriate marketing strategies, frequent extreme weather event and disease burden as factors undermining food security. Clover, (2003) affirmed that food insecurity is no longer seen as a failure of agriculture to produce sufficient food at the national level but a failure of live hood to guarantee access to sufficient food at the household level.

Greenhouse Effect Concept

Greenhouse effect is natural process of sustaining heat to regulate life processes on the earth but the mechanism has been disrupted by ever increase in volume of GHGs emitted to atmosphere by human activities. According to Johnton (2007), each day the sun emits rays of light out to the earth surface. The earth absorbs part of the heat, reflects another into the atmosphere and sends out a third part in the form of infrared rays. These rays are cushioned by the clouds and water vapour which stabilize the earth's temperature under normal circumstances.

Greenhouse effect is due to higher concentration of greenhouse gases produced by astronomical volcanic eruption and human socio-economic activities (Anyadike, 2009).

Fig 1: Greenhouse Emission Illustrations

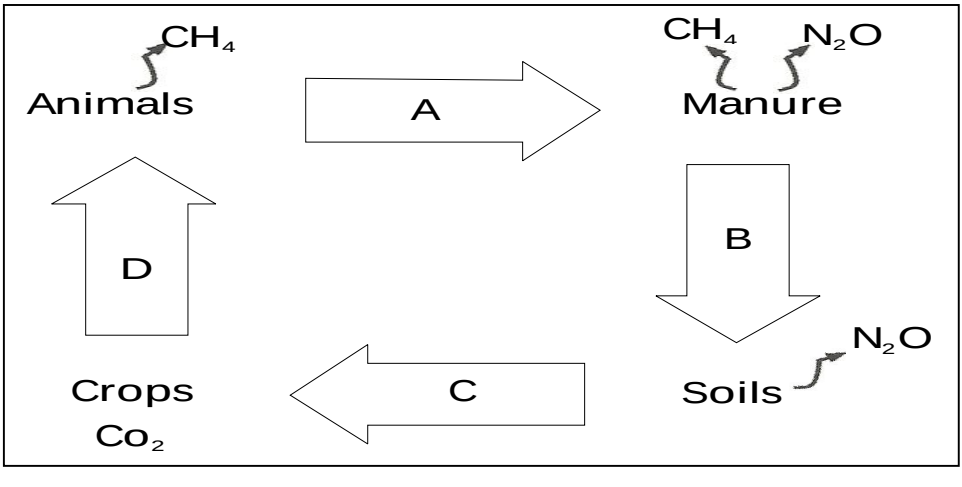


Among the greenhouse gases are carbon (iv) oxide (CO_2), methane (CH_4) and Nitrous oxide (N_2O). These gases absorbed bounce back rays from land, water and atmosphere then re-emitted at longer infrared wavelengths which heat the earth's surface.

Livestock Production and Green House Gases (GHGs) Emission

Livestock production involves the rearing of domestic animals for socio-economic purposes. It accounts for 40% global agricultural outputs providing for about 1.3 billion people worldwide. It is a sole source of animal protein through meat, milk and eggs, utilizes about 70% fodder and 30% grains. The feeding pattern of livestock contributes to the degradation, deforestation and soil compartment which lead to the production of CO_2 indirectly by livestock (Steinfeld et al 2006). Methane (CH_4) is produced through microbial (enteric) fermentation particularly ruminants and from manure (droppings/dung). Methane emission is affected by a number of factors such as animal's age, body weight, feed quality, digestive efficiency and exercise (Pautian, Antle, Sheehan, and Eldor, 2006). Belching and flatulence of animals are also sources of methane Johnson, (2000) indicated that enteric methane emissions are presumed to be the principal green house gas emitted from grassland – based systems but production intensity also influence source and relative contribution methane .

Nitrous oxide is also produced by livestock through spreading manure and applications of nitrogen fertilizers on pasture and range lands, Manure and urine from animal, once deposited on the soil emit N_2O (Steinfeld et al, 2006 & United States Environmental Protection Agency, USEPA, 2007). Intensive livestock farming associated with high ratio of grains does not only compete with man for food but induces greenhouse gases.



Emission from livestock (source: Wagner – Riddle et al 2005)

According to Food and Agricultural Organization (FAO, 2006) livestock contributes about 18% of the total global greenhouse gas emissions while about 3% of it is from Africa, attributed to management system which is emits carbon negation. In Nigeria, the distribution of greenhouse gases shows that agriculture is the second largest producer of GHGs, contributing 38.7% (Dayo, Gilau and Samuel, 2009).

Effect of Global Warming on Livestock Productivity

Greenhouse effect induces global warming, which has direct and indirect consequences on livestock productivity. Some of the consequences include;

1. **Economic losses to Farmers:** The overall performance of the animals may be determined using defined relationship between climatic conditions and voluntary feed intake. Madder, (1999) reported that ingestion of feed is directly related to heat production, any change in voluntary feed intake and energy density of the diet will change the amount of heat produced by the animal. Heat production correlates inversely with gross energy losses.

2. **Feeds and Feedlot Unavailability:** In Nigeria 90% of livestock in Sudan – Sahel region will be inadequately catered for as forage production will be affected due to scanty rainfall and intensive sunshine. Food crisis experienced by some countries was a result of grain dropping harvest, which was short by 93 million tons in 2003 (FAO, 2006). Climate impacts on grain harvest and forage quality.

3. **Diseases and Pest Prevalence:** Life cycles of pests and incubating period of diseases are influenced by climate change. Areas of increase in rainfall associate with high humidity couple with higher temperature end in greater development of diseases (Baylis and Gilhet, 2006). Also much pressure from insects and disease vectors will be noted. New diseases, immigrant pests and vectors with their destructive modes will make livestock production more complex. Baylis and Githeko (2008). A pathogen or parasite may change its interactions with host animal. Anyadike, (2009) reported new cases of unknown diseases and more pathogenic fungi are likely to be recorded in different areas. The immune system of the animal becomes a common targets.

4. **Problems of adaptability and biodiversity among livestock:** With global warming, heat is at the increase leading to reduction in pasture and surface water, induced salinity and temperature and precipitation changes in many regions, the adaptability and biodiversity of livestock account is negatively impacted. Within the geographical range and beyond tolerance level some species of livestock may go into extinction or phenotypic plasticity. In warmer climate, breeds that are heat tolerant are generally those that have lower productivity. Extreme environmental conditions are dangerous.

5. **Problem of reproduction and production:** Climate change has effect on conception rates. Hahn (1995), reported that conception rates reduces by 4.6% and a decrease in pregnancy rate for each unit change. It is clear that climate changes have potential to affect conception rates of domestic animals not adapted to those conditions. However, rapid changes in environmental conditions or extended periods of exposure to extreme conditions drastically reduce productivity and potentially life threatening (Adams et al, 1999).

Eco-friendly Farming Strategies to Mitigate GHGs Emission from Livestock

Demand for meat, milk and eggs are at increasing or geometric progression (FAO, 2000). Emerging issue like green house gases which induced green house effect with its adverse consequences on food chain are relevant concerns. Therefore the following strategies may be used;

1. **Efficient and effective soil conservation Technique:** Organic cultivation of forges and legumes is a sure way out of using nitrogen-based artificial fertilizers on pasturelands .The nitrogen-based artificial fertilizers change the nitrogen cycle in a greater magnitude and N_2O is emitted to the environment. Organic cultivation in another hand utilizes droppings and dung (manure) from livestock. During forages and legumes cultivation, the soil should be given minimal tillage; clean clearing and chemical weeding are to be avoided. Trees should be planted on rangelands.

2. **Proper management of manure:** Droppings and dung from livestock are useful sources of bio fuel, organic fertilizers and feedstuff for the same livestock. The utilization level depends on available facilities and methods of management. For instance allowing the manure to decompose on the open air means increase the quantity of CH_4 and N_2O in the atmosphere. De-conditioning the manure through a good waste management facility yields bio fuel, organic fertilizer and feedstuff. The production of bio fuel (bio gas) reduces fuel wood collection, deforestation and provides slurry for manure (Johnston, 2007 & Kaufman, 2007). As organic fertilizer, time of collection, proper processing and incorporation into soil are important factors that livestock farmers should be trained on.

3. **Stock Control and Good Pastureland Management:** An effective strategy to reduce CO_2 from livestock is to control the stocking rate. Over population induces much pressure on forages particularly under intensive system for direct grazing animals. Verge, Kline, and Desjardins, (2007) reported that in recent years, industrial livestock production has grown at twice the rate of more traditional mixed farming and more than six times rate of production is base on grazing. Again, the number of animals in a particular range determines the nature of soil degradation and volume of GHGs emission. The digestive gut of ruminant and

non-ruminant livestock breeds differ significantly and their rate of GHGs emission depend on their digestive guts. The stock man should bear these issues in mind to affect his choices. (Low External Input and Sustainable Agriculture (LEISA), 2008).

4. **Changing Diet and Standard of Diet Production:** Industrial livestock production goes with relatively more concentrated feeds and feeding methods. The ability of the animals to convert these feeds to quality meat, milk and eggs reduces the emission of GHGs. The quality of the diet is a factor in feed conversion,. The stock man should have choice of changing diet depending on parameter of utilization by animal (Pollen, 2002 &Connolly, 2007)

5. **Planting of trees around livestock buildings and in ranches:** In organized settlement farms are separated from residential areas, but with urbanization most of these farms are in the cities. Therefore, planting trees around the farm to provide shelter and absorb some of gases emitted from the animals should be ideal practices

6 **Livestock farmers should be provided with continuing education and training**

There have been various topical issues raised on the subjects of environment and agriculture in Africa especially in Nigeria which the farmers should be educated /enlightened and trained to enable them contribute effectively to food production.

Conclusion and Recommendations

Greenhouse effect is catchall at the heart of global warming and climatic change. Life continuity needs a balance eco unit supported by greenhouse effect but numerous greenhouse gases (GHGs) have eclipsed the atmosphere causing harm to environment. Livestock as a micro contributor to GHGs emission becomes a victim at long run. As victim, animal protein requirement by human is negatively affected. To sustain food security GHGs emission should be mitigated through proper diet management and formulation, organic soil conservation techniques, planting of trees around the farm and proper manure management. This paper also recommends that governments should organize training for livestock farmers to build their capacity on appropriate utilization levels of livestock droppings and dung as sources of bio fuel, organic fertilizers as well as provide facilities for effective methods of management of GHGs.

References

Anyadike, R. N. C. (2009). Climate change and sustainable Development in Nigeria. Agriculture, Policy and Extension. *Paper presented at the National Conference on Climate change and the Nigeria Environment UNN, 29 June-2nd July.*

Baylis M. & Gilhet A. (2006*)*. The effect of climate change on infections diseases of animals. *Encyclopedia of sustainability Science and Technology Springer.*

Baylis, M. & Githeko A. K. (2008). Effect of climate change on infectious diseases of animals. *Journal of Animal Science.* 85 421-432.

Connolly, K. (2007). Pill stops Cow burps and helps save the planet. *Guardian*: London, England. 23rd. Clover, J (2003) Food Security in Sub-saharan African Security Review Vol 12 No 1

Davies, A.E (2009).Food Security Initiatives in Nigeria: Prospect and Challenges. Monograph. Department of Political Science University of IIorin ,Nigeria.

Dayo, F. B., Gilau A. & Samuel M. (2009). Nigeria's Perspective on climate change mitigation: International Centre for Energy, Environment and Development *ICEED, working paper: Abuja Nigeria*.

FAO (2006). Livestock a major threat to the Environment: Remedies urgently needed www.fao.org/newsroom/en/news/2006/1000448/index.html. Retrieved March 28, 2011.

Food and Agricultural Organisation, FAO (2000). Food Nutrition and Agriculture; Alimentation Nutrition and Agriculture from Farming to Security.Rome,*FAO 119* PP4-12.

Haile ,M.(2005).Weather Pattern ,Food Security and Humamittarian response in sub-saharan Africa in Philosophical tracsaction.Biological sciences 360 ,1463.*The Royal Society Online Journal.* www.inasp.info/en/network/publishers/52 .Retrieved 6th February, 2013

Intergovernmental Panel on Climate Change IPCC (2010). *Impact, adaptation and vulnerability. Contribution of working Group III of the IPCC on climate change.* London: Cambridge University Press.

Idachaba, F.(2004) Food Security in Nigeria Challenges Under Democratic Dispensation. *Paper presented at ARMTI, IIorin ,kwara state 24th march.*

Johnston, T. (2007). Tyson Terms with Conoco Philips to produce Renewable Diesel fuel. www.reliableplant.com/Read/5853/conocophillips. accessed 23rd March 2011

Kaufman, M. (2007). *New allies on the Amazon: McDonald's Green Peace Unite to prevent rainforest clearing.* Washington Post. Washington, DC.

LEISA (2008). Dealing with climate change. *A magazine on low External Input and sustainable Agriculture* 24. 4.

Madder, T. L. (1999). Environmental stress in control beef cattle. *Journal of Animal Science* (81) 110-119.

Ojo,E.O. & Adebayo,P. F.(2012).Food Security in Nigeria :*An Overview. European Journal of Sustainable Development* 1,2 pp199-222.

Pautian, K., Antle M., Sheehan, J. & Eldor P. (2006). *Agriculture's role in Green House Gas mitigation.* Washington DC. Dew center on Global climate change.

Pollen, M. (2002). *The Omnivore's Dilemma: A natural History of four meals*. New York Penguin Press.

Steinfeld, N., Gerber, P., Wassenaar T., Castel V., Rosales M.; de Haan C. (2006). Livestock's long shadow: *Environmental Issues and Options* Rome: FAO.

United States Environmental Protection Agency, (USEPA, 2007). *Environmental Protection Agency Inventory of U.S* .Washington DC. Green House Gas Emission and Sinks.

Verge, X. D. C., De Kline, C., Desjardins, R. L. (2007). *Agricultural Production, green house gas emission and mitigation potential Agricultural. forest meteoro*l 142: 255-269.