Options of making livestock production in West Africa "climate-smart"

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Paper presented at the All Africa conference on Animal Agriculture, Accra, Ghana, 29 July-2 August 2019

Abstract

Recent analysis suggests that developing world regions contribute about two third of the global emissions from ruminants, with sub-Saharan Africa a global hotspot for emissions intensities, largely due to low animal productivity, poor animal health and low-quality feeds. These numbers suggest, therefore, that there are opportunities for easy gains to be made in terms of mitigation in the livestock sector and reduced emissions per unit of product. In this context, climate smart agricultural practices are necessary in West Africa region and in sub-Saharan Africa in general. Although there are many research and analytical efforts to minimize the impact of climate change on agriculture and livelihoods in Africa by various actors, there is however, no coherent documented state of knowledge of livestock-based climate-smart-agricultural (CSA) practices in West Africa. Identifying and documenting successful livestock-based CSA practices has been a challenge. To this end, the study synthesized current knowledge on climate smart (CS) options related to livestock production in West Africa, some experiences, lessons learned and identified gaps in knowledge. Building on these, the paper provided broad researchable areas to promote both adaptation and mitigation activities in the development of future projects. We concluded that livestock climate smart practices are highly context specific, and may involves trade-offs between productivity, adaptation and mitigation. Therefore, stakeholder consultation is important when deciding which climate smart practice to implement. Successful CSA strategies require investment in infrastructure that support smallholder farmers in understanding climate change, developing and refining strategies and evaluating CSA options. In addition, policy and institutional support is crucial to produce an enabling environment for both research and farmers to implement livestock-related climate smart agriculture.

Keywords

climate smart agriculture, herd management, livestock sector, West Africa.

Introduction

Climate change is one of the greatest challenges to sustainable development in general and food security in recent history. As a global phenomenon, developing countries are more exposed to the hazards of climate change and less resilient to them (Morton, 2007). Its negative impacts are more severely felt by poor people in developing countries who rely heavily on the natural resource base for their livelihoods. The livestock sector is one of the major contributors in agriculture, by some estimates contributing up to 18% of the global GHG emissions (Thornton and Herrero, 2010). Recent analysis by Herrero *et al.* (2013) suggests that developing world regions contribute about two third of the global emissions from ruminants, with sub-Saharan Africa a global hotspot for emissions intensities, largely due to low animal productivity, poor animal health and low-quality feeds. These numbers suggest, therefore, that there are opportunities for easy gains to be made in terms of mitigation in the livestock sector.

The biggest impacts of climate change are going to be seen in livestock and mixed systems in developing countries where people are already highly vulnerable (Thornton, 2010). The impacts that climate change will bring about are expected to exacerbate the vulnerability of livestock systems and to reinforce existing factors that are simultaneously affecting livestock production systems such as rapid population and economic growth, increased demand for food (including livestock) and products, increased conflict over natural resources (i.e. land, water etc.). Important effects of climate change on livestock production is changing the animal feed resources. Indirect effects on feed resources can also have a significant impact on livestock productivity (Getu, 2014). Others include drought and delay in the onset of rain led to poor regeneration of grass, water shortage and heat stress in livestock (Abate, 2009; Digambar, 2011), increased mortality of livestock, vulnerability to diseases and physical deterioration due to long distance travel for water and pastures (Abate, 2009). Direct effects of climate change include high temperatures and changes in rainfall patterns, translating in an increased spread of existing vector-borne diseases and macro parasites in animals as well as the emergence and spread of new diseases (FAO ,2008) the. And for rural communities, losing livestock assets might lead to the collapse into chronic poverty with long-term effects on their livelihood (IFAD, 2011). Adapting to climate change is a must for West Africa region, especially for the livestock provide 44% of agricultural Gross Domestic Products. Identifying changes in agricultural practices especially in livestock production that result in effectively adapting to site specific effects of climate change and their potential barriers to adoption is essential to address challenges of food security and climate change.

Although there are many research and analytical efforts to minimize the impact of climate change on agriculture and livelihoods in Africa by various actors, there is however, no coherent documented state of knowledge of livestock-based CSA practices in West Africa. To this end, this study is an attempt to synthesize current knowledge on climate smart (CS) livestock production in West Africa and identify gaps in knowledge. This report presents some of the experiences and lessons learned regarding climate-smart agriculture in relation to livestock production in West Africa with specific concentration on Burkina Faso and Mali. Building on these, the paper provides broad researchable areas associated with smallholders and pastoralists to promote both adaptation and mitigation activities in the development of future projects.

Climate smart Agriculture: concept and principles

Climate Smart Agriculture (CSA) is an approach that provides a conceptual basis for assessing the effectiveness of agricultural practice change to support food security under climate change. The aim of CSA is to integrate climate change in agriculture and make agriculture adapt to climate change and to reduce emissions (or mitigation) that causes climate change. Livestock production systems are considered to be “climate-smart” by contributing to increasing food security, adaptation and mitigation in a sustainable way. Any livestock management practice that improves productivity or the efficient use of scarce resources can be considered climate-smart because of the potential benefits with regard to food security, even if no direct measures are taken to counter detrimental climate effects (Ayantunde *et al.*, 2015). CSA is not a single specific agricultural technology or practice that can be universally applied. It is an approach that requires site-specific assessments to identify suitable agricultural production technologies and practices. According to FAO (2010) climate smart agriculture aims at:

1. Sustainably increasing agricultural productivity and income
2. Reduce climate change vulnerability (enhance adaptation),
3. Reduce emissions that cause climate change (mitigation), while
4. Protecting the environment against degradation and
5. Enhancing food security and improved livelihood of a given society.

In addressing climate change adaptation for livestock-based livelihoods, Ayantunde et al., 2015 listed key questions to consider:

1. Which types of livestock management are suited to climate change and where?
2. Which animal species and breeds should be kept in which areas and what are the trade-offs?
3. Are there current livestock-based livelihood systems in the region that are best suited to climate change adaptation?
4. How can we add value to the existing livestock-based adaptation strategies?
5. Are there policy and institutional mechanisms to enhance adaptation of livestock production systems to climate change and variability?

6. How could the capacity of rural institutions be strengthened to use appropriate tools and strategies to cope better with consequences of climate change?
7. How could we balance the need for short-term adaptation, which is often reactive, with long-term climate change adaptation planning? At community level, climate change adaptation should be considered in the context of other significant drivers of change (demographic change, economic development, market opportunities).

Existing knowledge on livestock-related climate smart agricultural practices in West Africa

In West Africa, there is obviously paucity of information on livestock-oriented climate smart practices, although, there are several crop-targeted projects based of CS principles. Most information at this stage is either on modelling, scooping of mitigation strategies or on resilience of livestock farmers. However, in other parts of Africa, East Africa for example (CCAP 2013; UNEP 2009) many livestock options for climate smart agriculture had been tested and documented while others are at the scaling up level (Kipkoech *et al.*, 2015). Despite this, a few interventions suggested for sustainable intensified livestock production in West Africa has been identified within the current context and described below. These interventions are grouped into three major types namely: **Feed related interventions, livestock production management and environmental management.**

Table 1 Summary of livestock production intervention in West Africa and ways of improving their climate-smartness

	Management objectives	Practices/ Technologies	Knowledge gaps	*Aggregate assessment			
				Food security	Adaptive capacity	Mitigation of GHGs	Suggested ways of improvement
Feed related interventions related	Fodder cultivation	Dual purpose legumes; Forage grass and legume cultivation; Fodder bank	1. Difficult to assess the impact of these feed improvement intervention in the context of climate smart practices because above interventions were not setup with the initial intention of climate change mitigation 2. Fodder production in most cases requires relatively secured land tenure to ensure that farmers who invest effort in cultivating the fodder species retain the right to exclude others from harvesting it. 3. For farmers who are convinced of the value of improved forages, availability of seeds and planting materials often form a bottleneck 4. The other major challenge to grazing management is the large-scale livestock movements (transhumance) in the region from the dry areas to the wetter zones in search of pasture and water in the dry seasons.	+++	++	++	The use of improved seed and adapted species. Grass-legume mixture will reduce the use of inorganic fertilize, increase sequestration and feed quality
	Forage conservation	Harvesting and conservation of natural and cultivated pasture in form of silage and hay		+++	+++	++	The condition for its realization requires careful selection of species, harvesting at vegetative stages, heights and at proper weather condition. Technical training on conservation technique.
	Forage quality improvement	Supplementary feeding using concentrate and by-products; Urea treatment of crop residues		+	++	+++	Improving the feed value chain to facilitate delivery of agricultural by-products from producer to farmers. Improvement of storage facilities for the by-products.
	Forage integration	Forage legume incorporation into arable cropping		+++	+	++	Its contribution to adaptation to climate change can be improved by involving ploughing partitioned and improved seeds
	Grazing management	Rotational grazing; Controlled grazing; Adjust stocking densities to feed availability		++	+++	+++	Requires a planned and well controlled movement. Awareness and training of pastoralist on their rights and duties, and laws regulating mobility and transhumance. Improve market linkages
	Crop-livestock-tree	Shade trees have impacts on reducing heat stress on animals and contribute to improve productivity, improved forage value		+++	+++	+++	Development of early maturing tree species with high biomass yield. Institutional and policy support for the production of tree seedlings adapted to different agro-ecological zones.
	Conservation agriculture	Improve soil condition and promote high yield and consequently crop residues		++	+	+	The use of cover crops with no forage value while crop residues are harvested for livestock feed
	Agricultural Water Management solutions	Water storage options (Zaï, demi lune, rainwater harvesting, small reservoirs)		+++	+++	++	Increasing fodder production during wet season and provide dual cropping season to improve feed access and water availability during the dry season
Livestock management intervention	Herd management	Species diversification	1. Among the Fulani, the principal pastoral ethnic group in West Africa, a shift from cattle to small ruminants will require overcoming a significant	+++	+++	++	Institutional and policy support for incentive for farmers

	Breeding strategies	Alteration of animal species and breeds	cultural barrier since cattle represent such a central part of the group's identity. 2. Matching type of animal kept and the nature of the livestock production systems remain a major problem most breeding intervention	+++	++	++	Institutional and policy support for animal breeding projects.
Environmental management	Manure management	Anaerobic digesters for biogas and fertilizer.	This option has not been well documented and practiced in West Africa unlike the other parts of Africa	+++	+++	+++	Efficient treatment of manure can reduce the emission of GHGs and raise agricultural productivity
		Composting, improved manure handling and storage, (e.g. covering manure heaps) application techniques (e.g. rapid incorporation)	Appropriate interventions need to focus on improving manure management to ensure that manure quality is not loss before applying it.	+	++	++	Its contribution to climate change adaptation can be improved associating the practice of Zaï, micro-irrigation, stone bunds and filter bunds

Food security / adaptation / mitigation potential: + = low; ++ = medium; and +++= high
*This general assessment may be varied in different locations

Making livestock production practices more 'climate-smart' in West Africa.

In view of above assessment for transforming livestock agriculture to underpin climate resilient livelihood systems and foster food and nutrition security as well as sustainable natural resources utilization, agricultural transformation in relation to livestock through CSA will require the following necessary actions:

Adaptive forage Improvement

Promoting adapted pasture species will play a major role in reducing vulnerability of feed resources to climate change. This improves preparedness for harsh climate induced conditions on livestock production itself and thus substantially raising survival rates and livestock performance due to availability of feed resources (Assan, 2014). Forage varieties with multiple attributes to overcome a range of biotic and abiotic constraints induced by climate change are needed.

Improved rangeland and grazing management

The starting point to improved rangeland management can be allocation of land to pastoralists for grazing. Allocation of land to pastoralist will encourage them to manage it and practice control grazing (Tumbo *et al.,* 2011). Grazing lands can also be rehabilitated by planting improved grass and fodder trees but few studies in SSA are available on this aspect. These management practices are likely to result in increased carbon sequestration through the restoration of degraded rangelands and changes in land uses.

Agro-silvo-pastoral practices

Improved integration of trees with crop-livestock systems do not only increase productivity of the farming system but also provide complementary crop residues to feed livestock, especially in rural communities where forage crops are rarely grown specifically for livestock. Breeding priorities for future trees need to be identified through close interaction between breeders, farmers and climate and global change scientists, and then the breeding strategies need implementation through appropriate investment.

Breeding adaptive animal

For the optimal utilization of the adaptation traits harboured in all breeds, research in genetic characterization and understanding adaptation in stressful environments needs to be strengthened. Developing methods for characterizing adaptive traits relevant to climate-change adaptation (heat tolerance, disease resistance, adaptation to poor diet, etc.) and for comprehensive evaluation of performance and use of animals in specific production environments will be an attractive option.

Improved manure management

Low-cost implements suitable for manure collection and spreading, and appropriate institutional arrangements to strengthen complementary interactions between farmers and herders, will improve manure utilization, consequently mitigate methane emission, improve soil fertility and increase food security.

Appropriate institutional support

Strong institutional support is required to: promote inclusivity in decision making; improve the dissemination of information; provide financial support and access to markets; provide insurance to cope with risks associated with climate shocks and the adoption of new practices; and support farmers' collaborative actions.

Promote a more conducive and inclusive policy

Governments and policy makers should craft country specific CSA policies that can help farmers especially livestock keepers, cope with the adverse effects of CC. Farmers need policies that remove obstacles to implementing CS practices and create synergies with alternative technologies and practices. Policy makers should harmonize and bring together the various scattered CS practices. A related policies, projects and programmes into one which is comprehensive and accessible by all stakeholders. Considerable policy support and capacity enhancement is needed for climate risk management including insurance and safety nets as well as improved access to weather information adapted to farmers' needs.

Gender mainstreaming of CSA options

The roles and the rights of women livestock keepers are often overlooked, and development is frequently skewed towards the interest of men, yet women are responsible for most sedentary care of livestock and play an active role in on-farm livestock duties and in the marketing of products (milk). Efforts to build resilience in livestock keeping communities therefore requires particular emphasis on building the resilience of women and enabling them to adapt to climate change.

Conclusion

Livestock remain a key component in the rural agricultural setting in West Africa. It provides the much-needed inputs into crop production, provides key source of income and to rural livelihood as well as augmenting their nutrition. Mainstreaming livestock practices that are climate smart should be the goal of any research for development in West Africa. We therefore conclude that:

(i) Livestock Climate smart practices are highly context specific, and at times involves trade-offs between productivity, adaptation and mitigation. As such, stakeholder consultation is important when deciding which climate smart practice to implement, as factors such as labour availability and agro-ecological conditions may constrain outcomes.

(ii). Successful CSA strategies will require investment in infrastructure that support smallholder farmers in understanding climate change, developing and refining strategies and evaluating CSA options.

(iii). Strengthen farmers' access to and understanding of information, through improved communication approaches and stronger extension services, including improved extension methodologies and practices based on farmer participation expanded farmer field schools (and "pastoralist field schools") will be crucial for the actualization of climate smart livestock production

(iv) Policy and institutional support is crucial to produce an enabling environment for both research and farmers to implement livestock-related climate smart agriculture.

Acknowledgement

The review was carried out with funding by CGIAR Fund Donors under The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

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