REVIEW ARTICLE

# Extension Approaches and Advisory Services for Climate Smart Livestock (CSL): An Overview

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## Abstract

Climate Smart Livestock (CSL) farming is a collection of different technical solutions to reduce the impact of climate change on livestock and vice versa. They include both mitigation and adaptation strategies, which will sustainably increase cattle productivity, offer adaptability, and reduce greenhouse gas emissions while ensuring food security. The role of extension and advisory services is essential for sustainable climate-smart livestock farming as well as combating climate change in developing countries like India, where the majority of livestock farmers are marginal to small, as these services are key in creating awareness, motivating adoption, and facilitating the implementation of suitable practices and technologies. Extension providers can play a major role in supporting climate-smart farming through technology development and information dissemination, strengthening farmer's capacity, facilitation and brokering, and advocacy and policy support. In this context, the article covers CSL and its essential adoption needs, Extension approaches for CSL, and CSL and rural advisory services.

**Key words:** Climate Change, Climate-Smart Villages, Extension and Advisory Services, Livestock Calendar.

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## Introduction

Climate Smart Livestock (CSL) is a collection of different technical solutions to reduce the impact of climate change brought on by global warming on livestock and vice versa. Climate Smart Livestock is a necessary solution to curb the worldwide issue of increasing greenhouse gas (GHG) emissions. As per FAO & New Zealand Agricultural Greenhouse Gas Research Centre (2017), the climate-smart livestock approach is a holistic strategy aimed at fostering sustainable livestock production systems that actively contribute to: climate change adaptation and mitigation endeavours, ensuring food security, facilitating sustainable incomes, enhancing animal welfare and minimizing environmental impact.

The measures that can sustainably increase cattle productivity, offer adaptability, and reduce greenhouse gas emissions (mitigation) while ensuring food security are highlighted by CSL. According to Kadzere (2019), there is an urgent need to alleviate the negative effects of climate change on livestock production to meet growing demand for livestock products worldwide. Livestock depends on environment and natural resources which are affected by climate change. Climate change affects livestock through increased temperatures, altered rainfall, heat waves, droughts, floods, and shifting seasonal patterns. These changes lead to reduced feed quality and yield, increased disease incidence, and heightened resource competition (Behera *et al.,* 2019).

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## Need for Climate Smart Livestock

The primary goal of Climate Smart Livestock is to enhance the well-being and food stability of small-scale and economically disadvantaged farmers. This is achieved by enhancing the responsible utilization of natural resources, incorporating suitable technologies and approaches in the production, processing, and distribution of livestock and its derivatives. There is an urgent need of adopting climate-smart livestock practices considering the collateral destruction caused during the process of livestock production, which encompass strategies for mitigating greenhouse gas emissions, enhancing resilience, and ensuring sustainable livestock production systems. Integrating these practices is essential for safeguarding livelihoods, ensuring food security, and

reducing the environmental footprint of the livestock sector in the face of a changing climate (Seo *et al.,* 2005; Thornton and Herrero, 2010; Gerber *et al.,* 2013).

## Extension Approaches Used in Climate Smart Livestock Farming

Extension services influence the way farmers act in order to address, rebound from, take advantage of possibilities, and adjust to changes in the climate (Christoplos, 2010; MoFA, 2007; MoFA, 2010). Globally, extension services significantly contribute to agricultural productivity and development (Boyaci and Yildiz, 2016). Ghana's development initiatives towards agricultural development have recognized that promoting rural extension services will serve as a conduit to achieve food security, rural development and address environmental challenges (MoFA, 2010; MoFA, 2016).

Climate-induced disasters directly impact farmers' livelihoods, which depend on agriculture and animal husbandry (Singh *et al.,* 2012). Developing countries like India must invest in financial, human, and infrastructural resources to enhance livestock extension services, ensuring well-funded programs, trained manpower, and effective delivery of Extension and Advisory Services (EAS) to promote higher productivity and sustainability in livestock farming (Chander & Rathod, 2013; Chander & Rathod, 2020). Livestock extension is experiencing significant transformations. Traditionally, it utilized a top-down, Training-and-Visit (T&V) method, where experts delivered technology and information directly to farmers, often without considering their individual needs or feedback. This traditional approach often failed to adequately address the diverse challenges like livelihood security for livestock producers, climate uncertainty, market fluctuations encountered by livestock producers. The modern approach to livestock extension has shifted towards a bottom up strategy, prioritizing the need for extension and advisory services to be demand-driven (Prabex *et al*., 2024).

The modern extension professional's role has shifted from a focus on production to becoming an integrated, cross-sectoral element within the extension system, particularly in addressing climate change, which remains a challenge for all extension systems. Effective strategies, such as using mass media for brief messages and farmer field schools for detailed discussions, can significantly enhance EAS contribution to Climate Smart Livestock (CSL) by improving resilience, adaptability, food security, and income. The adverse effects of climate change are being addressed globally through a variety of innovative extension approaches. Some of them are briefly discussed here as under:

### Climate Awareness Mass Media Campaigns

The extensive coverage provided by mass extension campaign methods is quite appealing (Wassajja, 2017). As commonly understood, the primary challenges faced by national extension systems include a scarcity of field extension staff and insufficient resources to effectively reach a significant number of farmers scattered across extensive geographic regions. Mass media can be used to accomplish extension more effectively in order to address these constraints. For the purpose of spreading awareness or providing straightforward information, extension through mass media can also be managed by non-extension players (such as radio or television) with technical inputs coming from extension workers via SMS (Belay *et al.,* 2017).

### Climate Trainings/Workshops

Education of extension/intermediary's personnel is important to update their understanding related to climate change, their impacts, and consequences or on different adaptation and mitigation strategies (Rwamigisa *et al.,* 2018). As a new and developing subject, climate-smart livestock should be covered by extension service providers and be trained on this (Rupan *et al.,* 2018).

### Animal Health Rallies

Animal Health Rallies are occasions or programs designed to boost its awareness of and concern for the welfare of animals, particularly in terms of their health and wellbeing. These rallies might bring together animal lovers, veterinarians, animal welfare organizations, and other stakeholders to discuss, educate, and advocate for better animal health practices. At the same time it could encourage community engagement by involving local schools, businesses, and residents.

### Climate Farmers Field Schools (FFS)

The Farmer Field School (FFS) employs a non-formal and participatory approach to extension, focusing on farmers and their requirements through experiential learning (Osumba *et al.,* 2021). As a result, it provides farmers with a low-risk environment in which to experiment with new agricultural management practices, discuss and learn from their observations, allowing them to gain new practical knowledge and skills, as well as improve their individual and collective decision-making (Mfitumukiza *et al.,* 2017).

### Livestock Calendar

Livestock is an important component of livelihood that not only supports the income of the farmers but the output also helps them in organic cultivation practices. During interactions with farmers, it was noted that farmers were not aware of any proper livestock management, government schemes, vaccination schedules etc. This reflects not only in the health of livestock but also the quantity and quality of the products. Livestock calendar with monthly advisories, government schemes, and vaccination schedules, best

practices etc. were published and distributed to the farmers, higher authorities and extension officers.

### Demonstration, Dissemination of Climate Resilient Technology and Practices

On-farm demonstrations provide livestock farmers with practical exposure to climate-resilient techniques, such as heat-tolerant breeds, efficient water use, and emissions-reducing manure management. This experiential approach, which integrates scientific knowledge with local practices, is further reinforced by demonstrations on drought-resistant fodder production, heat-reducing livestock shelters, silage making, breed selection, and integrated farming systems across diverse agro-ecosystems, collectively enhancing sustainable livestock management under climate change (Lipper *et al*., 2014; Prabhakar, 2023).

### ICT Supported Network

Information and Communication Technologies (ICTs) have significantly contributed as a means of transmitting information and facilitating communication in the context of climate change. Use of mobile phones, videos, radios etc. was done to address the issue of climate change by creating awareness among the farmers about the availability of different adaptation and mitigation strategies (Gangopadhyay *et al.,* 2019). Nonetheless, the presence and integration of ICTs differ among regions, developed and developing nations, urban and rural locales, and even within rural areas. The utilization of ICTs has the potential to enhance the capabilities of national institutions addressing climate change through facilitating improved decision-making processes that are both well-informed and more participatory. The application of ICT tools can aid the ministries and development agencies in coordinating efforts and executing regional initiatives (Turyasingura and Chavula, 2022).

### Farmer-to-Farmer Extension (F2FE)

F2FE involves peer-based training facilitated by a network of farmer-promoters and trainers. This approach is highly effective in scaling up climate-smart livestock practices by empowering farmers as change agents. It enhances adoption rates, as farmers are generally more receptive to learning from their peers than from extension personnel (Scarborough *et al*., 1997; Franzel *et al*., 2015).

### Appointment of Climate, Monsoon Managers at the Village and District Level

Appointing climate and monsoon managers at village and district levels strengthens local capacity to manage climate risks in livestock farming by monitoring weather, advising on adaptive practices, and coordinating responses to climate extremes. This approach delivers real-time climate information, enabling informed decision-making and enhancing resilience against climate variability (Rupan *et al*., 2018).

### Use of Indigenous Technical Knowledge (ITKs)

The extended relationship between pastoralists and livestock has equipped them with extensive indigenous technical knowledge (ITK), which is crucial for responding to livestock protection (LP) risks at the pastoralist level. This indigenous knowledge offers valuable insights into the processes of observing, adapting to, and mitigating the impacts of climate change (Agrawal, 2008; Thorne, 2008; FAO, 2016).

### Animal Clinics

Animal clinics serve as crucial points of contact between extension workers and farmers. These clinics allow extension workers to directly interact with farmers, sharing information about best practices in animal husbandry, disease prevention, nutrition, and other aspects of animal care. Extension personnel can organise mass vaccination programme, health check-up's, and keep in contact with the veterinarians at any cost. Major outbreaks of diseases can affect and spread to large number of animals in short amount of time, here the role of extension personnel is very important in dissemination of information to the public awareness.

### Climate-Smart Villages (CSVs)

CSVs are the developed villages or models of local actions that ensure food security, promote adaptation and build resilience to climatic stresses (Bonilla *et al.,* 2017). CSV have four components: climate information services; local knowledge and institutions; village development plans; and climate-smart technology. The location of a CSV is selected based on its climate risk profile and the willingness of farmers and local governments to participate in the project. There is no fixed package of interventions or a one-size-fits-all approach. The emphasis is on tailoring a portfolio of interventions that complement one another and that suit the local conditions (Vetrhus, 2019).

## Climate Smart Livestock And Rural Advisory Services

The intricate issues brought about by climate change for animal agriculture necessitate unified and collaborative solutions that involve cooperative efforts from extension services, research endeavours, and training programs (Fig. 1). The changes associated with climate change are occurring more rapidly than previously observed and require people who serve in extension, research, and training to continuously learn and upgrade their skills to keep pace with ever-changing sector norms and the expanding knowledge base (Kadzere, 2018).

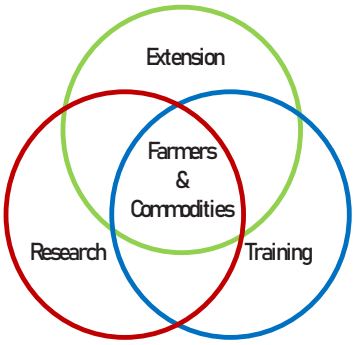


**Fig. 1:** Integrated collaborative services delivery model (Source: Kadzere and Poswal, 2016)

Rural Advisory Services (RAS) promote CSL by disseminating climate information and technologies and offering guidance on adaptive production methods. They use creative approaches such as climate awareness programs, training, and health rallies. Extension providers significantly impact CSL by developing and sharing technologies, enhancing farmer skills, facilitating, mediating, and advocating for policy support. Although RASs have already excelled in these areas, and are extensively involved in them; enhancing their effectiveness in promoting CSL will necessitate individual and organizational capacity building, as well as systemic institutional reforms (Rupan *et al.,* 2018).

## Sustainably Increasing Productivity and Enhancing Adaptation through Technology Development and Information Dissemination

Extension services have undergone a transformation, evolving from merely conveying knowledge, skills, and technologies related to crop, livestock, and forestry production to actively collaborating with farmers in the creation of novel technologies. This shift aligns with the need for location-specific investigations to identify sustainable livestock production methods and technologies for CSL.

As per Simpson and Burpee (2014), a critical challenge for RAS is to identify the necessary adaptive changes farmers must undertake and the timing of these changes. RAS play a role in communicating technologies, information, and methods using various approaches which encompasses conventional extension methods like interpersonal interactions, demonstrations, printed materials, and field days, as well as modern channels such as Information and Communication Technology (ICTs) like radio, mobile phones, videos, and social media. Additionally, avenues such as rural resource centers, farmer-to-farmer extension, and farmer field schools are employed (Amadu *et al.,* 2020). One instance is the potential for climate change experts to gain insights from RAS's experience in utilizing ICTs for information dissemination. Even though the task of technology and information distribution has historically fallen to extension personnel, RAS providers face difficulties in creating and disseminating technologies and practices that are resilient to climate impacts (Rupan *et al.,* 2018). Strengthening ties between researchers and extension providers is essential for accessing local insights, understanding farmers' needs, and evaluating technology effectiveness. Adapting to climate change requires broader natural resource management, so RAS providers must broaden their focus beyond individual households to engage with larger operational levels.

## Building Resilience through Developing Farmers' Human and Social Capacity and Providing Support Services

In order to effectively address the uncertainties and risks related to climate change, and to enhance their resilience while broadening their income sources, farmers should leverage both local and scientific expertise. This will empower them to independently choose suitable approaches and a variety of income prospects that are both diversified and resilient, all from a range of available choices (Shah *et al.,* 2017). Human capital refers to the skills, knowledge, and experience that an individual or population possesses, as measured by their worth or cost to an enterprise or country (Eriksson and Rataj 2019). The rural advisory service employs non-formal education and experiential learning initiatives (such as farmer field schools, farmer learning groups, and local agricultural research committees) to boost adoption and decision-making regarding knowledge intensive agricultural practices (Jacobi *et al.,* 2018). To promote livelihood diversification, some Rural advisory services have adopted a market-oriented approach to ex-tension by supporting farmers in the area of marketing, value addition and enterprise skills development (Martinez-Baron *et al.,* 2018). RAS also build resilience after extreme climate events by working closely with humanitarian agencies to distribute seeds and inputs (Christoplos, 2010). Although the role of RAS in building resilience has not been widely documented (Davis *et al.,* 2014), it is clear that strengthening the role of RAS in this area will typically require new skills and capacities at the organisational and individual levels.

## Supporting Climate Change Adaptation and Mitigation through Facilitation and Brokering

Farmers, alongside other stakeholders and service providers in rural areas, have extensively counted on extension organizations to serve as a link connecting them with service providers. In numerous countries, rural consulting firms are progressively aiding diverse innovation systems by assuming various responsibilities in the establishment of innovation platforms that involve multiple stakeholders. Serving as the key innovation broker (the organization that catalyzes the innovation process and links the parties) and acting as a "bridging" organization are two examples (McGonigle *et al.,* 2020).

According to Bussler and Schmidt (2019), innovation platforms are a type of institutional innovation that can contribute to climate change adaptation and mitigation. Extension providers may aid in mitigation by bolstering

farmer associations and rural organizations and connecting them to voluntary and regulated carbon markets (Yomo *et al.,* 2020). In addition to enhancing existing ties with conventional partners, rural advisers may assist farmers connect with new types of institutions relevant to climate change, such as insurance companies. To aid innovative processes, rural advisory services and advisors require skills in areas where they typically lack, such as network creation and broking, process facilitation, and process monitoring (Berry *et al.,* 2018).

### Monitoring, Advocacy and Policy Support

The engagement of Rural Advisory Services is crucial in actively overseeing the impact of climate change on agriculture and the advancements of CSL initiatives, working closely with both farmers and scientists. Since policy makers often grasp and address issues more effectively when they arise from significant incidents (Pralle, 2009), Rural Advisory Services (RAS), due to their close collaboration with farmers and communities, hold a distinct position to showcase the consequences of climate-related occurrences to policy makers. This empowers them to champion policy adjustments and encourage investments in CSL. Incorporating farmers, pastoralists, and those directly impacted by climate change as advocates to personify the issue, emphasize possible remedies, and offer input on policies and advancements, are strategies through which RAS can contribute to addressing the challenges posed by climate change. RAS can clarify climate change policies to rural communities and assess farmers' needs, awareness, attitudes, and vulnerability. This data helps policy makers develop region-specific policies addressing farmers' varying vulnerability levels.

## Conclusion

Climate-smart extension approaches should be integrated into broader adaptation measures and policies for livestock farming, with a strong focus on ICT integration. CSL policies must promote practices and essential services, such as financial services and knowledge management. An adaptive, demand-driven approach involving farmers as key stakeholders is crucial. This includes tailoring advisory services to local contexts, utilizing digital tools for efficient information dissemination, and improving access to diagnostic tools. Collaboration among farmers, policy makers, scientists, and local organizations is essential to develop practices for livestock adaptation to climate change. Integrating this model into government policies is vital for securing food and livelihood security in climate-vulnerable regions. Immediate actions for climate-smart advisory systems include establishing local platforms for better public sector alignment, strengthening linkages between farmers, researchers, and market actors, and focusing on capacity-building initiatives to empower farmers with the skills needed for long-term resilience and productivity.

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