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Harnessing the Chatbot Technology for the Empowerment of Small Ruminant Farmers in India

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ABSTRACT

Small ruminant farming is vital to rural India's economy, providing essential resources such as meat, milk, wool, and manure to millions of families. However, these farmers often face numerous challenges, including limited access to veterinary care, disease outbreaks, feed shortages, and fluctuating market prices. Traditional support methods, such as extension services and government helplines, often fall short due to accessibility issues and slow response times. This paper explores the potential of chatbots powered by artificial intelligence (AI) to address these gaps, providing real-time, accessible, and personalized assistance to small ruminant farmers through real-world examples of existing chatbot initiatives like KissanGPT and Farmer. CHAT, the paper demonstrates how chatbots can deliver timely advice on disease management, nutrition, breeding, and market insights, among other areas. Despite challenges such as digital literacy, connectivity, and trust, the benefits of chatbots such as scalability, multilingual support, and cost-effectiveness offer a promising solution for empowering small ruminant farmers. The paper also discusses the future potential of chatbots, including their integration with IoT sensors and AI advancements, to enhance productivity and resilience further. Ultimately, chatbots represent a transformative tool that can empower India's small ruminant farmers, improving their livelihoods and ensuring the sustainability of rural economies.

Keywords: Small ruminant, ICT, smartphones, Chatbots.**Introduction: A New Dawn for Indian Farmers**

In the vast, sun-drenched plains and rugged hills of India, millions of small farmers toil daily, nurturing the livestock that sustains their livelihoods. Among them are the small ruminant farmers who raise goats and sheep, often with limited resources but boundless determination. These animals, known as "small ruminants" for their modest size, play a massive role in rural India. They provide meat, milk, wool, and even manure, as a lifeline for families who depend on them for income and nutrition. But life as a small ruminant farmer isn't easy. From unpredictable weather to disease

outbreaks, from fluctuating market prices to a lack of timely advice, these farmers face challenges that can feel insurmountable. Only 6.8% of farmers receive extension services due to staff shortages (Chander *et al.*, 2010). Imagine a farmer in a remote village in Rajasthan, watching helplessly as a mysterious illness sweeps through his herd of goats, unsure of what to do or whom to call. Or picture a shepherd in Tamil Nadu, wondering how to protect her flock from a looming drought without expert guidance.

Imagine a different scenario: that same farmer pulling out a basic smartphone, typing a quick message - or even speaking aloud - and receiving instant, tailored advice from a digital assistant. No long journeys to a distant veterinary clinic, no waiting for an agricultural officer to visit. Just immediate, reliable answers at their fingertips. This isn't a distant dream - it's a possibility unfolding right now, thanks to the rise of chatbots.

Chatbots, those clever little programs powered by artificial intelligence (AI), are transforming industries worldwide, from customer service to healthcare. Nevertheless, in India, they're poised to impact agriculture - especially for small ruminant farmers profoundly. These digital tools can deliver real-time information, connect farmers to markets, and even help manage herds more effectively. In this article, we'll explore how chatbots are utilized - or could be utilized - to empower India's small ruminant farmers, bridging knowledge, resources, and opportunity gaps.

Small Ruminant Farming in India: The Unsung Heroes

Before diving into chatbots, let's take a moment to understand the world of small ruminant farming in India. Goats and sheep are the backbone of many rural economies, particularly for small and marginal farmers who own less than two hectares of land. According to the 20th Livestock Census (2019), India is home to over 148 million goats and 74 million sheep, making it one of the world's top producers of small ruminants. These animals thrive in diverse climates, from the arid deserts of Rajasthan to the lush hills of Himachal Pradesh, making them a versatile and resilient choice for farmers.

For many, small ruminants are more than just livestock - they're a safety net. They reproduce quickly, require less space and feed than cattle, and can be sold or slaughtered to meet urgent financial needs. A goat might fetch a few thousand rupees at the local market, enough to pay for a child's school fees or a medical emergency. Milk from these animals nourishes families, while their wool and hides support local industries.

However, despite their importance, small ruminant farmers face many challenges. In rural areas, access to veterinary care is limited, and diseases like Peste des Petits Ruminants (PPR) - a highly contagious illness dubbed "goat plague" can wipe out entire herds. Feed shortages during droughts, poor breeding practices, and a lack of market information further complicate their lives. Traditionally, these farmers have relied on word-of-mouth knowledge, occasional visits from extension workers, or distant government helplines like the Kisan Call Centre. However, these solutions often fall short - too slow, sporadic, or simply out of reach. On average, KCC callers waited for 2.12 minutes, with 10.2% of calls going unanswered and 5.8% getting dropped in 2018 (Kisan Call Centre Report, 2018).

Enter chatbots, a technology that promises to deliver help exactly when and where needed.

What Are Chatbots, and How Do They Work?

If you've ever chatted with a virtual assistant on a shopping website or asked Siri for the weather, you've encountered a chatbot. At their core, chatbots are computer programs designed to simulate human conversation. They use artificial intelligence, particularly natural language processing (NLP), to understand questions and provide answers. Some are simple, rule-based systems that respond to specific keywords, while others, powered by advanced AI models like ChatGPT, can handle complex queries with human-like fluency.

For farmers, chatbots can be accessed through smartphones via messaging apps like WhatsApp, Telegram, or dedicated mobile applications. They can respond to text or voice inputs, making them accessible to those with limited literacy. The magic lies in their knowledge base - a vast repository of data fed into the system, from veterinary manuals to weather forecasts and market trends to government schemes. When a farmer asks, "Why is my goat coughing?" the chatbot analyzes the question, pulls relevant information, and replies with advice like, "It could be a respiratory infection. Keep the animal warm and consult a vet for antibiotics."

Chatbots are a perfect fit in India, where smartphone penetration is soaring - over 500 million users by some estimates - and internet access is expanding even to remote villages, 59.87 percent (TRA, 2025). They are fast, scalable, and do not require a farmer to leave the field or wait in line. This could mean the difference between a thriving herd and a devastating loss for small ruminant farmers.

Chatbots in Action: Real-World Examples

While chatbots explicitly tailored for small ruminant farmers in India are still in their infancy, several initiatives hint at their potential. Let us look at a few examples of how chatbots are already helping Indian farmers and how they could be adapted for goat and sheep keepers.

1. KissanGPT: Bridging the Knowledge Gap

Launched in 2023 by agritech startup Titodi, KissanGPT is an AI-powered chatbot designed to assist Indian farmers with real-time agricultural advice. Available in multiple languages like Hindi, Tamil, and Gujarati, it answers queries on crop cultivation, pest control, and irrigation. Farmers can ask, "What is the best feed for my goats in summer?" and receive a response like, "Use a mix of green fodder and dry hay supplemented with protein-rich grains like groundnut cake." While KissanGPT primarily focuses on crops, its multilingual, user-friendly design could easily be expanded to include livestock-specific advice.

2. Farmer.CHAT by Digital Green

Developed by Digital Green in collaboration with governments in India, Ethiopia, Kenya, and Farmer.CHAT is a multilingual chatbot that provides personalized farming advice via WhatsApp and Telegram. It draws from a rich knowledge base, including call center transcripts and expert videos, to offer tailored recommendations. A shepherd in Maharashtra might ask, "How do I prevent foot rot in my sheep during the monsoon?" and get a reply: "Keep their hooves dry, trim regularly, and use a copper sulfate foot bath." With over 15,000 farmers already using it across multiple countries, Farmer.CHAT shows how chatbots can scale to meet rural needs.

3. PM-KISAN AI Chatbot

Introduced by the Ministry of Agriculture and Farmers Welfare in 2023, this chatbot supports farmers enrolled in the Pradhan Mantri Kisan Samman Nidhi scheme. While its primary role is to provide updates on payments and eligibility, its integration with the Bhashini platform - offering support in 22 Indian languages- sets a precedent for livestock-focused tools. Imagine a version that tells a farmer, "Your subsidy for goat feed has been credited," or "Apply for the National Livestock Mission to get free vaccinations."

These examples show chatbots' versatility in handling everything from scheme updates to hands-on farming tips. For small ruminant farmers, the next step is customizing these tools with data specific to goats and sheep: disease symptoms, breeding cycles, feed options, and market rates for mutton or wool.

How Chatbots Can Transform Small Ruminant Farming

So, what could a chatbot designed for small ruminant farmers in India do? Here is a rundown of the possibilities grounded in the realities of rural life.

1. Disease Detection and Management

Small ruminants are vulnerable to PPR, foot-and-mouth disease, and parasitic infections. A chatbot could act as a first line of defense. A farmer might type, "My sheep are losing weight and have diarrhea." The chatbot could respond, "This might be a worm infestation. Deworm with albendazole (10 mg/kg) and consult a vet." Chatbots could reduce livestock mortality and save farmers from financial ruin by providing early diagnosis and basic treatment options.

2. Feed and Nutrition Advice

Optimizing nutrition is critical, as feed costs account for up to 70% of livestock expenses (Sharpley, 2013). During a drought, a farmer could ask, "What can I feed my goats with no green fodder?" The chatbot might suggest, "Use dry straw mixed with urea molasses blocks for energy. Add locally available neem leaves for vitamins." This real-time guidance helps farmers stretch limited resources without compromising animal health.

3. Breeding and Productivity Tips

Improving herd size and quality is a priority for many farmers. A chatbot could advise on breeding seasons, artificial insemination, or care for pregnant animals. "My goat is due to be a kid soon. What should I do?" might prompt, "Provide a clean, dry shelter and extra feed like maize bran. Watch for labor signs and call a vet if needed." Such tips could boost kidding rates and milk yields.

4. Market Insights

Small ruminant farmers often sell at local markets without knowing fair prices. A chatbot linked to real-time market data could say, "Today's goat price in Hyderabad is ₹500/kg. Wait until Eid for higher rates." This empowers farmers to negotiate better deals and plan sales strategically.

5. Weather and Disaster Preparedness

With climate change bringing erratic rains and heatwaves, chatbots could deliver forecasts and coping strategies. "A heatwave is expected next week; keep your sheep shaded and provide extra water with salt licks to prevent dehydration." This proactive advice could prevent heat stress and losses.

6. Access to Government Schemes

Many farmers miss out on subsidies or veterinary services due to a lack of awareness. A chatbot could inform them, "Under the National Livestock Mission, you are eligible for free PPR vaccines; visit your local vet office." This bridges the gap between policy and practice.

Benefits: Why Chatbots Matter

The advantages of chatbots for small ruminant farmers are clear and compelling:

Accessibility: Chatbots are available 24/7 on a smartphone, and chatbots do not depend on office hours or physical proximity to experts.

Speed: Instant answers beat waiting days for an extension worker or a helpline operator.

Scalability: One chatbot can serve millions, unlike human advisors who are stretched thin.

Multilingual Support: With India's linguistic diversity, chatbots in Hindi, Tamil, Telugu, Bengali, or even tribal dialects make knowledge inclusive.

Cost-Effectiveness: Free or low-cost digital tools are a game-changer for farmers with tight margins.

Take the story of Ramesh, a hypothetical farmer in Uttar Pradesh. When his goats started coughing, he messaged a chatbot instead of trekking 20 kilometers to a vet. Within minutes, he learned it might be pneumonia, isolated the sick animals, and got a vet's number- all without losing a day's work. That is the kind of empowerment chatbots can bring.

Challenges: Hurdles to Overcome

Of course, chatbots are not a magic bullet. Rolling them out for small ruminant farmers comes with hurdles:

1. Digital Literacy: Not all farmers know how to use smartphones or messaging apps. Training programs or voice-based interfaces could help.

2. Connectivity: Rural internet is improving, but spotty signals remain a barrier. Offline modes or SMS integration might be solutions.

3. Trust: Farmers may be skeptical about advice from a machine over a trusted elder. Demonstrating accuracy through local success stories could build confidence.

4. Data Quality: A chatbot is as good as its knowledge base. Outdated or irrelevant info could mislead farmers, so regular updates are essential.

5. Language Nuances: India's dialects and colloquialisms can trip up NLP systems. Fine-tuning AI for regional slang is a must.

Addressing these challenges requires collaboration between tech developers, government agencies, and farmers to ensure that chatbots meet real-world needs.

The Future: A Chatbot Revolution for Small Ruminants

Looking ahead, the potential for chatbots in small ruminant farming is boundless. Imagine a chatbot linked to IoT sensors in a goat shed, alerting a farmer, "Temperature is too high; ventilate now." Alternatively, one that uses image recognition: "Upload a photo of your sheep's sore foot - it looks like foot rot." Integrating drone-based weather monitoring or blockchain for transparent market transactions could take it further. The government could play a pivotal role by expanding initiatives like the PM-KISAN chatbot to include livestock support. Private players, from agritech startups to telecom companies, could invest in tailored solutions, perhaps subsidizing costs through partnerships. As AI advances, chatbots could become even more innovative, predicting disease outbreaks or optimizing feed rations based on local conditions.

For India's small ruminant farmers, this is not just about technology but about dignity, resilience, and hope. A chatbot will not replace the sweat of their labor or the wisdom of their traditions, but it can amplify their efforts, giving them tools to thrive in a changing world.

Conclusion: Empowering the Backbone of Rural India

Small ruminant farmers are the unsung heroes of India's agrarian landscape, feeding families and fueling economies with little fanfare. Chatbots offer a chance to lift them - not by replacing human expertise but by extending it to every corner of the country. From a shepherd in the Himalayas to a goat herd in the Deccan, these digital assistants can deliver knowledge, opportunity, and security, one conversation at a time. As we stand on the cusp of this tech-driven transformation, the question is not whether chatbots can help but how quickly we can make them a reality for every small ruminant farmer in India. The future of farming is not just in the fields; it is on the screens and in the voices of those who tend the herds. Furthermore, with chatbots by their side, India's farmers might find the answers they need closer than ever before.

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