PARTICIPATORY ANALYSIS OF THE CONSTRAINTS TO ADOPTION AND DIFFUSION OF ARTIFICIALINSEMINATION IN DAIRYING IN LOWER ATBARA RIVER AREA

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المستخلص

تهدف هذه الدراسة تحليل مشكلات تبني وإنتشار التلقيح الإصطناعي كتقنية حديثة لتحسين نسل الأبقار المحلية بمنطقة أدنى نهر عطبرة، بواسطة مربي الأبقار أنفسهم. تم تجميع البيانات بإستخدام منهج التقييم الريفي بالمشاركة (PRA) وذلك من عدد (5) قرى بمنطقة أدنى نهر عطبرة وبمشاركة عدد (70) من مربي الأبقار الذين حضروا الاجتماع وإستخدموا مختلف أدوات المنهج (PRA) لتحليل المشكلات بأنفسهم. تم تسجيل المعلومات وتدوينها في سبورة العرض (Flip Chart) كما تم إستخدام بعض أدوات منهج (PRA) ومن أبرزها خريطة الموارد والخدمات والفرص، وجدول الأنشطة اليومية وخريطة تحليل الموسمية والأشكال الهندسية وأدوات التدرج وذلك بهدف تجميع وتحليل البيانات الإجتماعية والفنية وعرضها والموافقة عليها.

أوضحت النتائج أن المشكلة الأساسية التي تواجه عملية تبني وإنتشار تقنية التلقيح الإصطناعي هي "عدم توفر خدمات التلقيح الإصطناعي" بينما تم اعتبار مشكلة "النظام المفتوح لرعاية الحيوانات" كمشكلة غير أساسية. عند تحليل العوامل الاجتماعية التي تؤثر على عملية تبني تقنية التلقيح الإصطناعي أوضحت النتائج أن "وسائل الاتصال الشخصية" و"المشاركة الاجتماعية" تعتبران من أبرز العوامل الاجتماعية التي تساعد على تبني تقنية التلقيح الإصطناعي، بينما تم اعتبار "المعارضة من المجتمع الريفي المحلي" و"العزلة الإجتماعية" من أبرز العوامل التي لا تساعد على تبني تقنية التلقيح الإصطناعي. أما عند تحليل العوامل النفسية التي تؤثر على تبني تقنية التلقيح الإصطناعي، أوضحت النتائج أن "الميزة النسبية" و"المخاطرة" تعتبران من أبرز العوامل التي تساعد على تبني تقنية التلقيح الإصطناعي، بينما تم اعتبار "مدى تعقيد التقنية" و"عدم المخاطرة" من أبرز العوامل التي لا تساعد على تبني تقنية التلقيح الإصطناعي.

Abstract

The main objective of this study was to analyze the constraints to adoption and diffusion of Artificial Insemination (A.I.) as a new technology for improving indigenous cattle in Lower Atbra River Area as perceived by the cattle owners themselves. Data was collected using Participatory Rural Appraisal (PRA) approach from five villages of Lower Atbra River Area. A total of 70 cattle owners attended the meeting and the discussions were conducted with all the participant using different PRA tools. The PRA information was recorded on Flip charts. Mapping, time and trend lines, seasonal calendars, diagramming and ranking were used to elicit, record, analyze and agree on social and technical data. The results indicated that the most pressing constraint perceived by the cattle owners was lack of A.I. facilities while the least considered constraint was free range system of animal husbandry. The most important social factors stimulating the adoption of A.I. were personal communication network and social participation, while opposition in the farming community and social

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isolation were perceived as factors inhibiting adoption of A.I. technology. The most important psychological factors stimulating the adoption of A.I. technology were innovation proneness and risk taking, while complexity of A.I. technology and risk avoidance were perceived as important factors inhibiting the adoption of A.I. technology.

Introduction

Applied livestock extension become known to Sudan only a few decades ago and has come to be recognized as a system of service and education designed to meet the needs of livestock owners. The main purpose of this system which uses scientific methodology is to encourage livestock owners to adopt and apply innovations of proven value to increase livestock productivity.

Artificial Insemination (A.I.) is a vital tool for the rapid improvement of livestock allowing for maximum use of the best sires on numerous dams. It is one of the animal production technologies that augment production and returns from livestock at a faster rate and enhance cross breeding programs. The benefits of this technology are however, derived only when it is readily available to the livestock owner and is effectively utilized by him. Though the technology has been accepted and practiced in developing countries for a long time. A.I. has come into serious conflict with environmental, technical, social, cultural and psychological dimensions that adversely affect production (Omer, and Kate, 1990).

Getting a new technology to adopt, even when it has obvious advantage, is often very difficult. Therefore, a common problem for many individuals and organizations is how to speed up the rate of adoption among the members of social system (Mohamed *et al*., 2008). The rate of adoption is defined as the relative speed with which an innovation is adopted by members of social system (Rogers, 1995). It is generally agreed that innovation attributes are important considerations for potential adopters. Rogers (1995) observed that potential adopters assess the following attributes of innovation: relative advantage, compatibility, complexity, trial-ability and observability. It is proposed that Relative Advantage and Complexity represent "the functional dimension" of the innovation, while "Compatibilty, Trial-ability" represent "the social dimension" of the innovation complexity negatively affects innovation acceptance, while the other four factors have a positive effect.

A better understanding of the innovation diffusion process could help extension workers to better target their community innovation activities and provide insights into the social and psychological dimensions that influence the adoption and diffusion of an innovation within that community (Mele and Zakaria, 2002).

There is a limited literature on the constraints associated with adoption and diffusion of A.I. in Sudan and virtually none on the constraints perceived by the cattle owners themselves. The main objective of this study was to participatory analyze the constraints to adoption and diffusion of A.I. as a new technology for improving indigenous cattle in Lower Atbra River Area as perceived by the cattle owners themselves. The specific objectives of the study were to (a) identify the constraints perceived by the cattle owners in using A.I. technology, (b) shed light on social and psychological factors stimulating or inhibiting the adoption and diffusion of A.I. and (c) identify constraints to dairy production associated with adoption of A.I and analyzed for causes, coping strategies and opportunities. The outcome of this study would be of immense importance in policy making regarding the technologies to be employed for improved dairy production.

Materials and Methods

Study area

Lower Atbra River Area is located in the River Nile State, Sudan, between Longitudes 34°E-21.336 and latitude 16°N-26.742. The Lower Atbra River Area can be divided into three zones based on the type of land used. This study was conducted in the first zone which is located between Atbra town and Sidon town. About 90 percent of the population in this area is sedentary small-scale farmers who produce at least two crops a year using flood water and pump irrigation, in addition to animal husbandry.

Data collection

Data was collected using Participatory Rural Appriasal (PRA) approach from five villages of the Lower Atbra River Area namely: Aldabora, Omdebea, Alzorog, Gozalhalag and Alabaka villages. The criteria of selection were based on the importance of these villages in animal husbandry. The PRA was conducted in three days by a team of the Eastern Nile Watershed Management Project (ENWMP) during the period of 19-21 July, 20l1.

A total of 70 cattle owners participated in the PRA. These cattle owners attended in response to a general announcement of the meeting by the personnel of ENWMP, the discussions were conducted with all the participants. The PRA tools as described by (Leo, 1995; Allan and Curtis, 2002; and Ismail, 2011. were used and the issues discussed were constraints, availability of resources and opportunities among others.

Data analysis

The PRA information was recorded on flip charts. Mapping, time and trend lines, seasonal calendars, diagramming and ranking were used to elicit, record, analyzed and agree on community spatial, time related, social and technical data (Bhandri, 2003 and Mwanyumba, 2010). The innovation tree as a PRA tool was also used to help the PRA team and the cattle owners to understand some of the social and psychological dimensions that influence the adoption and diffusion of A.I. as a livestock innovation within the cattle owners. The innovation tree also enables people to visualize and analyze the way in which an innovation is spread over time between community members (Mele and Zakaria, 2002).

Results and Discussion

Constraints perceived by cattle owners in using A.I. technology

Table 1 depicts the constraints perceived by cattle owners in using A.I., the constraints ranked order varied between "absence of A.I. facilities" and "free range system of animal husbandry". Absence of A.I facilities is the most pressing constraint while free range system of animal husbandry is the least constraint. This result is in agreement with the findings of Omer (2007) who

found out the major constraints to adoption of A.I. in Sudan is the absence of A.I. facilities.

It is therefore concluded that the cattle owners are ready to use A.I. technology with breeding program and objectives well defined as well as adequate A.I. facilities made available and affortable. However, the cattle owners need to be educated more on the significance and practice of A.I. or infrastructural facilities developed in an integrated manner with essential manpower, financial input, capacity building and extension programs for bringing out the attitudinal change in the potential adopters of A.I.

Social and psychological factors influencing the adoption and diffusion of A.I. technology

Table 2 shows the social and psychological factors enhancing or inhibiting the adoption and diffusion of A.I. as perceived by the cattle owners. These factors were participatory analyzed directly with the cattle owner through the innovation tree. The most important social factors stimulating the adoption of A.I. were "personal communication network" and "social participation". On the other hand, "opposition in the farming community" and "social isolation" were perceived by the cattle owners as

Table 1: Constraints perceived by cattle owners in the adoption and diffusion of A.I. technology in five selected villages.

Constraints	Rank order
Absence of A.I. facilities	1
Lack of technical knowledge of A.I. practice	2
The absence of an agency promote and control A.I.	3
Lack of trained A.I. personnel	4
Lack of knowledge about usefulness of A.I. practice	5
Cost involved in A.I.	6
Distance of A.I. centers from livestock farms	7
Lack of knowledge of the bull semen to be used	8
A.I. could result in some harm to the animals	9
Detection of animals on heat is difficult	10
Preference for natural service	11
Cross-breed calves through A.I. not having market value	12
Low chances of conception	13
Religious prohibition	14
Personal dislike	15
Free range system of livestock husbandry	16

Source : PRA results ,July 2011

Table 2: Social and psychological factors influencing the adoption and diffusion of A.I. technology.

Social factors		**Psychological factors**	
Stimulating adoption	**Inhibiting adoption**	**Stimulating adoption**	**Inhibiting adoption**
Personal communication network	Opposition in the farming community	Innovation proneness	Complexity of A.I.
Social participation	Social isolation	Risk taking ability	Risk avoidance
		Extrovert	High level of stress
External pressure	Poverty		
		Overall knowledge	Lack of knowledge
Common need for solving the problem	Not consistent with the needs	Self fulfillment	Lack of motivation
Collectivist societies	Individualist societies	Pride in ownership	Lack of ownership
Legitimization of A.I. by religious leaders	Lack of legitimization	Decision making ability	Hesitation
Leadership structure	Poor structure	Trust in project staff	Mistrust in project staff

Source : PRA results ,July 2011

factors inhibiting adoption of the A.I. technology. The identification of the psychological factors stimulating and inhibiting the adoption of A.I. is also presented in Table 2. "Innovation proneness" and "risk taking" were perceived by the cattle owners as important factors stimulating adoption of A.I. technology. On the other hand, "complexity of A.I." and "risk avoidance" were perceived by the cattle owners as important factors inhibiting the adoption of A.I. technology. In summary, the remaining factors were also perceived as less important factors influencing the adoption and diffusion of the A.I. technology. The listing of the factors demonstrates the personal experience of the cattle owners. The factors partly determine whether the A.I. technology is adopted or not and how the cattle owners expressed their point of view and expertise after using the innovation tree tool to analyze their own innovation adoption and diffusion process. Anyone attempting to speed up the process of accepting of new ideas and practices must be aware of the total process and the sequence of influences of different point in the process (Rogers, 1995).

Constraints to dairy production associated with adoption and diffusion of A.I. technology

Table 2 shows the constraints to dairy production associated with adoption and diffusion of A.I. and analyzed for causes, coping strategies and opportunities. The primary goal of any PRA exercise is to initiate an attractive process between the community and the PRA team so that a "Community Action Plan" (CAP) can be prepared (Leo, 1995). Such outputs and conclusions are the culmination of careful planning and conduct of the PRA (Devendra, 2007). The listing of the constraints and causes demonstrates knowledge of their problems by the cattle owners themselves. Coping strategies is what they do currently to attempt to solve the problems and opportunities are possible solutions to the problems. The

identification of the opportunities by the cattle owners themselves shows that these are services, institution, and technologies they know of or have experienced, and indeed they have.

The problems in dairy production associated with adoption and diffusion of A.I as perceived by the cattle owners themselves were listed, ranked and presented in Table 3. High cost of A.I. services were ranked the most important problem in dairy production. The perceived expensive of A.I. services were considered to lead to cattle of poor potential and thus lower milk production and this was exacerbated by pests, diseases and dry season for fodder unavailability.

Low milk production is listed and is considered as a constraint although it is in fact a result and causes are indicated. This could be a problem in it self as it seems to absolve the causes of the result.

Pests and diseases are also considered pressing constraints. The main causes were lack of sprays, poor management, poverty and lack of equipment. Fodder unavailability did not rank high in the list as might have been expected and this is probably because the inadequacy occurs only during the dry season.

Lack of storage facilities was not considered to be a major problem showing either that there is a high turn-over of milk to the market or that the quantities do not demand these facilities.

Table 3: Constraints to dairy production associated with adoption and diffusion of A.I. technology.

Constraint	**Causes**	**Coping strategies**	**Opportunities**
High cost of A.I. services	Do not know	The local bull	Appeal for low price; improved bull camps; training on the importance of A.I.
Low milk production	Poor breeds; inadequate feed and minerals; pests and diseases; poor shelter.	Local bulls; purchase fodder and minerals.	Training; loans; increase fodder production; imported breeding.
Pests and diseases	Lack of spray; poor management; poverty; lack of equipment.	Zero grazing; local equipment; preventive medication for incoming stock.	Revive cattle dips and improve management work harder; go for loans; avail animals for vaccination.
Fodder unavailability during dry season	Low rainfall; low fodder; no alternative, poverty.	No strategies; grazing by the road sides	Fodder preservation; training on fodder preservation, planting fodder crops.
Lack of storage facilities	No facilities low production level	Boiling, selling locally; selling on credit to middemen	Cooperatives and external markets; cooling facilities; value addition e.g. yogurt, ghee.

Source : PRA results ,July 2011

Conclusions

The researcher recognizes the need to initiate and establish specific conclusions to serve as a basis for developing an ideal framework for planning A.I. extension and training programs for the cattle owners of Lower Atbra River Area. A review of the findings of this study resulted in the following conclusions:

1- The most pressing constraint perceived by the cattle owners was lack of A.I. facilities while the least considered constraint was the free range system of animal husbandry.

2- The most important social factors stimulating the adoption of A.I. were "personal communication network" and "social participation", while "opposition in the farming community" and "social isolation" were perceived as factors inhibiting adoption of A.I. technology.

3- The most important psychological factors stimulating the adoption of A.I. were "innovation proneness" and "risk taking", while "complexity of A.I." and "risk avoidance" were perceived as important factors inhibiting the adoption of A.I. technology.

4- High cost of A.I. service were ranked the most important constraint in dairy production, while lack of storage facilities was not considered to be a major problem.

5- Most of the cattle owners are ready to use A.I. technology with breeding program and objectives well defined as well as adequate A.I facilities made available and affortable.

However, dairy production is still low and inadequate to meet demands for food and income and there is room for improvement through more intensification forage conservation and use of available services and technologies. Extension programs and micro-credit facilities should be planned to enable the cattle owners move beyond the coping strategies towards exploitation of the opportunities and commercialization.

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