

Improving rural communication services through co-innovation towards commercial family farming in Timor-Leste: Insights from the *Redi KAMODI* model

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Abstract

Since its independence, Timor-Leste has invested substantially to enhance its agricultural sector and support family farmers to transition from subsistence to commercial farming. Cattle farming is one of the most potential agricultural enterprises to support farm family in rural areas. The national agricultural extension service has mainly applied one-size-fits-all innovation packages that demonstrably failed to provide a pathway of sustainable change and installed an attitude of dependency among farmers. This paper offers insights on how a rural communication services model based on co-innovation processes was able to guide farmers to become independent cattle producers and business managers, while simultaneously turning government extension officers into facilitators of change. The model, locally called '*Redi KAMODI*' (Cattle-for-Good-Lives Network), was developed and piloted in 2016-22 and an evaluation study was conducted in 2022. Farmers, government staff and researchers alike, despite some initial hesitation, embraced the structure and processes introduced by the *Redi KAMODI* model. The establishment of a village-level *Redi KAMODI* starts with a community-wide participatory situation analysis to collectively identify and prioritise constraints that hinder cattle productivity, as well as the options to innovate and improve the cattle production system. Once an initial level of awareness and readiness for change exists among the community, the *Redi KAMODI* model is introduced, farmers sign up voluntarily to become a member, and they decide on the establishment of the local management structure and mechanisms. Farmers receive regular training on technical, critical and business skills and they are facilitated to collectively experiment to answer the questions that they have and adapt introduced innovations according to their farm-based conditions. Intensive capacity development of extension officers, technical staff, local researchers and program managers, was needed, too, including technical training, facilitation and communication skills development, and organisational management. Twenty-one *Redi KAMODIs* were established involving around 600 farm families. The evaluation study evidenced that the *Redi KAMODI* processes transformed farmers' lives through enhanced knowledge and skills, and changed cattle fattening practices that almost doubled their income compared to the traditional grazing system. The *Redi KAMODI* platform has become a hub to facilitate horizontal communication between government staff, farmers, and related value chain stakeholders resulting in mutually beneficial relationships. Therefore, it can be concluded that rural family's participation in innovation and rural development through the *Redi KAMODI* has enabled farmer

empowerment and sustainable practice change in a collective manner, hence strengthening communities, as well. The *Redi KAMODI* can serve as a model to rethink the national agricultural extension system to become a rural communication services system that more effectively addresses the needs of family farming under resource-limited conditions towards improved and sustainable livelihoods.

Key words: co-innovation, rural communication services, family farming, participation, system transformation, capacity development

1. Introduction

Since its formation in 2020, the Government of Timor-Leste has put efforts to create economic stability in the country. Based on the latest UN data projection, this country of approximately 1,500 km² size is inhabited by around 1.3 million people (World Population Review, 2023, [Timor-Leste Population 2023 \(Live\)](https://worldpopulationreview.com/country-rankings/timor-leste-population-2023)). More than 70% of the population reside in rural areas where agriculture is the main source of income for more than 90% of villages. Productivity is generally low as a result of a small population, small farm size, adverse environmental conditions and undeveloped marketing infrastructure (da Cruz, 2016). Low farm productivity has contributed to high levels of poverty (Langen, 2016). Therefore, effective support of the agricultural sector has the potential to improve the livelihoods of the vast majority of Timor-Leste.

Family farming in Timor-Leste is predominantly subsistence-oriented with less than 2 ha of land owned by the average family (Islam et al., 2016; Langen, 2016). The Government has invested substantially to enhance the agricultural sector and support family farmers to transition from subsistence to commercial farming, which is the most obvious pathway to lift families out of persistent poverty (Islam et al., 2016). Cattle farming is one of the most potential agricultural enterprises, particularly in the mountainous areas, for families to enter commercial farming. Most farm families have some livestock, with average cattle ownership of 3.8 heads per household recorded in 2010 (Bettencourt et al., 2015). Cattle production is predominantly through traditional systems characterised by free grazing, low-input, slow return of investment, and low productivity. The latter is caused by feed insufficiency, slow growth, and high calf mortality as chronic problems (Bettencourt et al., 2015).

Utilising innovation in cattle production and transitioning farmers from subsistence into more commercial farming are among the available options to improve farming productivity and hence livelihoods in Timor-Leste. This approach

has shown to be significantly reducing poverty in developing countries (D'Exelle & Verschoor, 2023). Technical innovations suitable to the Timorese conditions are available to improve cattle productivity (see Lisson et al., 2010; Poppi et al., 2011). However, the national extension service system, which is one of the few sources for farmers to get access to innovations, has given livestock production limited attention. Since independence, development programs have focused on food crops, forestry, and horticulture (da Cruz, 2016; Langen, 2016).

The national agricultural extension service system of Timor-Leste is characterised by top-down approaches inherited from the transfer-of-technology era (Anderson, et al., 2006). The extension service has mainly served programs that introduce one-size-fits-all innovation packages that demonstrably failed to provide pathways for sustainable change to subsistence farmers and installed an attitude of dependency among farmers. At the same time, subsistence farmers are generally trapped in the low-risk low return agriculture system for financial barrier and attitude to avoid larger losses in case of farming failure (D'Exelle & Verschoor, 2023). This paper offers insights on how a rural communication services model based on co-innovation processes was able to guide farmers to become independent cattle producers and business managers, while simultaneously turning government extension officers into facilitators of change.

2. Theoretical framework

2.1. Participatory approach in agricultural research for development

Farmers' active participation in agricultural research for development (*R4D*) processes has become mainstream over the past three decades (see Biggs, 1982; Bentley, 1994; Petheram, 2000). Greater farmer involvement in *R4D* processes emerged from concerns of continuing low agricultural productivity particularly in unfavourable rain-fed areas despite massive research inputs (Farrington, 1989). Other critiques involved those addressed to top-down *R4D* initiatives designed by high level government officials that tend to work with progressive farmers for quick results, but limited large-scale outreach as those farmers don't represent the majority of farmers' conditions. It has been widely documented that farmer's social and economic conditions determine innovation uptake and agricultural productivity (Murray Prior et al., 2006), implying that innovations need to be adaptable to varying conditions, not one size fits all.

The underlying assumption that participatory approaches in agricultural R4D result in better uptake of innovations is based on evidence that greater involvement of farmers and extension officers in research design, implementation and evaluation processes makes agricultural research, development, and extension more effective (Okali et al, 1994). The more intensive farmer participation in all stages of the research, the more suitable the research outcome to suit farmer's needs (Petheram, 2000). The involvement of farmers in the identification of problems can motivate them to participate in finding and finetuning the right solutions and reduce resistance to innovation (Chambers, 1994).

The operationalization of a participatory approach to generate impacts in agricultural *R4D* initiatives is well depicted in a framework developed by van de Fliert and Braun (2002). In this framework, community-based identification of needs and opportunities serves as an entry point for farmer and stakeholder involvement, enabling all actor to gain understanding of the research context. Farmers are given space to internalize the introduced innovation into their existing practices, modify, receive, or reject it, after having developed the critical skills to make those informed decisions. Farmers play a crucial role in the analysis and evaluation of innovations, which will open more possibilities for the innovation to be adapted to suit local conditions. In this concept, extension activities are not seen as exclusively belonging to government agents, but also for NGOs, private or even from farmers that considered to have a "comparative advantage" as communicators at village level (van de Fliert and Braun, 2002).

Douthwaite and Park's study (2002) confirmed the importance of stakeholder involvement in implementation of the promoted technologies. As a technology is tested and adapted in the field, the process of technology development should become less controlled by researchers and more room be given to the stakeholders who will implement the innovation to make the necessary adjustments. They emphasized that feedback from farmers is crucial to scale out the introduced technologies. The only weakness of this concept is its assumption that bright ideas mostly come from researchers. In fact, multiple stakeholders can be the source of an innovative idea, including farmers, extension workers, practitioners, and even administrators (Biggs, 1990; Biggs & Clay, 1981).

Despite wide support for its efficacy in delivering impact in agricultural *R4D* initiatives, participatory approaches receive ongoing criticism at the same time, in

particular for the amount of time the processes take, which reflects the complexity of innovation development. Biggs and Smith (1998) argue that simply including people or groups in a process does not necessarily mean their voices will be heard and influence the process. Even if different groups are included in the process, their ideas may hold a different weight when setting priorities that do not represent their group because of competing interests. Good facilitators are needed to navigate stakeholders through these processes to avoid falling in the traps of pseudo participation.

Another concern often encountered with participatory approaches is the challenge to institutionalize the different way of working, which is experienced both at the research and extension level. A study by van de Fliert (2008) argues that an enthusiastic team applying a participatory approach frequently stumble against barrier of unsustainable financial and logistic issues. Hence, the inclusion of a research phase that designs and build capacity for an outreach strategy will determine scale of R4D impacts. Millar and Connell (2010) propose strategies of identifying simple and adaptable technologies and giving farmers key roles in the planning phase to be effective. They found that farmers who took a role in the R4D planning phase would develop a sense of ownership and commitment over the processes to implement and spread the promoted innovations. This is consistent with Chambers (1994) and Petheram (2000) who recommend farmers' involvement from the early stage of R4D initiatives to give greater opportunity for innovation uptake.

2.2. Participatory Development Communication

The concept of communication for development evolved from two models, first, the diffusion of innovations model, followed by the participatory communication models (Morris, 2003). The diffusion of innovations concept was popularised in 1960s by Rogers and Shoemaker and included steps of (1) informing; (2) persuasion; (3) adoption or rejection; and (4) confirmation (Rogers & Shoemakers, 1973 cited in Servaes & Malikhao, 2007). This model perceives development as a process to diffuse technology from the more developed world to the less one (Servaes & Malikhao, 2008). Therefore, communication is aimed to change people's behaviour by providing information and persuading individuals (Morris, 2003). The

change agent is seen as a 'messenger' to transfer and disseminate the prescribed knowledge from scientists to farmers (Kamara et al., 2023).

The diffusion of the innovations model was widely adopted in foreign development aid programs from the 1960s until the 1980s but started to receive critiques in the late 1970s (Huesca, 2007). Evidence showed this model has been unable to improve the livelihood of resource poor farmers due to the focus on adoption of high external inputs (Chambers & Jiggins, 1987; Pretty & Chambers, 1993; Röling and van de Fliert, 2008). It appeared to be unsuitable to solve farmers' complex problems embedded in multi-faceted local agro-ecosystems and socio-cultural conditions (Kamara et al., 2023). This realization called for a more 'participatory approach' that allows greater farmer participation in agricultural research, extension, and development processes (Farrington, 1989; Sumberg et al., 2003).

One of the most fully articulated concepts of participatory development communication is the notion of 'multiplicity in one world' (Servaes, 1999; 2003). This model promotes an understanding of diversity and plurality, with full respect for people living in different conditions and acting in different ways (Servaes & Malikhao, 2008). Participation is seen as a learning process involving three interrelated elements: collective definition of problems, group analysis of the underlying cause of the problems, and collective action to solve the problems (Servaes, 1999). Therefore, concern is put on the process of communication, on the context, on the meaning understood, and how this understanding will be reflected in the practice, rather than focusing on the transmission of information. Information is not created to be disseminated but to be exchanged when needed (Servaes & Malikhao, 2008).

2.3. Agricultural Innovation Systems and Innovation Platforms

A growing body of literature emerged in the last few decades on different systems for communicating agricultural information and technologies to influence people's behaviour. Agricultural extension services still provide the institutional setting in many countries in the Global South that provide the mechanism to communicate agricultural information to farmers and influence their practices. However, many of these service systems lack adequate levels of funding and the conceptual frameworks to train and mobilize their staff to be agents of change in an

ever-changing world who can effectively support farmers to solve the complex problems they face.

Acknowledgement of smallholders' complex and multi dimensions problems that require more participatory and empowering research and extension approaches has stimulated the emergence of Agricultural Innovation System (AIS) (Hellin, 2012; Kamara et al., 2023). AIS recognizes the specific roles various stakeholders hold in agricultural innovation processes, as well as the importance of their attitudes and behaviours in promoting/impeding agricultural innovations, and inclusive bottom-up in nature (Kamara et al., 2023).

In the last 10-15 years, there has been a growing recognition to bring different types of actors including in agricultural RUD processes into a systemic and effective interaction to foster innovation uptake, to collaborate, to enable negotiation, and to reduce resistances as innovation is about changes (Klerkx et al., 2013). These actors include farmers, researchers, policy makers, traders, and society organisations. The concept of innovation platforms is increasingly used to illustrate interaction avenues for those stakeholders from sectoral or geographical region (Ayele et al., 2012). an innovation platform involves the establishment and facilitation of a supporting network for technical, social, economic, and institutional mechanisms that result in innovations (Kilelu et al., 2013). Construction of innovation platforms generally involves members that act as champions, fostering collaboration, stimulating learning and mobilizing resources (Klerkx et al., 2012). The innovation platform concept is increasingly used in agricultural R4D agencies in the Global South to address institutional constraints to innovation for smallholder farming (Lema et al., 2021). Innovation platforms can sustain the impact of agricultural innovations for its emphasis on facilitation process based on need and system-oriented approach to suit farmer specific needs (Schut et al., 2016). It has the potential to provide the institutional setting and mechanisms for a new form of rural communication services. The study presented in this paper provides evidence of this potential.

3. Methodology

A case study methodology was used for this evaluation study that was part of an ACIAR¹-funded project '*Smallholder cattle enterprise development in Timor Leste*'

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(LPS/2014/038). The project aimed to increase the income of smallholder crop-livestock farmers and market chain operators in Timor-Leste through more efficient, commercially oriented cattle production and improved access to markets. A core strategy of the project was the creation and establishment of multi-actor innovation platforms, locally called *Redi KAMODI* (RK). *Redi KAMODI* consists of a village-level networks of groups and serves as a rural communication service involving local farmer, traders, extension officers and technical advisers.

This study was conducted in 2022 in 21 villages with active RKs, covering 8 out of the 13 municipalities of Timor Leste, including Bobonaro, Manufahi, Ermera, Ainaro, Covalima, Viqueque, Manatuto and Lautem. A qualitative approach informed the data collection methods, designed to explore experiences and perspectives of participants (Patton, 1987). Methods for data collection included review of RK reports, focus group discussion (FGD) and semi-structured interviews. A total of 186 participants were interviewed involving RK chiefs, RK farmers, non-RK farmers, traders, and RK facilitators (extension and technical staff of Ministry of Agriculture and Fisheries, MAF, at sub-district level). Qualitative data generated during the study were analysed using the following approach: (1) interviews in Tetum were transcribed in Bahasa Indonesia and then translated into English; (2) coding, categorization, and condensation into various themes; and (3) interpretation of meaning. This study assessed RK achievements, processes to get RK into a functioning co-innovation platform, and requirements to be implemented as a national program. Qualitative and transcribed interview data were coded for thematic analysis. Where appropriate, the quantitative data from records and reports were correlated to the qualitative data analysis.

4. Results and Discussion

4.1. Setting the context: farming systems and rural communication services in Timor Leste

Timor Leste has a mountainous landscape with tropical climate. However, significant differences appear between Northern and Southern coastal areas as in agreement with da Cruz (2016). The Northern part such as Aidabaleten and Rairobo is relatively much drier compared to the Southern one such as Fatucahi and Clacuc that has twice rain period, December-January and in July-August. Hence, the

southern areas have greener coverage with higher cattle feed availability throughout the year as compared to the northern ones.

Farmers in Timor Leste practice mixed farming enterprises in generally small scale and patchy. Based on the FGD results, cattle, rice, pigs, chicken, and maize are among the most important enterprises. Although average land hold accounts for 2.2 hectare per family, not all this area are planted. Limited labour and equipment for land clearing, fencing and tillage were among reasons mentioned. Crops farming is labour intensive since land need to be fenced rigorously to prevent roaming cattle destroying the crops. Unfortunately, local material for fencing makes it last for only two years. Due to this constraint, only a quarter or a third of the available land are planted for crops. Similar features were reported by da Cruz (2016), indicating that farming conditions in Timor-Leste has not been changed significantly in the last decade.

Another hampering factor to expand crops farming is low market demand and unattractive costs-benefits margins. Farmer trade is restricted to small volume in nearby market as most farmer grow similar crops (Islam et al., 2016). Travelling for bigger Dili market is not an option for these small producers because of high transport cost, bad road, and rarely available truck. Farmers in Clacuc and Tutubaba expressed disappointment after putting efforts, costs, and time into maize farming. Market was limited during harvest time as many other farmers produced the same product while selling to kiosk was not an option for uncompetitive prices compared to similar subsidized imported product.

In consistence with Bettencourt et al., (2015), this study identified that cattle play critical roles for large expenditure such as cultural ceremonies, building houses, school fees and as saving that considered to generate the highest revenue. Yet, cattle are managed under traditional farming systems. Improving cattle farming has been challenging for bio-physical and human resource factors. Feed and water scarcity, diseases, and high calf mortality were among chronic problems while extension and animal health services were limited. Losing all calves in one calving period is common as reported by farmers in Aidabaleten. Low cattle productivity was exacerbated by farmers' habit to sell cattle when in need, not in time for highest prices. This puts farmers in a weak bargaining position. Cattle were seen as an accumulative saving that can be sold at any time needed, as in line with Bettencourt

et al., (2015). Farmers sell cattle to local traders by estimation of body conditions and number of 'adik' (younger siblings).

Another hindering factor to cattle farming development in RK sites is limited access to information and rural services. MAF has put extension and technical staff at sub-district level to provide services in rural communities. The Government also established programs to develop extension system in the country (Langen, 2016). Nonetheless, interviewed MAF staff revealed that most services are technical such vaccination and animal health services depending on the government program and budget availability. Almost no funding available for extension related activities to visit farmers, neither to produce extension materials.

4.2. What is *Redi KAMODI*?

In respond to poor rural communication services to improve farming practices in Timor Leste, a R4D initiative introduced *Redi KAMODI* as a co-innovation platform. *Redi Kamodi*, a local abbreviation stands for *Redi Karau Ba Moris Diak*. 'Redi' means network and 'karau ba moris diak' means cattle for better livelihood. It is a co-innovation platform in which its members seek ways to improve livelihood through improved cattle farming. This definition implies that RK is constructed of setup structure of a formal group with a management team, stakeholder members who sign up voluntarily, processes of facilitation by external support network involving the project research team and government technical advisers, targets of improved cattle farming practices, outcomes of better livelihood, and impacts on community wellbeing.

By looking at the *Redi Kamodi* definition, this platform fits nicely into category of innovation platform to illustrate an avenue for stakeholders in a particular region to interact for a particular sector (Ayele et al., 2012), which is family cattle farming. As innovation platforms is built upon interventions to establish a supporting network for technical, social, economic, and institutional innovations or combination of them (Kilelu et al., 2013). Correspondingly, *Redi Kamodi* established network that members collaborated to explore ways to improve livelihoods through improved cattle management and marketing.

Establishment of a village-level *Redi KAMODI* started with a community-wide participatory situation analysis to collectively identify and prioritise constraints that hinder cattle productivity, as well as the options to innovate and improve the cattle

production system. Once an initial level of awareness and readiness for change exists among the community, the *Redi KAMODI* model was introduced, farmers signed up voluntarily to become member, and they decided the local management structure and mechanisms. Farmers received regular training on technical, critical, and business skills and they were facilitated to collectively experiment to answer the questions they have and adapt introduced innovations according to their farm-based conditions. Intensive capacity development was also provided for MAF facilitators including technical training, facilitation and communication skills development, and organisational management.

4.3. *Redi KAMODI* achievements

4.3.1. Expansion of *Redi KAMODI* groups

Redi KAMODI was started in 2016 with two groups and expanded into 21 groups in 2020 involving more than 500 households across 8 out of 13 municipalities in Timor Leste (Table1). As shown in Table 1, the majority of farmers in RK groups have practiced improved cattle management practices, planting feed crops, in particular the forage tree legume species *Leucaena*, to secure supply during the dry season, and fatten cattle using tree legume for a faster and higher profits. Profits from cattle fattening were higher with access to Dili markets with the sales system based on cattle liveweight. The heavier the cattle, the higher the price per kg liveweight. Results from practice changes after farmers and other stakeholders participate in *Redi KAMODI* will be discussed further in the next section.

Table 1: Redi KAMODI establishment from 2016 - 2020

No	Municipality	District	Village/ RK Name	Year start	Initial members	Members in 2017	Members in 2018	Members in 2019	Members in 2020	Members in 2021	Members planting feed crops	Members fattening cattle	
1	Bobonaro	Atabae	Aidabaleten	2016	23	19	53	49	52	63	49	38	
			Rairobo	2018	75		37	68	70	23	23	13	
			Atabae	2018	64		29	20	35	23	18	24	
			Hataz	2019	16				16	22	3	13	
		Cailaco	Meligo	2019	80			102	102	83	71	12	
2	Manufahi	Fatuberliu	Fatukahi	2016	23	27	23	23	20	16	12	31	
			Clacoc	2019	26			30	25	39	12	42	
			Caicasa	2019	15			10	15	15	10	15	
3	Ermera	Hatulia	Asulau/Sare	2019	70			70	12	12	12	5	
4	Ainaro	Hatudo	Leolima	2019	78				48	48	13	2	
			Becala	2020	42				35	35	35	35	
		Ainaro Vila	Cassa	2019	30				30	4	4		
5	Covalima	Tilomar	Casabauk	2020					98	65	12	9	
			Maudemo	2020	15				15	50	9	8	
6	Viqueque	Viqueque	Bahalarauain	2020	21				21	21	5	8	
			Luka	2020	15				15	16	7	3	
7	Manatuto	Natarbora	Umaboco	2020	19				19	8	2	6	
			Sicone Diloli	2020	10				10	11	3	3	
			Abatoan	2020	15				15	8	2	6	
			Aubion	2020	17				17	17	5	7	
8	Lautem	Tutuala	Mehara	2020	15				11	11	4		
		8	10	21		669	46	171	372	681	590	311	280

4.4. Impacts of *Redi KAMODI* on farm families

4.4.1. A life transformation (from farmers' perspectives)

RK has radically changed farmers' lives in a positive manner, as expressed by all interviewed RK farmers. This transformation is related to improved income from improved cattle farming practices, and enhanced knowledge and skills on business, feed, and cattle management. This improved income enabled them to send their children to school and improve family living conditions. The higher income was mainly generated from new practice of cattle fattening using tree legumes and new marketing system to sell cattle to slaughterhouses in Dili based on live weight. The price difference from the traditional system as compared to the new fattening system has been up to US\$ 300 – 400 per head at the similar age. This extra margin is significantly valuable for smallholder farm families to improve their household economy.

Farmers practicing cattle fattening with market orientation indicated that involvement in *Redi KAMODI* has transitioned their cattle farming system from a predominantly subsistence into a more commercial system by internalizing the introduced innovations into their farming system. This transition was enabled by ongoing capacity development activities and collective action of RK members, such as collective tree planting and marketing. For these positive impacts, farmers showed willingness to continue the changed practices and RK beyond the project life and keen to share to neighbouring villages.

"I feel happy because this RK program brings changes in life and knowledge and experience of working or being a cattle farmer." (Farmer-Manuel Martins).

"What I feel for myself with the RK program can change my thinking and the cows that I fatten if I want to sell. I already know the price." (Farmer-Domingos Tavares)

"We are here to continue and continue to other places, because it affects the needs of the family, sending our children to school, that's why we want to continue." - Norberto Leitao (farmer)

"To the neighboring village, which Redi Kamodi has not yet entered, we are the ones to share the information with them." – Anaceito de Aroujo (farmer)

The shift in RK farmers from subsistence cattle farming into more commercial orientation and their willingness to continue the changed practice mirror a study by

Lema et al., (2023). Their study identified that innovation intervention will sustain when it enables transition from subsistence smallholder into more business-oriented farming. Therefore, I argue that for innovation to get wide uptake in a sustainable manner, it needs to provide tangible economic benefits in a reasonable time. Implementing innovation and changing farming practices usually come with additional cost, labour, and time consequences. Smallholder farmers generally have limited resources and tend to retain the existing practices to avoid larger losses in case of farming failure (D'Exelle & Verschoor, 2023a). Hence, a relatively fast and tangible economic benefits is one of requirements for innovation to be adopted by smallholder farmers. In this case, cattle fattening using tree legumes has proved to meet these criteria. Although farmers need those extra consequences, the results pay all it back and satisfy farmers.

Transforming farmers' livelihood through RK processes was made possible by collective action and teamwork. Farmers reported that *Leucaena* planting required a lot of efforts, from establishing nursery, fencing, land clearing, transplanting, and nurturing the plantation. Being part of RK group member and working in group has enabled farmers tackling these challenging works. Farmer's teamwork was supported by RK regular meetings at the village level. These findings show RK has performed as innovation platform, that among innovation platform character is bringing different actors in agricultural *R4D* process to foster innovation uptake, to collaborate (Klerkx et al., 2013).

"There (at the meetings), for example, those who keep the cows there, we have discussions, how to give feed for friends who don't understand, the function of the group is to give each other ideas, do joint work plans" - Rodolfu Atu Suri

The positive impacts of *Redi KAMODI* for participating farmers has echoed to non-participating farmers. The majority of them already knew about RK and its activities from participating neighbours and got motivated to join. Farmers' main motivation to join was access to better market opportunities to sell cattle. There seemed to belief on RK system from impressive values RK farmers received. In rural societies, farmers tend to accept new technologies by influence, information, and support from friends and relatives (D'Exelle & Verschoor, 2023a). This gives a greater opportunity for RK to serve as a rural communication service where extension services are poorly functioning.

4.4.2. Pride for improved capacity and economy - from facilitators' perspectives

Government staff who served as facilitator also reported positive impacts from participating in RK processes. These impacts were dominated by improved knowledge and skills on technical and facilitation component. Respondents expressed gratitude and pride for their capacity development, from not knowing at all, into being able to run fattening enterprise and facilitating RK.

“Personally I feel grateful because this RK program gives incredible things for me, apart from numerous trainings we have received, we also have field works. There are components I learnt so far, communication and cattle management. For me, communication is very important because from this communication we can collaborate well with farmers” (Aristides Tavares – technical staff - Aidabaleten).

“I got many trainings from different resources theoretically and practically, hence I feel blessed to participate in Redi KAMODI program, from knowing nothing until now I can run (cattle fattening) myself” (Abilio de Jesus_Tech_Aainaro).

4.5. What does it take for Redi KAMODI to be a functioning co-innovation platform?

The RK model showed tangible achievements to serve as a co-innovation platform where members underwent change processes in cattle farming management, in individual knowledge and skills, in organizational development, in business and marketing orientation and finally in livelihood improvement. This study identified contributing factors for RK to achieve those results as will be discussed below.

4.5.1. Participatory approach as underpinning concept in establishment

Achievements of *Redi KAMODI* has confirmed results of implementation of participatory approach in co-innovation platform. This mirrors Okali et al, (1994) that greater participant involvement in the process would make agricultural research, development, and extension in less developed countries more effective. In RK processes, all stakeholders were involved throughout the research processes. Therefore, I support the implementation of participatory approach to achieve a functioning innovation platform to serve as rural communication services to improve farming practices, as has been proven by *Redi KAMODI* . Farmer involvement in

problem definition can motivate people to participate solving the problem and reduce resistance to research and innovations Chambers (1994). The higher-level farmer participation, the closer outcome will be produced to suit farmer's needs (Petheram, 2000).

As shown in RK processes, farmers involvement in situation analysis enabled them to identify problems and opportunity to improve cattle farming productivity including planting and conserving forage to anticipate dry season, practice cattle fattening to increase cattle sale prices, improving management system, and regular vaccination to control disease. When innovations were introduced through the innovation platform, farmers voluntarily took and practiced it in sustainable manner. This has confirmed that community-based need and opportunity can serve as an entry point for farmers and stakeholders' involvement, to gain understanding on the research context, and to internalize the introduced innovation into their existing practices (van de Fliert and Braun (2002).

The implementation of a participatory approach in RK as an innovation platform was supported by regular reflection activities. Lema et al., (2023) suggest that strengthening feedback mechanism in innovation platform activities is crucial to enhance its efficacy to deliver impacts beyond the project life. In RK processes, the reflection activities served as a venue to identify another problem for the next learning cycle where members addressed problems related to cattle development both for bio physics and social economic aspects. Results of these reflection activities were apparent by RK farmers continuously seek improvement on cattle farming practices related to technical and socio-economic aspects.

4.5.2. Co-innovation and multi stakeholder processes in operation

In agricultural innovation systems, addressing specific challenges will need to bring different players and their network (Klerkx et al., 2009). Those different actors may come from different background, interest that need an intermediary party to facilitate the innovation processes. The role is not in the creation nor the implementation of innovation but to connect various partners and enable learning and information flow (Klerkx et al., 2009). This study showed that establishing a *Redi KAMODI* unit into a functioning co-innovation platform to provide rural communication services required a multi stakeholder processes. It involved various actors including research team, farmers, traders and MAF facilitators. Actors in an

innovation system are catalyst to achieve the outcomes and determine the success of the system (Kamara et al., 2023) as was shown in *Redi KAMODI* achievements.

In the RK case, it was identified that project management played this role connecting participating parties since they have resource power. However, this study identified that the nature of project management was one among the contributing factors that determine performance of RK as co-innovation platform. The importance of management team in RK processes was side by side with bringing team into similar understanding on RK approach and facilitation.

Bringing team into similar understanding on participatory approach as the underpinning principles of Redi Kamodi was the foremost factor to achieve functioning RK as a co-innovation platform to serve rural communication service. RK project experienced a slow start for this regard as indicated by slow expansion in the first two years due to confusion over participatory approach despite induction workshop being held. This approach was simply understood as merely wait for everything from the bottom. Often research team only waited for proposed activities from farmers who have been so used to top-down and hand-out programs, and the proposal never came out. These findings were in consistence with what Van de Fliert (2008) underlines that integration of participatory approach into operationalization of RnD initiatives requires capacity building, establishment of communication forum and a rewarding incentives mechanism. The confusion over operationalization of participatory approach subsided after researchers from different background got involved in participatory planning workshops, trainings and had more frequent joint activities.

The next factor to achieve functioning RK units as a co-innovation platform to serve rural communication service was facilitation. RK processes were facilitated by project's field researchers and MAF facilitator at sub-district level both extension and technical staff who have received intensive capacity development from the project including technical training, facilitation and communication skills development, and organisational management. Through these facilitators, farmers received regular training on technical, critical, and business skills and they were facilitated to collectively experiment to answer the questions that they have and adapt introduced innovations according to their farm-based conditions.

The last factor to achieve functioning a RK as a co-innovation platform to serve rural communication service was project management as a supporting entity.

This study observed two different management style throughout the project with significant different results. The first was foreign-led management with rigid procedures that has led to demotivating local partners to participate in RK related activities. This was then changed into local-led management with more flexible nature that significantly brought positive influence to partner participation. Results of this changed management style was reflected in RK progress. It showed a slow start in the period of 2016 – 2019 (from 2 groups into 8 groups), while the concept was still being piloted but went up sharply from 2020 – 2021 with 13 new RK groups, after evidence of success became apparent to farmers and MAF staff alike. This finding is consistent with the underpinning principles of participatory approach in agricultural *R4D* that greater participant involvement in the process would make agricultural research, development, and extension in less developed countries more effective (Okali et al, 1994). The higher-level local partner participation, the closer outcome will be produced to suit local needs (Petheram, 2000). Therefore, for *R4D* initiatives in developing and challenging conditions like in Timor Leste, this study recommend to involvement local people at managerial level that determine direction and operation of the initiatives for their understanding and knowledge of local needs and conditions.

4.6. What does it take for *Redi KAMODI* to be implemented as national program?

Redi KAMODI processes have shown a function as co-innovation platform to serve rural communication services. Among results of RK has been transitioning smallholder subsistence-oriented cattle farmers into more commercial orientation. Respondent farmers also expressed their willingness to continue the changed practices beyond the project life and even expand it to neighbouring farmers. Despite those achievements, often *R4D* initiatives like *Redi KAMODI* will fade away when not getting institutionalised into the government system. Then what does it take for RK model to be implemented as national program?

This study identified three main requirements: (1) facilitation capacity at village level, (2) leadership capacity to coordinate a nationwide RK program, and (3) financial and physical resources. Capacity building can be in the form of regular and continue on-site training at sub-district level or opportunity to pursue higher degree training. In facilitating RK, training modules and other media are needed. Meanwhile,

leadership capacity was identified as an important requirement to implement RK model as a national model. Respondents mentioned the importance of facilitator to have good collaboration with leaders at national and municipality level. At the same time, supporting village rules/ consensus are equally needed to support RK program. As an example, the need of village rules about roaming cattle. Often cattle destroy the planted forages that then demotivate farmers to continue doing the new practices. Leaving roaming grazers and those planting forage without rule will ignite horizontal conflict between farmers. Village rules will assist to avoid this situation.

The last requirement identified to implement RK model as a national program is availability of financial and physical resources at municipality level in the form of operational budget and supporting equipment. Respondents acknowledged the importance of operational budget to support RK facilitation activities. At the moment, they have very limited operational budget with large working coverage. Hence, they expect sufficient operational budget to support continues RK facilitation from the Ministry of Agriculture or external sources.

5. Conclusions

This paper has aimed to offer insights on how *Redi KAMODI* as a rural communication services model based on co-innovation processes was able to guide farmers to become independent cattle producers and business managers, while simultaneously turning government extension officers into facilitators of change. Evident in this study show that *Redi KAMODI* processes have transformed farmers' and government facilitators' lives through enhanced knowledge and skills that then translated into improved cattle management practices. The changed farming practices have subsequently transitioned family farm from smallholder subsistence into more commercial farming systems that almost doubled their income compared to the traditional grazing system.

Farmers' life transformation by participating in *Redi KAMODI* was enabled by *Redi KAMODI* processes that started by community-based situation analysis as an entry point to engage with stakeholder, and at the same time to collectively identify constraints and opportunities to improve cattle productivity. For further processes, emphasis was put on facilitation and trainings to improve framers and local facilitators capacity on technical, facilitation and business and marketing of elements. *Redi KAMODI* platform has become a hub to facilitate horizontal communication

between government staff, farmers, and related value chain stakeholders resulting in mutually beneficial relationships.

Therefore, it can be concluded that rural family's participation in innovation development through the *Redi KAMODI* has enabled farmer empowerment and sustainable practice change in a collective manner, hence strengthening communities, as well. The *Redi KAMODI* can serve as a model to rethink the national agricultural extension system as a rural communication service. It shows efficacy in addressing the needs of family farming under resource-limited conditions to move towards an improved livelihoods in a sustainable manner.

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