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Stimulating Innovation Systems in Natural Resource Management in Western Ethiopia: Realities and Recommendations

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Abstract:

Practitioners and researchers alike argue that innovation is a product of the interaction, joint action and collaboration of a number of actors set around a given task. But practical extension system treats innovation as a set of technologies provided to farmers. In view of the agreeable concept, innovation implies more of interaction than mere practice that appears new to a given community. Development of agriculture is directly correlated with potential of natural resource. According to this diagnostic study, the impact of NR depletion on productivity is becoming a concern; and the land tenure policy which made natural resource a public good is the other fact that entails actors' joint action. This requires enlargement of institutional space to treat Natural Resource Management (NRM) in a system approach. This driving fact allows technological improvements, helps to work beyond technological induction, ensures the need for system approach; help actors discharge responsibilities with effectiveness, and keeps innovation platform active. Realities indicate that farmers view their participation in NRM planning, implementation and innovation as inactive. Their practices either traditional or based on instructive campaign. They have minimal or no role in the process while they understand participation makes a better achievement. According to farmers, various NRM actors are in the area. DAs, experts, administrators, NGOs, researchers and university professionals were mentioned. DAs on their part have the view that their efforts are not so active as earlier. As commented by farmers, they lost commitment; their attempts are hardly to make a change. Incentives are overlooked, their job satisfaction is lost and directives are rarely developmental. According to DAs, much of their time is spent on nonagricultural agendas. Technology diffusion, training, farmer visits, farm related problem identifications, are now said than done.

Experts agree on demoralized feelings of DAs, even if they state that they are offering technical trainings for DAs. DAs inform that trainings are not technical, but are transmission of administrative instructions. All interviewed actors indicated that there is potential stakeholder with varying level of responsibility but the link between them doesn't imply existence of innovation platform. The study indicates technological development per se cannot bring about sustainable change in NRM and hence is livelihoods. Thus, it is recommended that institutional and technological linkage must be in place paving the way for actor-roles linkage that sustains in innovation system.

Keywords: Innovation systems, Innovation platform, stakeholders, pluralistic action

1. Introduction

Innovation is literally defined as the idea, practice, or technology perceived to be new by people. Innovativeness implies the behavior of individuals to be pioneer in adopting the idea. Innovation adoption process involves the practice, the channel and the client interested to take up the practice. However, persisting question is whether to consider the practice, or the system. According to Wongtschowski M. et al (2013), practitioners and researchers argue that innovation is a product of interaction, joint work and collaboration of a large number of actors. But practical extension system treats innovation as a set of technologies provided by a public extension sector.

Innovation system is seen as the emergent property of multi-stakeholder interaction which works when actors involved realize that, they are interdependent. Actors in the systems could be individuals, enterprises or organizations, the interactions among them, the rules and framework, conditions shaping their interactions to enhance control over material flows, livelihoods, and opportunities for the actors in the systems. Such innovation systems can be identified; facilitated,

supported, and strengthened using *innovation systems approach* (Arnold V.H and A. Youdeowei, 2009). Innovation capacity further implies the capacity of an innovation system to bring about beneficial change. Enabling environment conducive to innovation contributes to a healthy and well-functioning system. In a system which favors innovation, there is diversity of actors who are well linked, and who operate in environment that encourages a change. On the other hand, where innovation is less likely to happen are characterized by dominance of one actor.

In Ethiopian rural technology promotion efforts, the culture of dominance and failure to ensure effective linkage among actors makes changes difficult. The case of Natural Resource Management (NRM) demands strong innovation platform beyond technological intervention. The current diagnostic study in particular focused on the availability of potential actors related to NRM and the level of interaction to bring up a meaningful change in practice of the community.

2. Description of the Study Area

The exploratory diagnostic research was conducted in Digaworeda of East Wollega zone of Oromiya, Western Ethiopia which is located at a distance of 343km west of Addis Ababa. It features a mixed crop-livestock farming system with lowland-dominated agro ecology. The natural vegetation cover is widespread, with prevailing deforestation due to expansion of farming. In-migration from other areas of the country and movement within the area from the highlands to the lowlands in order to access fertile farm land are observed. Diga has similar characteristics with adjacent weredas that include Jima Arjo, Arjo Gudattu, and Sasiga to whom the same recommendation applies.

The woreda is within the altitude of 1110-2300masl, depicting the characteristics of lowland and midland. Sufficient rainfall with unimodal nature is reported. Common crops include Teff, Niger seed, coffee, maize, barley and faba bean in the midlands; and in the lowlands, maize, sorghum, sesame, fruit trees are observed. Areas adjacent to the rivers are cultivated during the dry season in small scale. In the woreda the issue of natural resource management is critical. It is surrounded by valleys which make its soil susceptible to high erosion. Dima, Cirecha, Gela, Gutin and Didhesa are big rivers in the area where some diversion irrigation is observed.

3. Research Methods

This research was conducted aiming at the diagnosis of availability and interaction of various actors determined in the area; it attempted to see if the interaction defines the real practice of innovation system; while identifying relevant factors involved in NRM at different levels; exploring issues relevant to innovation platforms. Five kebeles were purposively sampled to capture a range of agro-ecology, presence of NRM interventions, and levels of natural resource degradation. Kebeles surrounded by big rivers were considered to have representation of community that shares the water resource. Selected kebeles are *Gudisa, Bikila, Arjo Kote Bula, Lalisa Dimtu, and Adugna*.

In-depth primary data were collected from communities using various PRA techniques. This includes; community resource mapping, participatory timelines, and Focus Group Discussions (FGD) composed of male, female, and mixed groups; and Key Informants' Interview (KII). Accordingly, three FGD composed of 15-20 members each with a logical combination of women and men were used in each kebele. Similarly, three elder, knowledgeable and expressive farmers (total 15) have been used for a community walk (CW) to narrate the historical events in the context of NR in the selected kebeles. In each group, age and wealth status were considered. Besides, KII conducted with three model farmers (men and women) in each kebele; three Development Agents (DAs) each in two clusters¹ and experts/ heads from various sector office/ institutions (Agriculture, Land Administration & Environmental Protection, Finance & Economic Dev't, Water Resources, Cooperatives, Credit and Saving Association); 5 kebeles and 1 woreda administrators; two staff each from agricultural research centre and Wollega University were consulted. One from NGO (pathfinder); and one from private farm investor were also part of KII. Generally, a total of 292 people (239 in 15 FGD, 15 KII, 6 DAs, 14 CW and 18 experts) were interviewed. Semi-structured checklists were developed in advance for guiding the interview.

Secondary data were collected from kebele admin, DA stations and woreda offices. Due to the qualitative nature of the data; innovation systems and innovation capacity were assessed based on various actors' perception through action research. The whole process of data collection and analysis is central to the following key innovation questions:

- What are the NRM practices innovated?
- Who is currently innovating in NRM?
- What support do they receive? And from whom?
- What networks currently exist and how do they function?
- What is the scope for organizations to collaborate?
- What enables successful innovation? And what determines actors' interaction?
- What barriers constrain sustainability of innovation platform?

¹ Cluster village composed of three kebeles.

4. Result and Discussion

4.1. Major Actors and Their Views in Innovation System

In the study area, there are actors to initiate new practices and encourage the continuous use of the practices by farmers. Different responsible actors are available at various levels in the structure. When ultimate adopters are farmers, other actors like government offices, local institutions, and development agents were believed to play important role in the process. Networking and interaction is considered more to understand the existence and strength of innovation systems than the practices induced. The following part of this paper describes the various factors involved in Diga innovation platform taking into account the natural resource management practices that significantly contribute to the achievement of rural livelihoods. Respective roles of identified actors will be discussed and cross referenced to understand the strength of the link between them.

It was indicated that government agencies including local administration and community have been observed to have stakes in NRM and related practices. Interviewed experts reported that their roles are limited and major actors are farmers themselves. This is correlated with farmers' traditional practices on NRM. Even from the existing government sector, only few of them have association and role in NRM. Yet, they view the current innovation status in the area differently.

4.1.1. Farmers' Views on Innovation Systems

Farmers as major actors in NRM have limited knowledge on the practicalities, while they understand the essence of the system approach in adoption of innovations. They have been doing NRM activities based on traditional practices; a new practice is inaccessible to farmers, unless it comes with administrative instruction. Farmers are often told to rehabilitate degraded hillside or gullies through campaigns that are supervised and overseen by government bodies. This indicates that the role of farmers in planning process is minimal. On contrary, they are the right group to probe their problems and imply appropriate interventions, though their views are often overlooked. As are blamed by farmers for not doing enough to help them improve their living status. On their part, DAs admit their failure attributing to lack of support from relevant higher supervisory structure (experts). This was further clarified when farmers and DAs made a joint problem diagnosis. This instance is the beginning of disintegration in the innovation system. While farmers are missing in the planning process, only DAs and experts put down instructions for doing things. This negates the practical definition of participatory approach. DAs take their usual responsibility of channelizing the action report to Woreda experts, and that is the level at which things get an end. Woreda experts are active in passing down instructions with the same tone as the regional bureaus than conceptualizing with farmers' contexts and roles of DAs.

Some DAs disclosed that there is no effort and initiation in their part to try new things. This is due to lack of trainings on new practices, lack of materials resources, and lack of support/ motivation from government in supporting adoption of technologies. They also noted that there is no institution and organization to support innovation practices. About five years ago, DAs used to be placed in villages, closer to farmers. Their roles were door to door, but now most of them are stationed in offices, shuttling between villages and towns spending their time in town. Their role remains transmission of information on input distribution, tax collection and arranging meetings. This view of farmers is shared by DAs who also agreed that their (DAs) placement is not encouraging to play their required roles. According to discussants, earlier development agents were very much motivated and committed to work for change. This is confirmed from DAs at Arjo and Guddisa kebeles. DAs in turn disclosed that their declining motivation is emanated from lack of incentives packages and encouragement from wereda experts who are also busy with other administrative assignments.

Innovation as a form of improving traditional practices were observed in the area for increasing crop production/ productivity, improving soil fertility and reducing soil erosion. But the focus of extension remains with crop technologies. NRM practices are instructional/ campaign based. Thus, the fear of failure is the major reason for farmers for not trying innovations. This is because the risk of failure is fully taken by farmers themselves.

- **New practices:** As innovation platform, village community through Kebele leadership gets together and discusses on kebele level development issues. Then development team is established to facilitate people for joint action especially on common agendas like terrace and dam constructions. The development team (locally called *Gare*) composed of cells (*Shane*) is responsible for resolving conflicts related to drainage, terrace, dams and grazing land.

Irrigation is currently promoted to ensure continuous supply of food for households. Other soil conservation measures are also tried as new practice to increase productivity, improve soil fertility and reduce erosion. The other new practice in the area is Soybeans production for nitrogen fixation and better income. Production of Soybeans and cauliflower is adopted from the then Didessa state farm. Later on, it was discovered that newly introduced crops such as groundnut and selected leguminous animal feeds are good for fertility improvement.

- **Challenging the innovation:** Farmers' innovativeness and innovation practices are most associated with new production technologies that have economic and environmental importance. Irrigation based practices are mostly exercised. This is due to existence of potential rivers such as Dimtu, Cirecha and Gela Rivers. Dimtu and Cirecha are accessible to Arjo and part of Bikila farmers. Gela River is located between Gudissa and Lalisa Dimtu kebeles, where serious and recurrent conflict is reported. Dimtu is also a potential source of irrigation but currently banned due to aggravated conflict between Addis Gebo and Dimtu zones of the same kebele. Despite the potential of the rivers,

disputes have been going on due to competition on the rivers. The research explored if there are local legislations (by laws) on irrigation water use set by community/authorities, but that was not reported. As a result, the upper stream farmers have limited opportunity to irrigate their farmlands due to lack of capacity to buy water pumps.

According to farmers, local administrators and officials are less concerned of the cases, otherwise the conflict could have been resolved easily if they had been involved in the dispute management. The issue of natural resource-based disputes would not have been serious concern had there been sufficient support from administrators. Many initiatives and innovations have been conveyed to farmers but the problem is the capacity and confidence of try things. This is true as the cost of bearing the risk remains with farmers. Woreda office of agriculture and rural development is the only channel to promote such initiatives like irrigation development, intercropping, cash crop production, nursery development, etc. Even some farmers in Lalisa Dimtu have not recognized the role of agriculture office. In some cases, like in Arjo, research centers have been in the system distributing new finger millet seeds as a demonstration. In this case, successful farmers became local seed producers and marketer. Cooperatives also assist farmers in the supply of necessary inputs. Churches have supported poor farmers acquire seeds.

In Guddisa kebele there is a strong cooperative association that supports member farmers with the effort of trying new technological practices. Credit is available for farmers who are willing to adopt a particular innovation. However, some members indicated that the association needs technical support on the effort to help farmers improve their lives. Farmers meant that although the cooperative association is assisting its members in trying innovations, it is challenged with lack of capacity to train, manage, and follow up activities. This attempt is a signal for appreciating private extension service delivery in this community. The role of cooperatives in the absence of active extension personnel is found to be remarkable. Some of local institutions that provide support for farmers includes churches, CBOs, *Idir*, *Debo* and cooperatives are among those. *Idir* involves saving contributions, helping, and supporting each other during funerals, sickness and loss of livestock assets. It helps members who lost family members due to death. It also involves contributing labor for work to members who are affected. *Debo* is also a local membership of people used to share labor in times of need (e.g. construction of houses, planting, weeding, harvesting, and threshing). Kinship and neighbors are other means of getting support in the community. Other collaborators of the local innovation system include health extension agents, school teachers, NGOs (Pathfinder-mentioned) as well as students. According to farmers, these groups of people in one way or the other offers some kinds of advice on care for environment and natural resource. Farmers recognized availability these potential actors to ensure innovation system, but the reality indicates that there is no integration between them. This remains a challenge for promoting innovation system in NRM.

4.1.2. DA's View on Innovation System

The most surprising case during the survey was the fact that development agents working in the woreda are not happy to be named "DA". Informant lady development agent explained that they don't want to be named DA. She said they would be happy to be called "*Hojjetaa Misoomaa*". The term of their interest literally means the same "development agent". This indicates that they are unhappy with their role as development agents. Despite the naming, DAs have agreed with the views of farmers that their motivation for change is blocked due to lack of support / encouragement from their supervisors. Particular to NRM, DAs reported that no visible efforts have been exerted to try new practices. They attributed this to a number of factors, including lack of on-job training, lack of inputs, lack of motivation, failure of their offices to create opportunities for skill improvement. They further stated lack of innovation platform to support the community in sharing ideas and trying new practice. Hence, this gap requires establishment of forum for bringing together different actors to share ideas and create new approach for NRM. This is to call for advisory services that recognize the importance of different actors in providing customized advice with pluralistic delivery system.

Consulted DAs were transparent to admit their weaknesses which they reason to lack of refresher training on the latest development in their field of studies. They noted that they are working for over five years with the knowledge gained from Agricultural Vocational Education and Training (AVET) centers. Currently, there is limited in-service training, which used to be regularly planned and provided in the past. Besides, there is limited chance to improve their capabilities. Despite, the various factors challenging DAs from exerting their defined roles, they tend to be busy with other administrative duties like conflict investigation, resolution, plot/boundary demarcation, irrigation plot allocation, facilitation for tax collection, and organizing community meetings. Technical matters like visiting farmers (fortnightly), holding discussions with farmers on development issues, identification of farm problems, and finding solutions through joint actions seem to have completely been elapsed.

4.1.3. Experts' Views on Innovation Systems

For the purpose of this study, all subject matter specialists have been treated as an expert in areas of their profession and contacted to assess their views on the status of innovation in NRM. Experts however, noted that there are two categories based on their level of involvement in planning, implementation and innovation systems; as well as their relevance to/and association with NRM. Accordingly, they were classified as major and supporting actors.

- Major expert actors in NRM innovation

Experts from natural resource, water resource, and irrigation development teams; crop sector, land administration and environmental protection and Agriculture and Rural Development (ARD) have been classified as major actors. These groups tend to be relatively closer to the subject and are playing active roles in NRM. Training farmers and DAs on nursery development, supply of seedlings, allocation of irrigation water, provision of nursery equipment and helping farmers in land use planning are regarded as the major roles of this category. Experts reported as if they provide technical support to DAs, but DAs detested. Overall, experts tend to have relatively good association and focus to natural resource management. Water resource sector on its part lacks trained professionals and is not financially in a position to plan on water resource management. The routine role of this sector is transmission of information to DAs. Only “dos” are communicated and “how to dos” are not in place. When it comes to land administration and environment protection sector, it is vested with the responsibility of caring for the environment and natural resources. However, its role has been so confined to maintaining peace between farming communities by setting plot boundaries.

In case of crop experts, who are also categorized as the major expert group, the mandate is to work to increase crop production by encouraging farmers use improved technologies packaged with chemicals and fertilizers. Discussion with this expert revealed that they have a very limited understanding of the association between crops and NRM practices. Although experts reported giving training for DAs, this has been refuted by some DAs. By the same token, DAs indicated that experts provide trainings and orientation on resource management policies as declared by the high-level decision makers. Land administration policies and guidelines are communicated to farmers on meetings. The wereda office of ARD has the role of guiding the operation and facilitates the exchange of knowledge and information among different actors in the innovation system. But flow of information is instructional than knowledge sharing and innovativeness.

- Supporting expert actors in NRM

The second category of experts is named “supporting experts”. Actors categorized under this cluster include finance section, cooperative section, animal production sector, extension expert, irrigation development office and Woreda administrators. The role of supporting actors in NRM is very minimal. Irrigation experts are concerned with allocation of irrigation plots. NRM and issues hardly falls within the scope of this sector. It is amazing that NRM is secondary even for extension experts. This confirms the rhetoric of the fact that Ethiopian extension system is crop biased (DavisK., et al, 2009). Cooperative development experts are relatively in close contact with farmers by means of promoting marketing and input supply. They also offer training for farmers besides helping them with marketing issues. The wereda administration plays a supporting role in NRM activities as it coordinates all development sectors. Their understanding about their roles with respect to NRM is limited, though they are aware of the importance of NRM and the need to allocate sufficient budget for the sector.

4.1.4. Views of Institutions (Outside Community) on Innovation Systems

Bako agricultural research center and Wollega University are the closest learning and research undertaking centers to share the problem of farmers and induce required technical skill to develop the capabilities of farming community. The research center is mandated for development and adoption of new technologies relevant to NRM. These include Soil and water conservation, agro forestry, and agronomic practices. The Center works with the community on technology verification, pilot testing and dissemination of the technologies. Regarding Diga site, the center reported that it has been involved in identification of crop production technologies suitable to the district and dissemination of already released teff, finger millet and soybean varieties. Moreover, cross-bred heifers were distributed to farmers as part of supporting development of the woreda. The center supports NRM interventions by offering technical trainings and organizing field days composed of various stakeholders.

Discussants from Wollega University shared the idea that there is a research center based research-extension-farmer linkage advisory council. Though the university recently joined the forum, it has reported as a good platform for strengthening innovation in Diga and areas around. According to both institutions, the forum conducts regular meetings and undertakes research and extension activity review sessions with all stakeholders in the zone. It has created an opportunity for sharing farm problems among stakeholders. The forum members include research center, University, private seed producers and distributors, public seed enterprises, soil laboratory, veterinary clinics, private agribusiness firms, input dealers, farmers’ cooperatives and model farmers. It was also reported that farmers’ problems are many, research attempts are also equivalent. Despite this, the reality is that the research focusing resource poor farmers is more of technical and biological where constraints limiting adoption of farmers are beyond that. Therefore, what is required is innovation platform that combines technical, institutional, organizational, and social aspects to develop coherently to address constraints holistically.

4.2. Driving Facts for Stimulating Innovation Platform in NRM?

This research explored that development of agriculture in the area is directly correlated with the potential of natural resource. The fact according to the diagnosis is that impact of NR depletion on productivity is becoming concern on one hand, and the land tenure policy which made natural resources a common public good is the reason on the other hand. This requires enlarging socio-economic and institutional space to treat NRM issues in the system approach. This driving fact: allows technological improvements, helps to work beyond technological induction, and ensures the system approach that help actors discharge their roles and responsibilities with accountability.

The experience on innovation systems in Diga and its surrounding indicates that transfer of information is very informal. That is through marketers, and trans-boundary travelers. There is a traditional farmer-to farmer diffusion of information which could be a potential to modernize and institutionalize. The current local structure in place organizing farm households into Cell (*Shane*), group (*Gare*), zone (*Gox*) and *kebele*, was intended for administrative purposes; yet, it helps in facilitating information flow among community. This local structure is used by different actors as a platform to discuss issues related to NRM and village development issues in general. Observation in the diagnosis necessitates actors' interaction to influence the development, diffusion and continuous use of NRM practices in the area. The available actors and their interaction is the driving fact that stimulates innovation platform even though the influence and power of each actor differs. The currently available village development planning structure that ranges from individual household the kebele level is the opportunity that is already deported. (See the structure under)

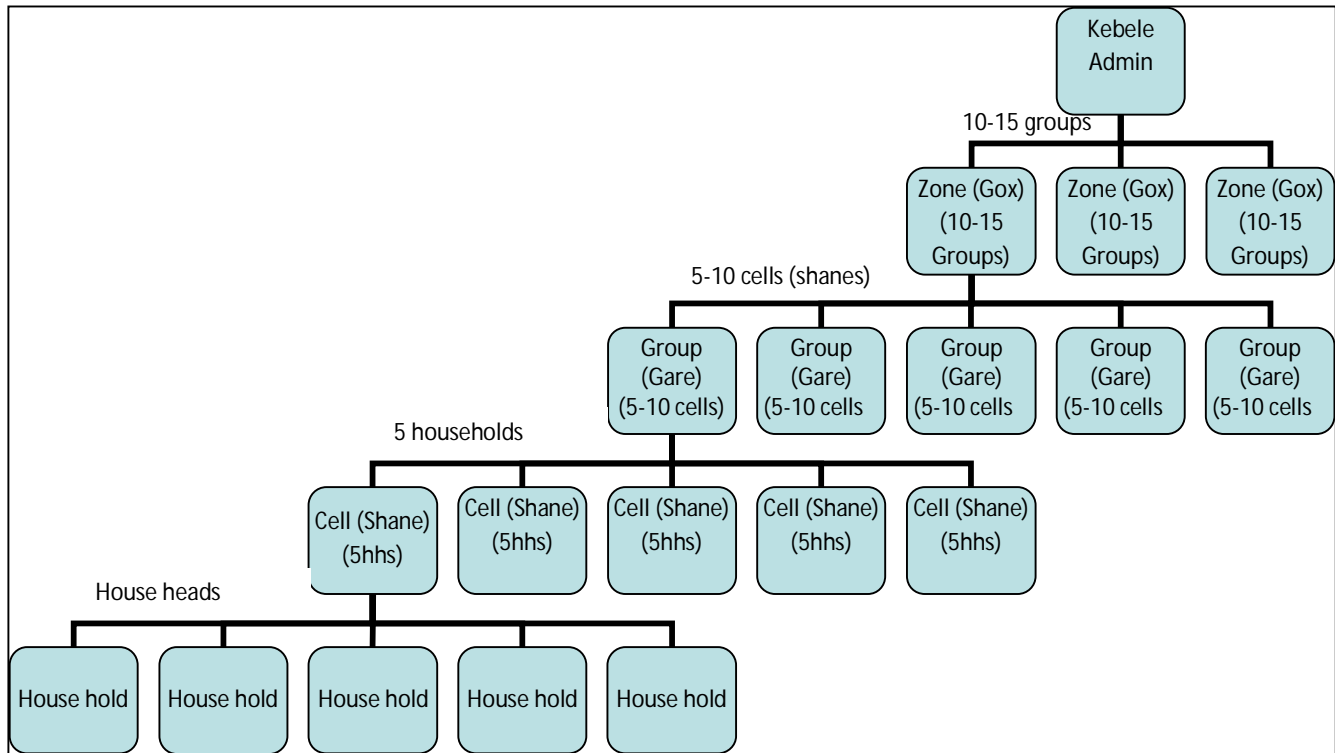


Figure 1: A penta-level village development planning structure (Innovation platform?)

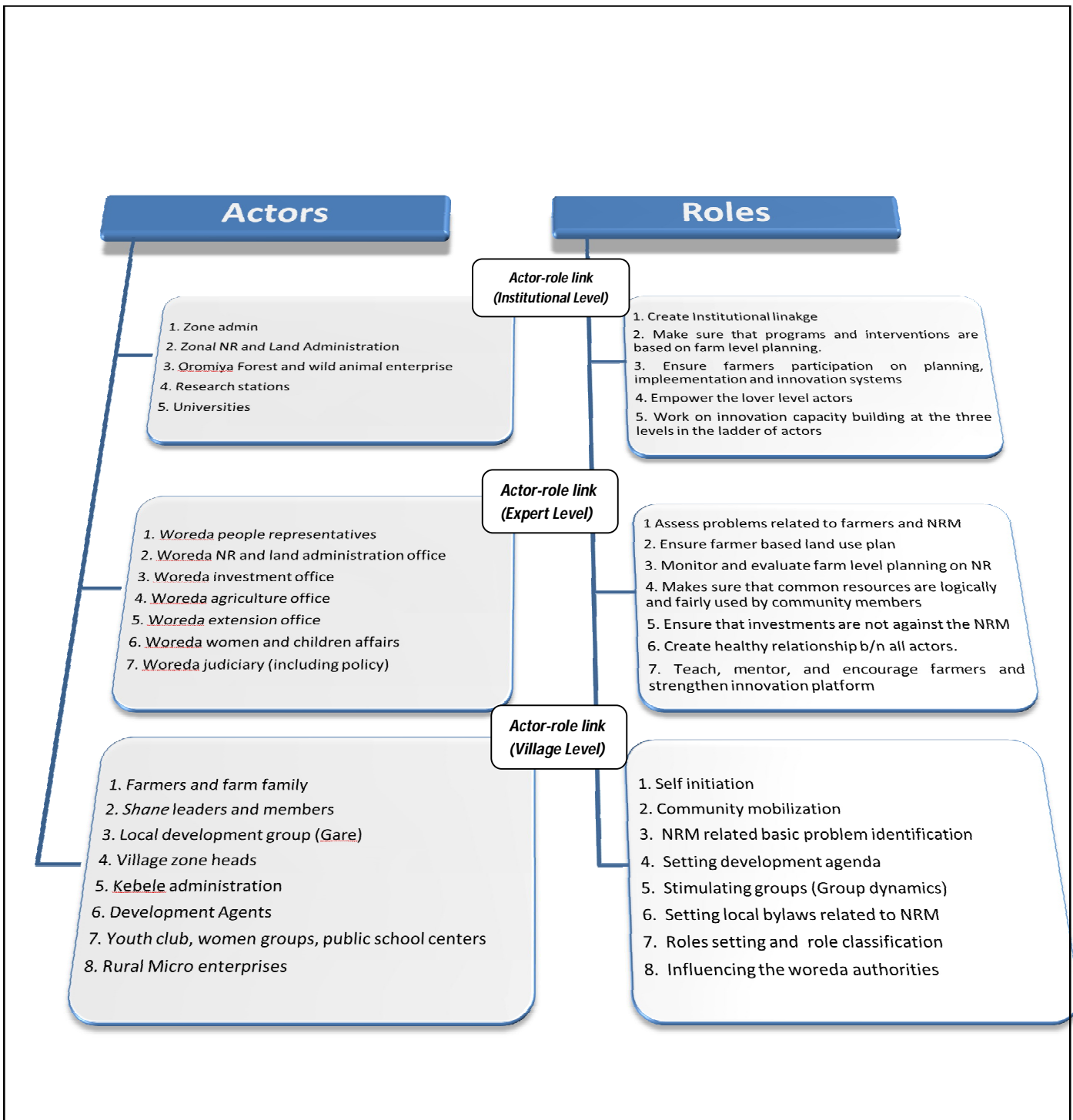


Figure 2: The ladder of actors vs roles link in NRM

5. Conclusion and Key Recommendations

The views of farmers and Development Agents in most cases correlates in those current DAs are not working for change. Experts were declaring to have strong connection with the rural community by way of capacity building relevant to NRM. But the reality indicated that it is the national campaign of soil conservation through terrace construction that is reported as planned activity by the experts. Informants indicate that some type of participatory approach is deployed, but that is not beyond getting together for politico-administrative purpose. At institution level, it was reported that the need for platform is most demanding. The currently existing forum (research-extension-farmer linkage advisory council) is the best opportunity for addressing the concern of innovation in NRM in particular and development in general. Farmers did not deny this issue, but the problem is lack of the link to assure strong innovation platform up on which the issue of NRM would be addressed. Innovation platform being in place helps communities and other actors to engage in more effective and sustainable NRM. The need for a wider participation of actors and more opportunity for multi-directional feedback have much to offer in enhancing innovation capacity at local level. The two institutions being an opportunity for working on local problems, the strong innovation platform ensures sustainability of pluralistic action in the innovation system.

5.1. Realities

Natural resources are abundant in the study area. It is surrounded by vegetation, rivers, waving landscapes, and seasonal rainfall. These resources require effective management. Actors concerned about issues of NRM are available at different levels. All have their defined roles and responsibilities. But are all disintegrated. There is no role and responsibility link between the actors. Despite the local knowledge and interest of farmers in dealing with NRM related problems, there are factors limiting innovation at local level. A stretched government structures and number of experts from various disciplines is found to be inactive. An inherent top down approach in technology dissemination leaves farmers and DAs passive in planning innovations.

5.2. Integration

Integration is required between all actors in the system due to institutional arrangements and vested roles and responsibilities, besides the professional roles. This creates an opportunity to link actions at different levels whereby strengthening innovation platform. It also gives chance for development of innovation capacity. The platform being in place helps the linkage of actors and actions at different levels. This in turn improves the capacity that drives the action in the system; this is known as an innovation capacity. The research indicated availability of various community groups in Diga woreda. This includes; farmers, DAs, experts, administrators, research center, University, private investors, cooperative associations, school teachers, students and NGOs. These great numbers of stakeholders were, however, not linked to each other for collective action on concerns of NRM. From this, it can be generalized that the disconnection between any of these important actors needs to be agenda of the area. Establishing active innovation platform and hence innovation capacity of the components and/or integration of actors in the system is the key recommendation of this study.

5.3. Addressing Gender Dynamics

In the study area, significant roles of women and men groups have been identified categorized by gender differences. In the construction of terrace and physical structures for control of erosion, women have shown remarkable participation. Whereas youth and men groups of the community involved more on tree plantation, catchment development, irrigation resource use and allocation, NRM planning as a whole. Though all members are rarely involved in NRM planning process, women in particular are missing in this process. They were found active only in the implementation stage. This appreciates the dynamics of gender in the system stimulating rural innovation in NRM.

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