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Review Article

Major Constraints of Watershed Management Practices in Ethiopia and Ways Forward

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Abstract: Watershed management gives an opportunity for understanding and reconciling the interconnections among various land use systems. Watershed management has an old history that can be related to ancient mankind agricultural activities though the holistic way of conserving natural resources under watershed. There are various opportunities under watershed management such as jobs, getting benefits, conserving nature and reducing negative impacts together. However, there are challenges arises during implementing the watershed management in different watersheds. The challenges should be clearly identified and forwarding solution should be given for policy and decision makers in order to improve the successes and benefits of watershed management in Ethiopia. The aim of this review was to identify the constraints of watershed management measures in Ethiopia and provide ways forward in tackling the challenges. Watershed management was officially initiated and practiced in Ethiopia for five decades and some successes have been achieved and different degraded sites were changed to productive sites. However, the failure of different watershed management measures was observed across the country as a result of various constraints of watershed management in Ethiopia. Some of the major constraints of watershed management in Ethiopia are lack of awareness among policymakers, policy and strategy related constraints, socio-economic and biophysical constraints, capacity constraints, financial and incentive constraints and lack of community awareness. Some of the recommendations were given as follow: policy and strategies should be applied at a watershed level as it presented in the document; compressive technical capacity building training should be given to the local experts and extensionists and information center should be created for sharing data between concerned institutions and stakeholders about the technologies in watershed management practices.

Keywords: Policy, Strategy, Socioeconomic, Biophysical Constraints, Community Awareness

1. Introduction

Watershed is a given area of land that shares common water outlet channels and storages [1]. It can be too small with few meters square of land or bigger millions of hectares [2]; but both should have some common characteristics to be watershed some are boundaries, channel and outlet. The watershed is commonly named after river or lake [3]. It is unifying geographical characteristics for the common share of opportunities and constraints in a given community [2]. More often, when biophysical and socio-economic problem in one part of the watershed could possibly affect the other part of the watershed both socio-economical and biophysical condition one in other way [4]. By its nature of the watershed, tackling solution for affected part of the watershed should participate or include the not affected part of watershed in holistic approach.

Watershed management is any human action aimed at ensuring a sustainable management of the natural resources in a watershed [5]. Other define watershed management as the combined use of natural resources (land, vegetation and water) in a geographically separated drainage area for the livelihood benefits that aimed at conservation of the hydrologic services and reducing the adverse impacts on downstream [1]. In these cases, major points to be considered in a watershed management are the natural resources, human benefits, sustainability and human actions properly and wisely [6]. An integrated ecosystem management approaches should be used and understanding of the interaction between living organisms

with nonliving should be considered during watershed management. For the success of watershed management, actors should consider different factors such as multidimensional aspects (socioeconomic, biophysical and institutional) [4]. Watershed management provides platforms for collaborative action and decision making in the face of competing claims on resources [7].

Watershed management has old history that can be related with ancient mankind agricultural activities though the holistic way of conserving natural resources under watershed came later [1, 5, 8, 3]. There are various traditional soil and water conservation knowledge in Ethiopia which have centuries of history. The *Konso* soil and water conservation measures [9, 10], the *Gedio* traditional agroforestry knowledge [11], the *Borana* traditional natural resources conservation approaches could be listed among many traditional knowledges on nature conservation across Ethiopia [12]. The modern approaches of conserving Watershed give an opportunity for understanding and reconciling the interconnections among various land-use systems [1, 13, 5]. The land management in modern watershed approaches has history less than half a century in Ethiopia [14]. In 1970s various soil and water conservation measures have been implemented by Ministry of Agriculture in Ethiopia [15, 16, 17, 18 19]. Since then, many efforts were given to conserve the natural resources under watershed management [19]. There are success stories of watershed management in many districts of Ethiopia [8, 14, 20, 21]. Among the successes of watershed management, water spring recharging again, soil loss reduction, regeneration and afforestation of the degraded land, soil fertility improvement, crop production increment, animal product improvement and in general the livelihood of the community changed positively could be listed where watershed management applied properly [21-25]. The core features of a watershed that control the management approaches are the interconnection of upstream resources such as water and land with downstream impacts and externalities, coexistence of land and water resources [1].

Previously, the approach was top down approach that was followed to implement different activities in the watershed [25-27]. That means orders, plans and types of activities sent from the center to the community. This approach has failed in different watershed as a result of absence of consultation of the community during planning. Later, the approach was changed to bottom up, where the community discuss, plan, implement and the officers, authorities and policy makers support the planning and activities. This one has registered various successes in different watershed across Ethiopia [25, 27].

There are various opportunities under watershed management such as working together getting benefits together, conserving the nature and reducing negative impacts together [21, 28-31]. However, there are challenges arises during implementing the watershed management in different watershed [21]. The challenges should be clearly identified and forwarding solution should be given for policy and decision makers in order to improve the success and benefit of watershed management in Ethiopia. The aim of this review was to identify the constraints of watershed management measures in Ethiopian and provide way forward in tackling the challenges.

2. Constraints of Watershed Management in Ethiopia

Watershed management was officially initiated and practiced in Ethiopia for five decades and some successes have been achieved and different degraded sites were changed to productive sites. However, failure of different watershed management measures was observed across the country as a result of various constraints of watershed management in Ethiopia. Identifying the major constraints of watershed management in the country could help the policy makers to find alternative solution in tackling the constraints for the successfulness of the watershed management measures and improve the livelihood of the watershed. Some of the major constraints of watershed management in Ethiopia are lack of awareness among policy makers of the extent and impacts of land degradation, policy and strategy related constraints, socio-economic and bio-physical constraints, capacity constraints, resource and incentive constraints and lack of community awareness [3, 21, 27-32]. Each of the major constraints will be discussed in detail below.

2.1. Poor Linkage and Information Sharing Between Concerned Institutions

The work of watershed management requires multidisciplinary professionals and stockholders who should participate from planning stage to monitoring and evaluation stage [33]. So that, different actors in the watershed should be linked and work together for the common goal of sustainable benefits of livelihood and conservation of the nature. However, in most part of the country poor linkage between concerned institutions in the conservation work that completely lead the activity to perform poor and unsuccessful in parts of Ethiopia.

Many called information is power. Having information or data about the new technology will reduce common errors to be done and time to achieve solution in the watershed management. In general, having the information about the given issues will benefit the acts and activities to be successful in short time. Poor communication could be a cause for lack of information sharing among acts [3]. Poor information sharing is not only from local actors, but also there is gap among policy makers and researchers in the higher level. Currently, after fifty years of tedious huge measures of watershed management in Ethiopia, it is hard to find the comprehensive data about the measures of watershed management from the beginning in Ethiopia [3, 21, 34].

2.2. Lack of Community Awareness

Awareness is consciousness of person or people about a given activity or conditions. It is very important characteristics of human that affect the success of the watershed management measures. At some level quit number

of people were not well recognized the presence of land degradation in their watershed. This means that, there is lack of awareness about land degradation and watershed management benefits among the community [33]. Lack of awareness could hinder the success of the watershed management to come in the community [21, 35].

2.3. Lack of Awareness Among Policy Makers

Lack of awareness among policy makers about the extent and impacts of land degradation were observed in different regions. Loss of soil structure, excessive runoff, sheet and gully erosion, flooding, siltation of riverbeds and reservoirs are some of the symptom of land degradation [1]. Land degradation is the process of deprivation of quality of natural resources mainly land based resources from the natural condition [36]. Others defined land degradation as a long term, delicate and self-reinforcing and accelerating process with impacts consistently leading to declining the livelihood of rural community [37, 38]. According to UNCCD [39] land degradation is any reduction or loss in the biological or economic productive capacity of the land caused by human activities, exacerbated by natural processes, and often magnified by the impacts of climate change and biodiversity loss. Factors for land degradation are anthropogenic activities caused by human population pressure and lack of effective alternatives; factors related with environmental such as climate change, deforestation, expansion of cultivation and over grazing (35, 40-45). It is difficult to observe the direct effect and expansion of the degradation until severe impact such as drought and famine occurs. As a result, very little attention was given to the problem in Ethiopia until major crisis occurred and affected large part community.

Among the reasons why policy makers and other concerned bodies give less attention was because land degradation was usually described by soil loss per hectare per year or deforestation rate from a given area. It is difficult to quantify and not directly seen the impact of soil loss that is reduction of productivity. This leads to reduced productivity and increases crop vulnerability to normal variations in rainfall leading to an increased vulnerability to famine. Consequently, most decision makers have considered land degradation as a problem of highly degraded areas only and this is why watershed management activities over packed in areas of food insecure areas.

2.4. Policy and Strategy Application Limitations

Policy is set of guidelines and directives to the state for harnessing resources and to provide the sectoral (agriculture, industrial and domestic) need in equitable way that leads to sustainable development. Policy is a guiding principle of major goals and activities to specific measures prepared by the governing bodies. Various natural resources and watershed related policies and strategies were prepared by the government in different periods [27, 30, 47, 46]. However, there is still lack of properly implementation of the policy and strategies according to it were instructed on the document at site or lower level of administrations [34, 48]. If it is not executed as it was recommended, it will not have value or not bring any positive change on the natural resources. In other hand, some policies and strategies could limit appropriate execution and sustainability of soil and water conservation measures at watershed level [34]. Other policies could have limitation in different aspects so that it may need continues improvement of policy and strategy documents specially to tackle the limitations observed in the policy documents [21]. Apart with these strategy and policy constraints, the policies and strategies were prepared by categorizing the country according to their potential as low and high yield production. The implementation of watershed management measures was targeted by the policies and strategies to low production potential areas where deficiency of food production usually existed. Following this, many development and relief organization have targeted low yield production potentials to intervene degradation problems and most activities have been implemented and concentrated in the few areas [3, 21].

2.5. Socio Economic and Bio Physical Constraints

Socio economic conditions could affect the success of watershed management measures positively or negatively. Similarly, the bio physical condition such as climate, topography, soil and drainage system could impact the achievement of watershed management measures in rural areas. It is expected that the constraints of socio economic and bio physical conditions could lead to the failure of the watershed measures in various location [49]. There is many socio economic and bio physical constraints that hinder the development of watershed management practices in the watershed [3].

Among the major socio-economic constraint, poverty is one and crucial condition that need consideration and tackling mechanisms prior to or while implementation of watershed management measures. Poverty is the fundamental socio-economic problem affecting not only the sector but also most of the Ethiopian population [50]. There is a strong connection between worsening poverty and land degradation in the rural areas [37]. This constraint is not only a chronic problem made worse by a range of shocks, but also causes enormous environmental loss as the poor are pushed to mine the rapidly deteriorating natural resources [51, 52]. The indication of various impacts of poverty on land management is mixed and depends on the type of land management and the nature of poverty considered [53, 54].

The constraints on social and economic status such as gender, youth, age, social position, education level, population growth and ownership and other conditions could also affect the effectiveness of watershed management activities. Rapid population growth is also one of the major socio-economic constraints the highland of Ethiopia is confronting as it could contribute for land degradation and worsening of poverty in Ethiopia [55]. As the population growth rapidly the need for food, energy, water and other land resources could also grow simultaneously [56].

Among the biophysical constraints that may affect

successful implementation of watershed management, climate variability is becoming a significant factor, especially for the lowland sections of the country. Increasingly, erratic rainfall has been reported to be a hazard in main part of the country. Climatic variability is seen in recurrent droughts and this is associated with high rainfall variability, which have long been a feature in Ethiopia, and contributed to the decline in vegetation cover, loss of biodiversity and ultimately worsening land degradation [28].

2.6. Technical Capacity Constraints

Practical watershed management measures require knowing and understanding technical methodologies and skills prior to implementation of the conservation measures in the watershed [5]. Even more, prescribing solution for any conservation related problem at different part of watershed also require an in-depth knowledge and experience on specific issues of watershed management [34]. Most of applications in the watershed management are requiring knowledge of hydrology, engineering, forestry, agronomy, sociology, economics, extension and/or other background course.

This means that the management of watershed will require an interdisciplinary knowledge or working with inter disciplinary group of people [3]. Some extension experts at local level may lack the capacity mentioned above at some level. In other way professional biasness could impact their decision on watershed management as most expert assigned to do the activities without having background knowledge of managing watershed issues in a community. For instance, the assigned agronomist could dominate activities of crops management in the entire watershed, while other resource conservation expecting the compromising decision on water, forest, soil and wild lives conservation. There could be capacity difference between local experts in productive and less productive areas. Lack of technical expertise could be caused by poor trainings, experienced expert turnover, lack of on job training from senior experts and lack of guidelines for local level experts and extensions assigned on watershed management activities [3, 21, 34].

2.7. Financial and Incentive Constraints

For every watershed management measures to be successful and bring changes in each watershed, finance is very crucial (1). Every activity could require allocated money or budget to be expended for watershed conservation. Different findings have confirmed that provision of incentive for participants in watershed management activities could help the measures bring positive changes in the landscape and livelihood aspects [9, 57-59]. In most part of the country watershed conservation activities especially soil and water conservation, tree planting and area closure measures were done by community mobilization without payment to the farmers for 45 days [60]. Apart from the community mobilization activities other watershed management measures must get financial support.

The constraints of financial and incentives support could impact the successfulness of the watershed activities. As most activities requires human work force, some financial support or wage should be given for the worker. When there is lack of finance, the work will not be done or stop at the middle. As a result, the goal of that specific watershed management measures could not be achieved as a result of financial deficiency. Similarly, farmers are encouraged when they get some incentives. They work as owner of the activities and keep safe the measures for long time and if there is lack of incentive the reverse is true [61, 62].

Watershed management measures in Ethiopia have constraints such as in balance of budget and work load; highly scattered finances, strict fund utilization procedures; lack of integration of supports; lack of continuity of supports; lack of inbuilt monitoring and evaluation of projects and long development period [3].

3. Conclusion and Recommendation

In summary, watershed management practices were implemented in Ethiopia, since 1970s in various part of the country, for conservation of degraded land in the hilly areas. The conservation measures were started by implementing soil and water conservation activities, and then followed by planting conservation trees across the degraded areas. Currently, watershed management is following holistic approach targeting sustainable natural resource management and utilization for the improvement of the livelihood of the community in the watershed. This approach has brought success across the areas where watershed management measures applied in Ethiopia at some extent.

However, indifferent part of the country, failure of the watershed management measures was observed tragically in resource poor nation Ethiopia. There are causes for the failure of the watershed management measures. The causes for the failure are constraints during application of the measures in watershed. For this review, some of the constraints were identified systematically. The constraints are policy and strategy application limitations, socio economic and bio physical constraints, technical capacity constraints, financial and incentive constraints, lack of awareness and poor linkage and information sharing between concerned institutions.

The following recommendations were given to improve the successfulness of watershed management practices in Ethiopia.

1. Awareness creation should be given to the stakeholders of watershed management including policy makers about the presence of land degradation and its consequence later.
2. Policy and strategies should be applied at watershed level as it presented in the document.
3. Socio economic and bio physical conditions should be studied prior to implementation of watershed management measures and searching sustainable solution for the constraints such as poverty, severely degraded sites and other constraints.
4. Compressive technical capacity building training should be given to the local experts and extensionist, who are

going to implement the watershed management measures.
5. Whenever planning of watershed management measures, the financial planning and searching and allocation of budget for implementation and provision of incentives for farmers should be considered ahead of time.
6. Awareness creation for the watershed community should be given methodologically at the beginning of the watershed management practices in the areas.
7. Appropriate linkage between concerned institutions should be formed based on watershed management approaches.
8. Information center should be created for sharing data between concerned institutions and stakeholders about the technologies in watershed management practices.

Conflict of Interest

The author declares that he has no competing interests.

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