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Large Scale Commercial Farming and Its Environmental Impacts: The Case of Gambella Regional State

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Abstract

The change in Ethiopia's economic policy from small scale farming to large scale farming began with the global food and fuel crisis in 2007/8. This has led many countries including the Gulf States and several East Asian countries, to re-evaluate their strategies and secure land and water essentially to produce food and fuel. Consequently, in Ethiopia, more than four million hectares of land has been leased to investors for large-scale commercial farming out of which the total land area of 524,202.58 hectares has been distributed for both local and foreign investors in Gambella Regional State. Hence, the main purpose of the study was to assess the impacts of large-scale commercial farming on the sustainability of environment in Gambella regional state. To this end both primary and secondary data sources were utilized. The study found that, though the large-scale commercial farming is contributing to the economy both at national and regional level, it has adverse impacts on the environment. To mention a few, the unconstitutional procedure followed in land transfer, investors' undue concern and care for natural resources, and the absence of guidelines and frameworks endanger the environment. In addition, the absence of synergy among actors contributed towards drastic environmental problems. Besides, the study found that the investment in the region is disconnecting the environment from its dependents (local people) and putting the sustainability of the environment in a query unless it is managed with immediate interventions by the concerned bodies.

Keywords: *Large Scale Commercial Farming, Environment, Sustainability, Investment*

Introduction

In the past two decades small-scale farmers were seen as the catalysts of the country's economy, and agricultural development policies of Ethiopia mainly focused on smallholder farmers. However, the government claimed that smallholder-focused development strategies were proved to have limited economic and social success in Ethiopia, and it became necessary to introduce large-scale commercial agriculture (De Zoyas 2013 in Mesay, 2015). To this end, the government has particularly encouraged export-oriented investments in order to boost foreign exchange earnings and trade, and ultimately to finance capital imports to enhance industrialization (MoFED, 2006).

The transformation from smallholders' agriculture to the large-scale mechanized farming was clearly indicated on the 2006 Government's Economic Plan for Accelerated and Sustained Development to End Poverty (PASDEP) (MoFED, 2006). Accordingly, the government has been trying to attract investment by easing regulatory frameworks and providing various incentives (Ambaye, 2013). Accordingly, more than 4 million hectares of agricultural land has been rented at low rates to companies that were to set up enormous commercial farms (Bertelsmann Stiftung, 2014). In between October 1995 and July 2011, the Ethiopian Investment Agency issued investment licenses for 1,055 FDI projects with a total of about 4,219,780 hectares of land to be cultivated (Getnet 2012).

The issuance of investment licenses was mainly focused on the lowland areas of Gambella, Oromia, Benishangul-Gumuz and Southern Nations, Nationalities and Peoples Regional state (SNNPR). Particularly, Gambella and Benishangul-Gumuz were by far the main locations of land identified for future investment where 42% of the total area coverage in Gambella and 14% of Benishangul-Gumuz were identified for future investment. In Gambella Regional State, the total land area of 524,202.58 hectares has been distributed to 960 domestic and foreign investors (Gambella Investment Agency, 2014).

The shift of focus and the allocation of land to investors in different regional states have created debates and contestations among politicians and scholars. As land the main economic and political resource for developing countries like Ethiopia, it is likely for different actors to develop competing interests over land (Desalegn, 2011, 2013). One of the debates on large-scale commercial farming has been about its impact on the sustainability of environment. It encourages the utilization of land and land-based resources. Besides, there are wastes and chemical diffusions from commercial farming and these diffusions result in environmental pollution (Alufohai & Oyoboh, 2013). The land transfer in Ethiopia, including the case in Gambella, was related to the global food and oil crisis of 2007/08 that has enhanced the proliferating of land acquisition in developing countries.

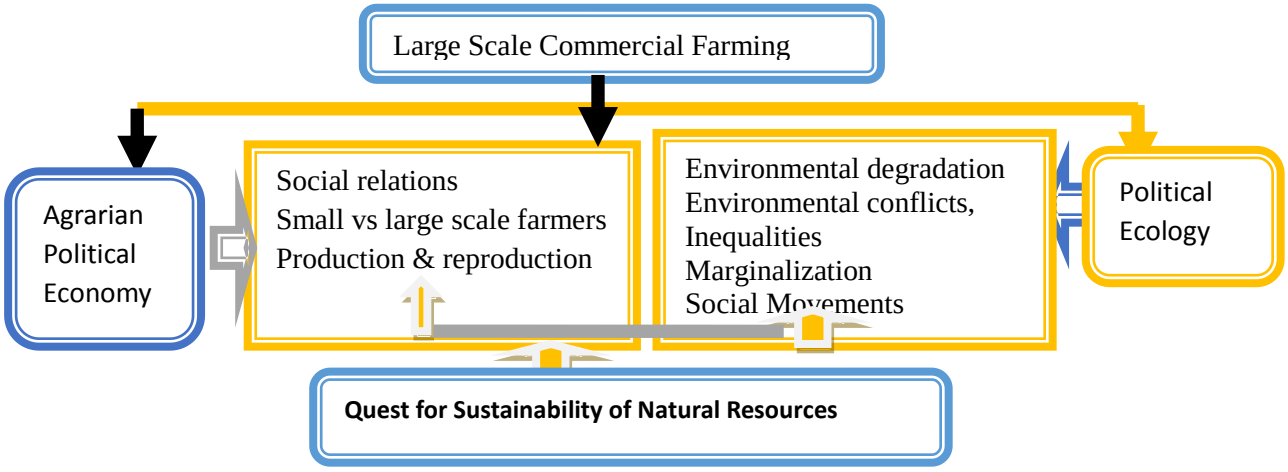
Different studies (see OI, 2011a, 2011b; HRW, 2012; Moti, 2015) have been made to analyze the political, economic and social effects of large-scale commercial farming in Gambella regional state. However, there is a dearth of researches on the impact of large-scale commercial farming on environmental sustainability. Moreover, I found that the publications and resources available on the subject are not adequate enough to justify the results presented by the methodologies followed. Most materials are institutional reports with visible partiality of augments. Therefore, this study strives to fill

the gap by looking at the issue by focusing on environmental impacts of large-scale commercial farming by using vivid scientific methodologies and keeping the neutrality of arguments.

Conceptual Framework

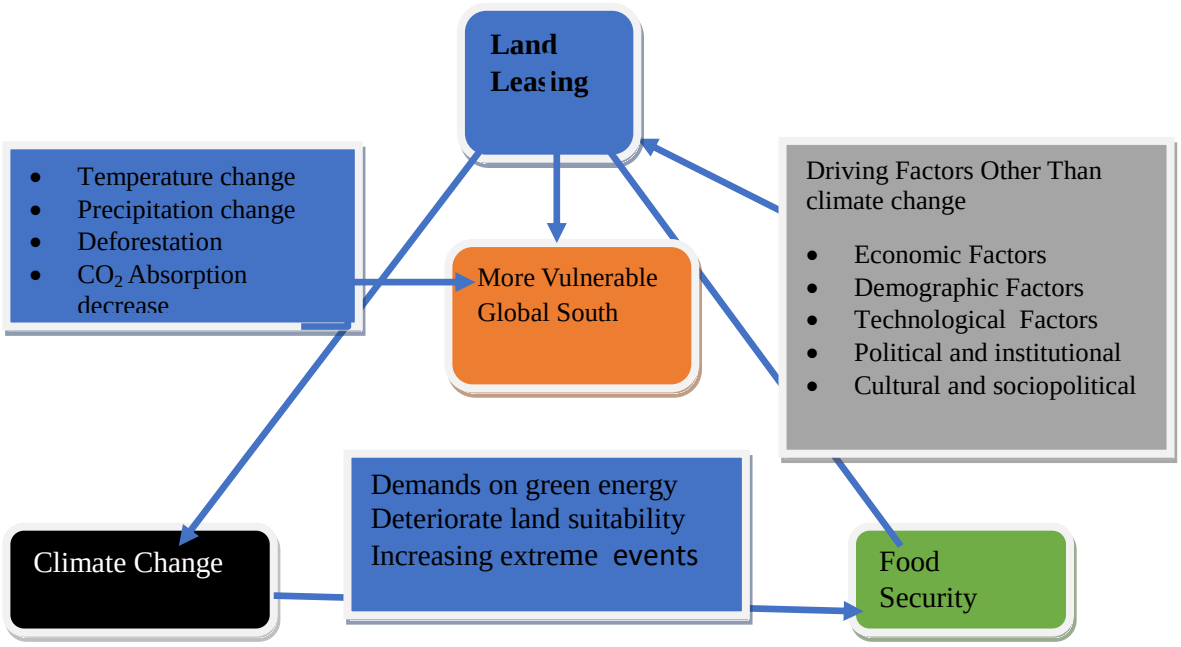
This study employed the following three conceptual frameworks in order to analyze the impacts of large-scale commercial farming on environmental sustainability. Firstly, the Agrarian Political Economy theory deals with the social relations, and the dynamics of production and reproduction in the agricultural system (Bernstein & Byres, 2001).It frames the relationship between the capitalist mode of production and its impacts on small-scale farmers by questioning, "Who owns what? Who does what? Who gets what? What do they do with it?" (Bernstein, 1992). Thus, the framework has been used to analyze the interactions and impacts of the large-scale commercial farming on local small-scale farmers' environment by articulating from the views of who owns what? Who does what? Who gets what? What do they do with it?".

Secondly, the Political Ecology theory deals with the complex interactions between the environment, politics, economics, technology and social traditions (Bryant & Bailey, 1997). Besides, the theory also deals with the diverse topics such as environmental conflicts, marginalization, environmental degradation and conservation, environmental identities and social movements (Robbins, 2004). Thus, the framework has been employed to understand the new power structures and relationship created among different stakeholders that has been generated and reconfigured following the introduction of large-scale commercial farming in the region.



Source: Author (2018)

Finally, Kihwan and Natalia (2012) have shown that the relationship between land leasing, climate change and food security is inseparable, and there is vicious circle among these variables. As it has been discussed in the above section, the large-scale agribusiness often yields disastrous environmental repercussions that stem from mono-cropping, improper disposal of chemicals and fertilizers, and overuse of water (Emily, 2017). In most cases, it leads to deforestation, which contributes to climate change. Accordingly, Burley and Bebb (2010) stated that climate change is likely to affect food security by increasing extreme weather events (e.g. extended drought, frequent and severe flood, cyclones, and hailstorms) that change land suitability for food production. Climate change in turn becomes a driving force of increasing severe weather events and green energy demands, reduces food security and increases demand for arable land (Kihwan & Natalia, 2012).



Vicious Circle of Climate Change, Food Security, and Land Grab (Lease) Model (Kihwan and Natalia (2012)

Research Design and Methodology

The present study employed descriptive research design and the data were collected through interview, observation and focus group discussion. Among the three approaches (qualitative, quantitative and mixed approach) described by Creswell (2009), qualitative approach was employed. Both primary and secondary data sources were utilized. Primary data were collected from investors, community leaders, local community, and from government authorities at different levels. Information from books, journal articles, international legislations and guidelines, magazines, organizational and institutional publications like UN reports, AU guidelines and reports, and government progress reports were also used as secondary sources.

Regarding data gathering tools and instruments, observation, in-depth-interview and focus group discussion were used. The researcher used observation to observe farming areas in order to reflect on the discursive conclusions about the myth of idle land, and photo capturing has been used as evidence in the analysis. Besides, the researcher organized seven Focus Group Discussions with local people in the seven village centers surrounding investment projects in order to elicit the impact of investments on the environment.

In the process of identifying informants, purposive sampling was used. Seven investors were selected purposively where two of them were foreign investors (KARATURI, and SAUDI STAR), while five of them were local investors in different Woredas. These investors were selected purposively as they took large areas of land in the region, and, media coverage in terms of the debates and contestations of land leasing case was higher on these investors than others. Besides, office representatives like Ministry of Federal Affairs Gambella Region Representative, Gambella Investment Agency Directorate, the Directorate of Ethiopian Agricultural Investment and Land Administration Agency (EAILAA), and the seven Woreda administrators were interviewed, and the data collected were analyzed qualitatively.

Large Scale Commercial Farming in the study area

Land acquisition and commercial farming are not entirely new phenomenon in Ethiopia since there have been attempts made to modernize land utilization system by giving the title either to the peasants who till the soil or to large-scale farming programs (Adil, 2010). Though their land tenure system and land administration system seem to be totally different, both the military (1974-1991) and EPRDF (1991-present) regimes have tried large-scale commercial farming practice with different justifications.

The 1995 constitution of Ethiopia (Article 40.3) states that "the right to ownership of rural and urban land, as well as of all natural resources, is exclusively vested in the State and in the peoples of Ethiopia, and land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of exchange". Contrary to the constitutional provision that claims land belongs to the government and the people, and should not be subject to sale, the government has been leasing lands for both local and international investors. International investors from Western countries, South East Asian countries and the middle East are engaged in land acquisition from Ethiopia (Adil, 2010).

Predominantly, Gambella region has a titanic potential for agricultural productions and possesses enormous arable land suitable to both small-scale and large-scale commercial farming. Ethiopian government identified the region as one of the regions in Ethiopia that is suitable for agricultural investment and classified most parts of the region as "*underutilized*". Due to this, the government has awarded thousands of hectares of fertile lands to foreign investors often in long-term leases and at bargain prices of less than 2 USD per ha annually (Dassalegn, 2011, 2013).According to Gambella Investment Agency (GIA), land-leasing process has been carried out in the seven woredas (Etang, Lare, Abobo, Gok, Godare, Gambella, and Dima), and the total land area of 524202.58 hectare has been distributed for both local and foreign investors.

Land Allocation Processes in Gambella Regional State

In Gambella region, there has been diverging politics and compelling interests of different tiers of government over the ownership and management of land (Ojot 2013). For instance, under military regime, the land and land related the government-handled issues by its slogan of encouraging state farms. The government of the then used large areas of the region as a potential and strategic site for state farming project (Eshetu 1978). After the collapse of Derg, EPRDF government has changed the usage and ownership of land throughout the country through different phases.

According to Ministry of Finance and Economic Development (1993), EPRDF's first decade (1983-1993) was fully covered by the policy of Agricultural Development Led Industrialization where smallholder farmers were given major emphasis. Whereas, the second decade (post 1993) has shifted the pattern to the promotion and development of large-scale commercial farming. Particularly, since early 2000, emphasis has been given for large-scale commercial farming in lowland areas including Gambella regional State (Dessalegn, 2011, 2013).The flow of investors to the region showed dramatic increase in between 2007-2009 (Gambella Investment Agency2014), and the land leasing process had been carried out in two forms.

In the first case, the regional government (Gambella Investment Agency) took the responsibility, and the regional offices in the sector handled all the processes. In the second case, with the push and persuasion from federal government, the regional state has delegated federal government to process the land leasing system in the region. Although there is conflict of interests and debates about the delegation of land processing power to the federal government, it has been justified by the inefficiency of the region to handle the large-scale land deals. As a result, the Agricultural Investment Support Directorate (AISD) was established for handling land-leasing process (the nowEthiopian Agricultural Investment and Land Administration Agency (EAILAA). This delegation was done without any legal ground, and it is against (out) of constitutional provisions. Thus, as EAILAA is delegated for it, the order of the office would be implemented without any denial or question from the region. Gambella Investment Office Director stated that the initiation to delegate the process of land leasing has been initiated by the federal government and said;

> ... *in principle it is the mandate of regional government to process land lease process, but* by the push of federal government to request and by *the request of regional government, the mandate has been delegated to the federal government and we do have a memorandum of understanding about land leasing which has no constitutional and legal ground, and not binding agreement too...*

Accordingly, 3.67 million hectare of land was demarcated for and managed by federal land bank. From 2009-2013, the Agricultural Investment Support Directorate was mandated to give a land of beyond 5000 hectare for investment for both local and foreign investors. Therefore, once the authority to allocate the land within Federal Bank is delegated to the Ethiopian Agricultural Investment and Land Administration Agency, Gambella Investment Agency and other Woreda administration offices become powerless to decide on the land and to question EAILAA about for whom? How much?, Why? and How ? Land

would be given to investors. This takes us to the agrarian political economy and political ecology conceptualizations on state-society relations in the process of utilization, management and administration of agricultural land.

Besides, the regional official stated that land leasing process at federal level goes as follows: if the investor is new to the system (office), land requisition form must be submitted to EAILAA by the investor. The office would provide full information about land types available in the region to the investor. On the other hand, if the investor is not new and demands for additional land for extension of the project, he/she must come to the office with identified/marked appropriate land area. In either of the cases, investors would be asked to submit project document to the MoARD along with business plan. The memorandum of understanding between regional and federal government binds EAILAA to provide only land within the federal land bank. Thus, if the investor is new, only land in the federal bank would be shown and given. If the investor has come with identified/marked land as an extension, the office would check whether the land is within the scope of federal bank or not. Thus, after checking the land, investor's business plan would be evaluated as per the offices' criteria, which include financial capability, citizenship, and past financial statement.

If investors' business plan is believed to be effective, EAILAA writes a letter to the regional investment office to demarcate and hand-over the land to the investor. Then, the investor would make an agreement with Woreda administration and would pay land lease fee for Woreda administration. Finally, the receipt of lease payment and the map of land demarcated would be submitted to EAILAA. The following sample is taken from one of the orders sent to local governors (GRIA) from federal government (EAILAA) to provide land for investors.

Ethiopian Agricultural Investment and Land Administration Agency
No.xxxx
Date.xxxxx.
To: Gambella Region investment Agency
Subject: Giving Investment license
As per his request to be engaged in agricultural investment, Mr. xxxx is already accepted by the office (Ethiopia Agricultural Investment and Land Administration Agency) by fulfilling all the necessary criteria's needed to be fulfilled for becoming an investor and also, he has presented his business plan. Therefore, 10,000hect of land is given for him by the office (Ethiopia Agricultural Investment and Land Administration Agency) in xxxx Woreda. Hence, hereby the office would like to request you to provide him with investment certificate and to demarcate the land for him.

Source: Gambella Region Investment Agency

Receiving this letter of order, the Gambella region's Investment Agency would immediately write an order to the woredas. Investors directly go to the woreda administration offices and take the land.

Secondly, the Regional Investment Agency has the power to handle the land leasing process in which the land amount must be less than 5000 hectare, and outside of federal land bank. In this case, the regional investment agency plays the land administration and its investment related process in parallel to federal government. The presence of these two separate processes of land allocation has the following impacts up on the sustainability of the environment.

- As the land is allocated from both sides, it makes the control, management and administration complex.
- It has created a blame shifting scenarios between the federal and regional government where negative impacts have been observed.
- It has opened a door to some investors to misuse the natural resources during their investment progress. For example, some investors destroyed forests for charcoal production, and they exported it to many cities including Ababa.

The impacts of Large Commercial Farming on Environmental Sustainability

Under Article 44 (1) of Ethiopian Constitution, it is clearly stated, "all persons have the right to clean and healthy environment". Art (92) also states (1) Government shall endeavor to ensure that all Ethiopians live in a clean and healthy environment; (2) The design and implementation of programmes and projects of development shall not damage or destroy the environment; (3) People have the right to full consultation and to the expression of views in the planning and implementations of environmental policies and projects that affect them directly and, 4) Government and citizens shall have the duty to protect the environment.

Hence, in any context (developmental or non-developmental) citizens deserve clean and healthy environment, and they have the right to be consulted and express their views in any decision regarding their environment. Besides, with in the policy document of Ministry of Work and Urban Development (2008), the goal of Environmental Policy of Ethiopia is indicated as "to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development". Thus, unquestionably, Ethiopian government and the people have the commitments and responsibilities to

preserve and protect the environment. As the environmental issues affect the present and the future generations' fate, any initiatives and projects be it developmental or not must consider the legal and policy frameworks available to guide the best performances.

In Gambella regional state, with expanding large-scale commercial farming and the increasing number of investors, environmental issues are becoming the center of discussions for different stakeholders. The data gathered through focus group discussion and key informant interview indicated that investors in various sites of investments exercise environmentally destructive practices. The region's Investment Agency Directorate said,"We have tried to visit what investors are doing and how they are doing in different Woredas. During these field visits, we observed that the investors were cleaning and extremely destroying the forest" (interview with Investment Agency Directorate, 2014).

Besides, all Woreda administrators confirmed the problems, and added that investors are focusing only on their present profit, and giving undue focus for natural resources like water recourses, wild animals and other natural resources. They claimed that, the EAIAA has never developed any guidelines, and code of conducts for investors, and there is no authorized office formed to control environmental impacts related to the investment. The local people living around the investors' farming projects supported the arguments and one of the respondents said;

> In our culture forest is all in all for us", it is our food from where we find roots and leafs for eating. It is our medicine that we use it for all sickness; it is our building materials which we use it for building our houses.....so our land and its forest are all in all for us.... But, today investors are focusing on cleaning this forest without any question and control (Mr.X informant, March, 2015)

The people stated that their ecosystem is more than any of their resource that they inherited from their fathers and grandfathers, but the investment in the region is affecting water resources, wild animals and forest ecosystem. Besides, the local people pointed out that they are working as laborers inthe commercial farm, and as a result, they lost access to medicinal plants and other sacred spaces. As per the view of Ovied(2011), this practice can be stated as "action which, may undermine community's right over communal resources and deprive local communities of full access to vital resources such as water, forest, and other natural resource as "marginalization of Communities Right". Moreover, investors also confessed that they are not yet working on the protection of the environment. One of the Managers of the projects said:

> In the process of extending land for investment we might have affected the environment. We never lie by saying there is no chemical releasing, no forest clearing, and related impacts ...we do not have a guideline and code of conduct developed either by our

> management or by the government. But, in the future, as much as possible, we will try to work on it (anonymous informant, April 2015).

Accordingly, Gambella Regional State's investment agency stated that, investors in the region come (especially those with the capacity to invest on more than 5000 hectare of land) to the region with approved and finished process. Thus, the divided nature of the power of land allocation has made the issue of management over environmental impacts a difficult issue. The Ethiopian Agricultural Investment and Land Administration Agency stated that the economic, social and environmental impact assessments are presented after the land is taken over by the investors. In order to triangulate and validate the data, investors were also asked whether they carried out social, economic and environmental assessments. Investors stated that they do have a business plan and they undertook business feasibility assessments, and they didn't present an impact assessment for the land they never know (took over). Thus, from the investors' point of view, there is misunderstanding of social, economic and environmental assessment documents with the business plan submitted to the office. Therefore, based on the analysis of the empirical data, the following conclusions are made on the impacts of large-scale commercial farming on environmental sustainability of the region:

- **Deforestation:** In the lowland regions where most of the current large-scale land investments are taking place, there are no studies so far on the rate of deforestation. However, Ojot (2013) stated that, at the moment, it is clear that much of the land that has either already been leased to large-scale investors or is still in the federal land bank marketed as available for investment is in areas that are covered by forest or woodland. Due to this, all these huge tracts of land that have been leased out to investors are being deforested. For instance, in Gambella regional state, 10% of the region is already allotted to investors, and bulldozers have already cleared this amount of land. If all of the areas identified as a potential investment area are leased out to investors, 47% of the region will be cleared of forests and woodlands in the coming few years (OI 2011a).

Besides large-scale commercial farming, high financial return from charcoal production is also fuelling the scale of deforestation in the country as a whole and in Gambella region in particular. Even though the production of charcoal is forbidden by the law in Ethiopia, it is a common and widespread practice in both rural and urban areas of the region (Ayalneh, 2002). Local dwellers also confirmed that local investors are using the land they have taken for investment to charcoal production. According to Ojot(2013), some investors are using the land only for charcoal production than the

project they have taken for. He added that even some investors left the region for good after getting cleared all of the trees on their plot of lands.

During the observation, the following photos have been taken to confirm the information from informants.

Source: Captured By Author (2015 & 2014)

- **Climate Change:** According to IPCC, climate change is "... a statistically significant variation in either the mean state of the climate or in its variability which is caused either natural internal processes or external forcing to persistent anthropogenic changes in the composition of the atmosphere or in land use." It affects average global surface temperatures and sea levels, soil moisture and local precipitation, among other variables (Rosenzweig et al, 2002). Tropical forests do not only serve as reservoirs, sinks, and sources of carbon in the world, but also provide several ecosystem services that have impacts on a region's climate. Among these services are; the maintenance of elevated soil moisture and surface air humidity, reduction of sunlight penetration, weaker near-surface winds and the inhibition of anaerobic soil conditions (PielkeSr et al, 2002). Therefore, large-scale commercial farming where there is no guideline produces significant effects on climate change, primarily through the production and release of greenhouse gases such as carbon dioxide, methane, and nitrous oxide, which on the other hand, affects the productivity of large scale commercial farming through affecting temperature, precipitation and glacial run-off (United Nations Report (2007).

Gambella region has huge potential for agricultural productions and possesses enormous arable land suitable to both small-scale and large-scale commercial framings (Dassalegn2011, 2013). Accordingly, in Gambella, since the mid-2000s, the government has awarded millions of hectares of fertile land to rich countries, and this resulted in tremendous environmental devastations, like clearing and burning of forest, draining of wetland and increasing number of people being largely dependent on international food aid and financial assistance, in the region (Azeb 2017;Azeb & Wolfram, 2017). The data gathered from FDG and the key informants' from respective offices, local peoples, and investors indicated that there is dramatic change in terms of climate. The change has seen in the form of increasing level of temperature and changing nature of rain.

- **Food Insecurity:** There are also indirect impacts of large-scale land deals on the livelihood of local people. These include loss of access to seasonal resources for non-resident groups such as transhumant pastoralists, shifting of power from women to men when the commercial value of land gets high, eviction of local users from higher-value lands to marginal lands that could create more pressure on the latter (Cotula et al, 2009). According to Kihwan and Natalian (2012) large-scale commercial farming in the peripheral areas contributes to rural food insecurity in two forms. Firstly, in developing countries, land deals result most of the time in the displacement, dispossession and disenfranchisement of local communities so that they often lack formal property titles over the land and can easily risk losing access to it (Von Braun & Meinzen-Dick, 2009).

This results in the reduction of production and productivity of the dependents that leads to food insecurity. Secondly, large-scale commercial farming results in food insecurity as there is perception that the land given for investors is free, abundant and underutilized land.This perspective is in contrast to the fact that it is already being used by local people as shifting cultivation and as the sources of food in different ways. For instance, in Gambela, the government has signed deals with investors from India, Saudi Arabia, China and other countries since 2008 for large-scale agricultural projects in the region. The deals have given foreign investors control of half of Gambela's arable land (GRAIN, 2011). All land allocations recorded are classified as involving 'wastelands' with no pre-existing users, and without any information or consent for the sale and purchase of such territories, the surrounding communities have lost the forest they use for refuge in times of violence, an excellent source of medicinal plants, and a valuable reserve of food during famines (GRAIN, 2011, Kihwan & Natalian,2012).

One of the participants of interview from local people stated as:

> *In our culture forest is all in all for us", it is our food from where we find roots and leafs for eating. It is our medicine that we use it for all sickness; it is our building material which we use it for building our houses.....so our land and its forests are all in all for us.... But, today they (Investors) focused on cleaning this forest without any question and control*(anonymous informant, April 2015).

- **Diminishing Bio-Diversity:** Forests and national parks are the main sources of foods, and serve as the multiple means of livelihoods for the people living in Gambella Regional State mainly in rural areas. Nevertheless, both regional and federal governments allotted large hectare of lands to foreign and local investors within the National Park. For instance, Saudi Star rice farm that owned 10,000 hectares has largely cleared forest and savanna that were commonly understood as part of Gambella

National Park (Azeb, 2017a,b). Oakland Institute (2011a) referring Ethiopian Wildlife Conservation Authority (EWCA) stated that in the early 2008, around 438,000 hectares of land have been awarded to investors in the vicinity of the Gambella National Park without environmental impact assessments. The institute stated that large-scale investors, including Karuturi and Saudi Star, have already cleared lands that local people have always presumed to be part of the park.

Besides, Azeb (2017) and Azeb and Wolfram (2017) stated that, wetlands with abundant fish populations and birdlife are presently being altered for rice production while extensive forest cover in nearby areas has been completely cleared without consultation of communities. Though International Union for the Conservation of Nature and Natural Resources (IUCN) categorized Gambella National Park as protected area, large-scale farm companies have currently invaded the national park. Therefore, as investors are continuously destroying the forest for extending extra land for investment, diminishing bio-diversity is one of the problems happening in the region. One of the local people stated that:

> *Our land and our forest is a home for our cattle, our wild animals, and for our people. Hence, the more the investors are clearing our forest the more they are clearing our fate. For example, previously both consumable and non-consumable birds and wild animals were seen openly. Due to the deforestation in the region, right now wild animals and bird species are fleeing to south Sudan* (anonymous informant, April 2015).

Therefore, it is possible to understand that environmental sustainability is in question, and officials also pointed out that during their visits to the commercial farming sites, they have seen the effects in terms of deforestation, which directly results in the diminishing nature of biodiversity. Mesay (2015) also confirmed that the impact of large scale land transfer on the bio-diversity of ItangWereda has further contributed negatively to ItangWereda's food security by affecting the livelihood of traditional bee-keepers, hunters and fishermen who depend on the bio-diversity.

- **Environmental Pollution:** Other experts are concerned about as yet un-measurable environmental impacts that are commonly associated with industrial-style agriculture such as increased toxicity, creation of new weeds, disruption of nature's system, and the spreading of genetically engineered genes to indigenous plants (OI, 2011a).

Alufohai and Oyoboh (2013) stated that pollutants from commercial farming emerge in the form of agricultural chemicals used or misused or ignored, and this happens in scenarios like pesticide drifts or in soil contamination, groundwater and water pollution as well as air pollution (spray drift). Pesticides include those based on organo-chloride or Pesticide residue in foods or else Pesticide toxicity to bees (in list of crop plants pollinated by bees and pollination management).In Gambella regional state, investors stated that they are using pesticides, especially those based on organo-chloride. Local administrators and local people have also confirmed this. Thus, chemicals being used by investors pollute the environment, and damage the ecosystem. Local inhabitants also raised their concerns during FGD on the impacts of fertilizers and pesticides used by investors on their water resources, and its contribution to the diminishing fish and honey production.

- **Drying Water Resources**: Though there is no evidence of mechanisms for determining the impacts of water use on downstream users or surrounding environment, given the critical importance of downstream water quantity and quality, the cumulative impacts and stresses on water systems are of great concern (Oakland Institute, 2011a,b). These impacts include total water withdrawals/use, water quality issues, climate change considerations and etc (ibid). For instance, Mesay (2015) stated that some of the tributaries of Baro River dried up due to extensive irrigation schemes in the dry season thereby altering the flow of the river, this in turn affect downstream users in the form of reduced water supply. Moreover, the participants of focus group discussion revealed that **t**he investment projects in the region are contributing to the absence of water resources, and contributing to the negative relationship in between local people, local people and government, and local people and investors' relationship.

Causes of Environmental Damages in Gambella Regional State

a) Double Coincidence of Power: Constitutionally, Article 52 (d) of FDRE, states that the state is given with the power to administer land and other natural resources in accordance with federal laws. Thus, Gambella regional state is responsible for managing the land and other natural resource of the region. In contrary to this, the federal government took a delegation to itself to process land leasing process of the region, and the region has the power to give a land less than 5000 hectare. Whereas, the land constituting beyond that amount could be only processed by federal government. Therefore, this double coincidence of power among the federal and regional governments led to the confusion of who

would be responsible to manage the impact of commercial framing on environment and on other aspects.

b) **Myths of Free Land:** Worldwide, the areas being targeted for this kind of large-scale farming are being portrayed on paper as 'empty', 'marginal', 'idle' or 'degraded' land, largely unpopulated, unused, unproductive, and unlikely to compete with local food production (TNI, 2012). Accordingly, all the federal and regional officials stated that the land given for all investors is a free land, which has not been used by anybody. Moreover, investors also believed and considered that the land never belonged to anybody else, and it was idle/free land. As a result, they give less consideration for the impacts of their acts on the environment. Thus, out of the four myths in the region (food security, unused/free land, employment and Foreign Direct Investment), the dominating myth in Gambella Regional State is the "myth of free land". However, the reality is that as the local pastoral and agro-pastoral communities shift from place to place, there is no empty, idle, or unused land among pastoral and semi pastoral communities.

C) Absence of Framework and Guiding Code of Conducts: Generally, there are no laws, regulations or directives that oblige benefit sharing between investors and the public (Tamrat, 2010). For instance, in Oromia, any investor is obliged to plant native tree species in at least 2% of the project land, whereas the federal contracts do not impose such obligations but require projects to 'conserve tree plantations that have not been cleared for earth works' (Getnet, 2012). But, in Gambella regional state, there is no well framed code of conduct for investors or a framework guiding the broader large-scale commercial farming.

c) **Ethnic and Political affiliation of Investors to the Ruling Party:** According to GIA's official report of 2013, out of 960 investors investing in Gambella region, 424 of them have received land for agricultural investment in Seven woredas. In addition to the land provided by regional office, EAIAA has also provided 308015 hectares of land for the total of 45 investors, out of which 19 of them are foreign investors, and the remaining 26 are local investors. From this, it is possible to conclude that, the number of local investors investing in the region is greater than the number of foreign investors. Whereas, out of the local investors except very few investors in Anuwaa Zone, almost all of the local investors investing in Gambella regional state are the *"highlanders".*

On the other hand, Sindayigaya (2012) stated that in developing countries domestic investors and elites governing are also claimed to be the member of land grabbers. Backing this argument, Tinyade(2012) stated that alternatively, governments and their elites are active land grabbers of such land themselves, and government elites may have stakes in the "investment project". Accordingly, out

of the highlanders, as per the official record of Gambella Regional Investment Agency, more than 90percent the total local investors are from Tigray. Oakland Institute (2011a) institute also stated that majority of the investors in the region are Tigrians (the ruling party's ethnic group) and many of these Tigrian investors seem to have limited, if any, farming experience. Many of them seemed to be engaged primarily in land clearing and charcoal production activities. Thus, such affiliation enabled investors to get political backing both during getting the land and in the aftermath of the land acquisition.

e) Absence of Communal Participation: Art 43 (2) of Ethiopian constitution entitled with "the right to development" states that "*…Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community…."*.Therefore, from the views of Ethiopian constitution and other scientific approaches, peoples' participation in development project or program, which affects their life, is very important.

Accordingly, local people should be given the opportunity to participate in making decision about the nature of commercial farming, its cost and benefits for local communities and surrounding environment. But, the data gathered from local people revealed that they had no clue about the large commercial farming operating in their region. Local people were not given the opportunity to be consulted about the projects operating in the region. Beyond this, even regional officials stated that the absence of participation is not only for local people, but for regional concerned bodies too. This is due to the fact that federal government undertakes the process of land leasing. Thus, the absence of local communities' participation in the process has led the local communities to externalize and hate the commercial farming in progress. This resulted in the absence of common understanding among investors and local communities, and contributed to the absence of synergy in working to protect the environment.

Conclusions

Large-scale commercial farming has become a fashion of business especially after the 2007/08 food and oil crisis in the world. The rush for global free and arable land also made Ethiopia one of the targets of local and international investors. Resultantly, huge amount of land has been leased out to investors in Gambella Regional State and the study addressed the impact of this investment up on the

environmental sustainability of the region. Hence, the study articulated that the large-scale commercial farming in Gambella regional state has resulted in crisis like deforestation, climate change, pollutions, soil degradations, diminishing biodiversity and food insecurity. The causes of the problems were; double coincidence of Power, myths of free land, absence of framework, ethically and/or politically affiliation of investors to the ruling party, and the absence of communal participation. Therefore, though it is impossible to avoid large commercial farming, it is very important to at least minimize the level of negative impacts by giving responsibilities to different concerned bodies, developing frameworks, and developing guiding principles and code of conducts.

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Networks, Perceptions, and Migration Decisions: A Comparative Analysis of Young Migrants from the Gurage and Wolayita Areas to Addis Ababa

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Abstract

In Ethiopia, rural-urban migration has been visibly dominated by the mobility of the youth. Scholarly works in the area have exhaustively identified the prominent causes as well as effects of this pattern of mobility. By going beyond the push-pull categorization, this study comparatively examines the role of social networks in the migration decision of young rural-urban migrants. Precisely, revealing the nexus between social networks, migrants' perceptions of their home, and destination, vis-à-vis migration decision has been the concern of this inquiry. The study being of a qualitative type, interview and focus group discussion were employed as the main instruments of data collection. Having adopted a purposive sampling design, participants of the study were selected by using snowball and quota sampling techniques. The research has pursued a thematic design of analysis. By and large, young migrants' perception consisted of mixed as well as erroneous characterization of their destination. Exaggeration of possibilities and reduction of impossibilities characterizes the defect in the flow of information from one end of the network to the other. As a result, the paradox between perceptions, expectations, and realities has urged migrants to rethink their choice of migration as a feasible response to their socio-economic circumstance. Social networks and migrants' perception of their destination had played unequivocal role in the migration decision of both groups of the study. Besides, social networks determined not only migratory decisions but also sponsored it and have evidently played a role in the migratory projects of migrants.

Keywords: Social networks, Perceptions, Migration decision, Migratory projects

Introduction

Human beings have always moved in search of new opportunities, or to escape poverty, conflict or environmental degradation (Castles and Miller, 2009:2). Birth and death are natural and mainly ruled by biological aspects while migration is more affected by socio-economic factors and human behavioral subjectivities (Filho *et al*, 2011). Factors motivating local as well as international migration have been both numerous and interdependent. According to Hunnes (2012), the decision of when to move and the

motivation for that movement is shaped by various factors that drive migration. Although migrant's aspiration for greater economic well-being has been considered paramount both in internal and international migration (Adepoju, 2007; Harris 1970; and Todaro, 1969), earlier theories of migration, particularly, the neo-classical theory, has failed to explain why only few people migrate to some destinations and not others (Arango, 2000:286).

Despite several political unrests, economic inequalities, and environmental degradation not many people are part of the international migration; in fact, many countries - especially like China, India, Brazil or Nigeria – have a higher rate of internal migration when compared to international migration from the same destinations (Castle and Miller, 2009). According to Adepoju (2007), regional migration involves diverse types of people, professions, classes and cultural background. The Sub-Saharan Africa – in which Ethiopia is part a - is a region characterized by a variety of migration configurations: contract workers, labor migrants, skilled professionals, refugees and displaced persons- in regular and irregular situations. Migration patterns in Ethiopia include rural-rural, rural-urban, urban-rural, and urban-urban movements. The rural-urban migration trend in Ethiopia has been explained by a number of so-called push and pull factors. Ezra and Kiros (2001) identified overpopulation; famine, poverty, land scarcity, governmental agricultural policies, and lack of agricultural resources as the main push factors among rural-urban migrants in Ethiopia. In addition to the above-indicated factors, a study conducted on the causes, characteristics, and outcomes of migration to Addis Ababa pinpointed that social networks were among the determinants in the migration decisions of rural-urban migrants to Addis Ababa (Moller, 2012).

With regard to this, Arango (2000) states that, while networks rank among the most important explanatory factors of migration and are not an entirely new notion, their introduction to migration studies has certainly brought an additional perspective through which issues of migration can be scrutinized (Arango, 2000; Boyd, 1989; Chen, 2009; and Fawcett, 1989). Networks shape migration outcomes, ranging from no migration, immigration, return migration or the continuation of migration flows (Boyd, 1989). That being the case, Meeteren and Pereira (2013) have critically examined the function of social networks among different group of migrants. The function of social networks, the findings of their study revealed, varied across diverse group of Brazilian migrants to Portugal and the Netherlands. Similarly, Willems (2003) has shown the difference in the type of support that social networks are capable of providing in the case of urban refugees in the context of Eastern Africa. The support given by social networks included: emotional support, material help, accommodation, and financial assistance.

What is more, the decision to migrate depends on the extent to which the migrant is connected to the communities both at home and destination. For instance, someone with 20 contacts in the destination is roughly twice more likely to migrate than someone with 10 contacts (Blumenstock and Tan, 2016: 25). As the utility of social networks varies among different individuals and group of migrants, explaining and understanding the differential role played by networks enables an accurate understanding of migration decisions and captures the intra-group and inter-group intricacies in migration decisions.

The relationship between migrants' perception of their home, destination, and migration decisions has also been central to this study. The utility of networks, as articulated throughout the literature on the issue, mostly begins with providing information based on which would-be migrants could form their own sketch of their destination. Moller (2012) states that, a considerable share of the migrants, when they arrived in Addis Ababa, had already accumulated some information regarding the general opportunities and challenges posed by the city. As stated by Dominiko (2016), young migrants from the Wolayita area formed an account of their destination based on the information they were able to acquire from their networks. Additionally, Dominiko (2016) states that, migrants' perception of their destination ("easy to make money", "easy to get job", "better quality of life") has urged them to consider leaving their hometowns and villages as a feasible alternative. Information from migrant's networks at the destination has partly formed their perception of the destination. In view of that, this study comparatively examines the nexus between migrants' perception of home, their destination, social networks, vis-à-vis the migration decision of individuals from two groups with different migration history, i.e the Gurages and the Wolayitas.

Context of the Study

The geodemographic scope of this study encompassed young rural-urban migrants from the Wolayita and Gurage areas to Addis Ababa. But still, the research did not include those migrants who moved to Addis Ababa for they are already recruited for a professional job or who have left their place of birth for educational purposes like joining higher education.

The main economic activities in the Wolayita zone include: subsistence mixed farming system where 'enset' (false banana) farming is intermingled with the production of cereals, root crops and coffee. Demographically, the high density of population in the zone has gradually made land a scarce resource. In other words, access to land has been uneven among and within households. Besides, such

demographic pressures pose different economic, human health, and resource related problems (Dominiko, 2016).

The Wolayita zone entertains not only outmigration but also in-migration from one village/town to the other.[1] For instance, Sodo Zuria is among the weredas with a higher rate of in-migration. Of the population in this wereda, the youth between the ages of 10-29 years constitute 52.4 percent (CSA, 2010). Bombe, a locality in the Wolayita zone, has been one of the destinations chosen by young migrants. Migrants' preference of this location has been partly motivated by the availability of alternative livelihood. Young migrants were able to produce and sell charcoal to residents from the surrounding villages and towns. As charcoal production has been forbidden and declared illegal by the authorities, migration to this destination has shrunk down and triggered young migrants to search for other opportunities. As a result, since 2006/2007 young migrants from the area began to migrate to Hadaro, a place in the Hadiya zone (not far away from the birth place of most migrants). Eventually, the surplus in the market for daily laborers has caused the reduction of the daily wage from twenty-five birr (about 0.92 USD) to fifteen birr (about 0.55 USD). Consequently, young migrants have begun looking for better opportunities.

The Gurage zone is also characterized by similar economic activities. Particularly, farming, livestock rearing, and trade are among the dominant categories. Although the out-migration of the Gurages has been motivated by various factors, economic aspirations were the common motive among generations of migrants from this area (Nida, 2000). Furthermore, there is a renowned culture of migration of young people from the Gurage area to Addis Ababa since the 1950's or even before (Zewde, 2002). According to Nida (2000), the size of the Gurage population in the capital of Ethiopia, Addis Ababa, which increased from 2,000 in 1910 to 255,000 in 1984, is evidence of their large-scale migration. In the year 2017, the total population of Addis Ababa was estimated to be 6.6 million and 19 percent of this was believed to be Gurages, i.e, 1,254,000 (The World Fact-Book, 2017).

As this study has been conducted based on the accounts of young rural-urban migrants from the Gurage and Wolayita areas to Addis Ababa, it may not fully capture the perspectives of other members of the households which migrants are part of. However, as this research primarily aims to demonstrate the nexus between migrants' perception of home, destination and the role of social networks in migration decision; this limitation may not negatively reflect on the objectives as well as the findings of the study. The intricacy of the factors in migration decision allows social networks to be treated only as a sufficient

[1] Based on the first, second, third national censuses and the unpublished documents of Municipality (2012) of the town the population size of the study area increase from time to time: in 1967 /-- 10.842, in 1975--- 19.414, in 1984--- 24.278(the First National Censuses), in 1994--- 36.287(the Second National Censuses) in 2007 ---76,050 from which 43,639 were migrants (Aydiko, 2015).

condition in explaining migration decisions. Therefore, this study falls short of determining the existence of would-be migrants who decided to stay at home whilst they have destination networks and the same level of information with those who have decided to migrate.

Materials and Methods

As this study uncovers the nexus between migrants' perception of their home, destination, and social networks vis-à-vis migration decision, qualitative research approach has been utilized. Kalof, *et al* (2008) states that, one of the objectives of qualitative research is to understand processes, experiences, and meanings people assign to things. In terms of research design, comparative and explanatory designs were pursued. Basic questions of the study were addressed based on both primary and secondary sources of data. Interview and focus group discussion were the instruments through which primary data has been collected. Relevant books, journal articles, and research works related to issues of the study were consulted as the principal sources of secondary data.

A purposive sampling design served as the procedure through which participants of the study were selected. Particularly, the sample population of the study has been selected through snow ball and quota sampling techniques, as snow-ball sampling uses a small pool of initial informants to nominate, through their social networks, other participants who meet the eligibility criteria and could potentially contribute to a specific study (Morgan, 2008: 816-817). These techniques are believed to be apt as the population under investigation is dispersed and difficult to easily detect. Yet, identifying the first participants has been guided by the general information the researcher had about the location and job sectors in which most of these migrants involve. On the next stage, the first participants of the study were used to identify additional participants, which fulfill the attributes outlined for the sample population. Quota sampling has also been used to select participants from different age groups and year of arrival at the destination. The rationale for such selection has been driven by the plausibility of reflecting diverse voices and experiences of the participants. Although finding precise figures has been difficult, in the last six years or so, young migrants from the Wolayita area have become a visible group of migrants in some of the urban places in Ethiopia. Besides, they have also involved in different job sectors which other migrants previously took part in. On the other hand, the mobility of young migrants from the Gurage area goes back to the 1950's or even before. Moreover, due to the large volume of rural-urban migration of the youth to Addis Ababa, the research focused only on those migrants who moved to Addis Ababa in the time between 2013-2016 and between the ages of 18-22.

The data collected both through interview and focus group discussion has been analyzed by using qualitative approach. The process of data analysis began with the transcription of almost all the recorded interviews, informal conversations and views from focus group discussion. Then the data has been interpreted in relation to the themes of the study. At this level, thematic analysis has been employed. Conducting thematic analysis on data requires that the text in question is organized into manageable categories and linked to concepts. Moreover, the accounts and experiences of different individuals as well as groups has been compared and contrasted.

Findings and Discussion

Migration Decisions: An Overview of Push and Pull Factors

Migration decision includes the decision to migrate, stay, as well as return. This decision of individual actors is the result of the dynamics between micro-level, meso-level, and macro-structural conditions (Haug, 2008). Thus, theories of migration should not only look at mobility but also immobility, not only to centrifugal forces but also centripetal ones (Arango, 2000: 293). As diverse as the reasons for the decision to migrate, principal factors which motivated young migrants from both of the studied groups included: lack of opportunity to work in diverse sectors or absence of alternative livelihood strategies, cheap labor at their home town, the belief that success is not a figment but a reality in Addis Ababa, better quality of life, peer pressure, migrants' notion of success, and success stories they have heard through the networks they have formed. The decision to migrate to Addis Ababa has been rarely motivated by parent's lack of commitment to their children's education and young migrants' lack of perseverance to walk in a challenging path.

Unlike young migrants from the Gurage area, those from the Wolayita zone have consistently pointed out the lack of opportunity and how cheaper their labor has been afforded in their hometown. For instance, shoe polishing, which is the job that a considerable number of these young migrants from the Wolayita area take part in, generated a lesser amount of income back home. They stated that, they charged more for the same job in Addis Ababa and people are able to afford it. Young migrants who engaged in this job claimed to have more customers and make more money in Addis Ababa. Another migrant from the Wolayita area states, "even making one hundred birr in a month was very difficult back home." That is to say, the expected wage gap between sending and hosting areas is the major pull factor, while surplus rural labor is often viewed as the major push factor (Chen, 2009:5). The above claim and

aspiration of young migrants can be associated with the neoclassical economics models where migration emerges from individuals search for more satisfactory economic conditions like higher wages or better job opportunities. Yet, as the living conditions at home and destination are different in several regards, better wages may not necessarily entail better quality of life.

However, migrants also indicated that, due to a large influx of young migrants to Addis Ababa, the wage for daily laborers has decreased in the last three years (i.e 2013 -2016). The presence of large young labor force has partly contributed to this reduction of wages. For instance, daily laborers who curve stones used to be paid 130-150 birr per day (4.81 - 5.56 USD). Nowadays, this rate has gone down to 70-90 birr per day (2.60 - 3.33 USD).

The fact that opportunities were limited in Wolayita combined with the information that there are plenty of job options in Addis Ababa have contributed to the migration decision of migrants. Not only the opportunities to work in diverse sectors not demanding special skills but also the amount of hourly and daily rate of payment for such jobs has been the other factor that young migrants claimed to be the cause for their mobility. Hence, this account of migrants can be elucidated in terms of the rational choice theory, which considers individuals as capable actors who select from sets of choices. Yet, the availability and selection of such options are hardly unconstrained.

Creating alternative livelihood for households and the role of families has been a factor, which affected the migration decision of young migrants. As a way of diversifying household livelihoods, some families have encouraged the migration of their children to Addis Ababa. A young migrant from the Gurage area said, “I came here one year ago. My parents were not against it.” Another migrant from the same area stated, “our families want us to go to Addis Ababa, and work and make money.” However, some family members were against young migrant’s decision to move to Addis Ababa, as they wanted their children to pursue their education and follow a different path of life. Migration has been a livelihood diversifying strategy of households among individuals from both groups of the study. For instance, a migrant from

the Wolayita area said, "I occasionally send money to my parents." Families who could not afford their children's educational and living expenses has encouraged migration. The success of prior migrants has partly contributed to such stance of families. Common to individual migrants and other members of the households was the association of migration decisions and aspiration for better life. Migration has been considered as an instrument for the enhancement of the livelihood of rural households (Makonnen, 2016).

Precisely, migratory decisions and projects are not entirely regulated by the principle of maximizing individual benefits. The new migration economy theory holds that, migration decisions were made to maximize the benefits of households as well as individuals (Stark, 1991). Moreover, migrants' decision to migrate can also be associated with what is formulated as the encouraging hypothesis. According to this thesis, families may encourage members of their family to migrate for work, e.g. as a strategy to secure the household income (Hugo, 1981: 196; Stark, 1991).

Migrants' dislocation from what they considered home or family and the desperation they felt has urged them to look for alternative socio-economic setting in which they will be able to reconstitute a meaningful existence. Moreover, weak attachment with members of the family has contributed to the migration decision of young migrants. For instance, a young migrant from the Wolayita area said, "my brothers own a boutique in Areka (a locality in the Wolayita area). Yet, they did not want him to work with them to overcome his economic problems. At this juncture, the notion of conflict hypothesis can be invoked to indicate the role of unresolved disagreements among members of a family. Intra-familial conflicts within the community also cause migration (Hugo, 1981: 196). While this has not been the case among young migrants from the Gurage area, the aspiration to build a better future and overcoming their basic challenges is no doubt a factor that they share with young migrants from the Wolayita area.

Overall, economic challenges - lack of opportunity to get 'fairly paying' jobs, cheap labor, and limited job sectors due to less demand from the existing market at home-, hopelessness (the belief that success takes a long way at home), success stories, household's outlook towards migration, social networks, poor (at home) as well as better quality of life (at the destination), narrow definition of success, and the

aspiration to build a better future were the determinant factors which shaped the migration decision of migrants from both groups of the study.

Social Networks and Migrants' Perceptions of their Destination: The Nexus?

In this study, perception pertains to the pre-migration realm and refers to the visualization, imagination, idea, or portrait that migrants had about their destination. A perception signifies an opinion formed as a result of different information, misinformation, assumptions, and judgments thereafter. Filho *et al* (2011) argue that, each agent has a perception about the environment and this perception is a result of several elements present in the neighborhood of the agent. Psychologists propagating its subjective dimension have challenged the objectivity of perception. "Perception reflects the needs, expectations, attitudes, values, and beliefs of the perceiver. In this light, the phrase "seeing is believing" must be modified. Clearly, we see what we believe, as well as believe what we see." (Coon and Mitterer, 2010: 176).

The key actors in the networks of both the Gurage and Wolayita youth consisted of friends, families, relatives, distant relatives, and friends of friends. Particularly, young migrants from the Gurage area mainly relied on family networks, while young migrants from the Wolayita area had such an option only to a limited extent. This was partly due to the fact that, migration of the youth from the Gurage district goes a few decades back and there is a socially and economically established Gurage community in Addis Ababa. As such influx of young people from the Wolayita area is relatively a new phenomenon, finding a socially and economically established community seemed impossible. But still, Meeteren and Pereira (2013) argue that, migration scholars need to move beyond the narrow conceptualization of social networks based on community or kin relationships, to consider multiple configurations involving different agents – both in the origin and destination countries – at different stages of the migration process.

Young migrants' perception of their destination has shown both intra-group and inter-group variations. Migrants' perception of their destination consisted both down to earth and illusory characterizations. Additionally, such deficiencies were detected among young migrants in both groups. Social networks had the role of painting the portrait of a world that was previously unknown to would-be migrants and lent the instrument through which this world could be experienced. For instance, a young migrant from Wolkite town, which is in the Gurage Zone, stated that, "when people tell you about Addis Ababa, you

will be eager to go there and change your life." Young migrants from the Wolayita area have shared this aspiration as well. The circumstances of those at the sending end (their success or failure) has been the basis based on which they have shown their world to those who aspired to be part of it. The extent to which those at the sending end of the network made the destination appealing has attracted young migrants from both groups of the study. For example, a young migrant from Areka, a locality in the Wolayita area, stated, "people from my village told me about the beauty of the city." Generally, "If you work hard, you can make a lot of money", "there are plenty of jobs that you can make enough money from", "there are enough jobs", "you can change your life", "Addis Ababa is a place where you can dress up nice, make money, and also get a nice food", "and you can rely on us (friends and relatives) until you settle and find jobs (exclusive to young migrants from the Gurage area). Since they described the general scenario at the destination, these statements, which were exchanged through the networks, shaped young migrants' perception of their destination as well as migration decision.

To an extent, the above stated information were substantiated by the success stories of migrants who went back home during different socio-religious holidays. In other words, returnees who have realized their migratory projects have served as a basis of migrants' perception of their destination. For instance, a migrant from the Gurage area revealed "my friends said, "you can work anything and change. They have told and shown me the progress they have made". Also, another migrant from the Wolayita area stated, "from what I have heard from friends, I thought of Addis Ababa as the 'America of Ethiopia`." According to the view of another migrant from the Wolayita area, Addis Ababa is a place where two of his friends were able to make the money to buy a motorbike.

Young migrants both from the Wolayita and Gurage areas have heard stories of success, better life, more opportunities, better payment, and the possibility of changing one's own and others life. As a result, migrants associated their destination with different ideas, which mirrored their perception of it. The information passed through social networks added more confidence to the migratory decisions of young migrants, while the absence of details had prompted migrants to rethink their decision to migrate. For example, the information received by some migrants in both groups stretches to include details regarding the amount of income made in different job sectors. As a result, would-be migrants were able to make a comparison between their situation and the possible gain from their decision to migrate. Thus, the decision to migrate has been guided by a cost-benefit analysis.

Networks, Perceptions, and Migration Decisions

In addition to the raw success stories communicated through social networks, some young migrants from both groups were able to form and corroborate their opinion of the destination with actual evidence. Although this corroboration has not been entirely based on the success of family members, at times, the stories were as concrete as they can be as they involved close family members. For instance, a young migrant from the Gurage area states, "I heard about Addis Ababa from my father. I have seen him change. It was not much of telling, it was more of observing his changes and deciding to follow his footsteps." Regarding young migrants from the Wolayita area, an influence from such circles occurred very rarely. Migration decisions of young migrants both from the Gurage and Wolayita areas were not merely based on the information handed down through social networks. But, they were also triggered by the repeated pressure and seduction from the sending end of the networks.

As almost all the youth from both districts are economic migrants, they largely sought information focused on economic matters. The exchange of information concerning the socio-cultural condition at the destination has been noted only rarely. This aspect, which is also a factor in migration decision, has been neglected among young migrants from the Wolayita area. For they were convinced by the idea that they would get sufficient support from their friends and relatives during their transitory stage, young migrants from the Gurage area were also negligent towards the socio-cultural condition at the destination.

Migration decisions, besides the availability of jobs and better payment, were partly influenced by other conveniences, which migrants believed could ease their transitory stage (early days at the destination). Occasionally, the networks at the destination, in addition to providing information about the destination, arranged accommodation for newly arriving migrants. Nevertheless, under circumstances where young migrants did not have such an image of their destination; where relying on others, even temporarily, is not an option; they resorted to different alternatives to realize their aspirations. For instance, young migrants from the same neighborhood moved in groups from their hometown to Addis Ababa. In some cases, as they have information about housing, the newly arrived young migrants handled this part of their passage collectively. This strategy has been mostly pursued by young migrants from the Wolayita area. With regard to this, a young migrant from the Wolayita area stated that, "I came to Addis Ababa with other five people from my village and they all had some information regarding jobs and other details important for their future. Besides, four of us have rented a room and shared the cost". Even within the same group of migrants, strategies devised to enable migration, staying, and returning; as well as achieve migratory projects were different.

As crucial as the information communicated through the networks has been; it has occasionally been misleading. At times, as confirmed by migrants from both groups, migrants were deluded by the information passed through networks, as it did not signify the actual situation at the destination. For instance, a young migrant from the Gurage area stated, "my relatives encouraged me to come to Addis and change my life". They told me, "If you have a good habit of saving, you can change your life easily". Yet, that alone was not enough." Another migrant from the same area pointed out that, "switching between jobs has not been as easy as said." Migrants' misperception of their destination has been partly caused by such and such incomplete information from the sending end of the networks. Now and then, such misperception and misrepresentation emanated from migrants' interpretation of what they have seen and heard. That is to say, having seen and heard the success stories of their friends and relatives, young migrants formed a particular picture of their destination. A migrant from the Wolayita area indicated, "I used to think that you can just simply get money; but once I arrived in Addis, everything is different. I have observed how hard work makes money making possible". Additionally, a young migrant from the Gurage area thought of Addis Ababa as a city where only rich people lived.

Migrants' perception of their destination has gone through some changes once they have arrived at the destination and began experiencing the world that previously existed only in their imaginations. At present, young migrants' positive characterization of their destination is based on the availability of job opportunities, better income, the ease in forming social ties or absence of tribal barriers in bonding with other people, and better quality of life. For instance, a young migrant from the Wolayita area pointed out, "at the beginning I did not like Addis Ababa. That was because life was tough. Nowadays, I do not feel that way." Another migrant from the same place of origin indicated that he was uncertain about the social life and bonding at the destination. After a few months of stay at the destination, the migrant was able to observe that bonding with people is relatively easy.

Exaggeration of possibilities and reduction of impossibilities characterizes the defect in the flow of information from one end of the network to the other. Regardless of their unmeet expectations, young migrants were not equally disappointed by the situation they have come to find themselves in. Careful examination of different aspects of the reality at the destination has not been an issue of concern in migration decisions of young migrants from both areas. Both the receiving and sending ends of the network were critical about the information they send and receive only to an extent.[2]

[2] The receiving end of the social networks refers to those who receive or seek information regarding the destination, while the sending end connotes those who are sending information to would-be migrants.

Migrants' Perception of Home and Migration Decisions

Migration decisions were influenced not only by migrants' perception of their destination but also their attachment and characterizations of what they call 'home'. Migrants' perception of their place of origin has been vastly positive. In other words, only insignificant portion of young migrants from the Gurage and Wolayita areas negatively characterized their hometowns and villages. As bitter are the experiences and memories of home of some migrants from both groups, others did not relate to their place of origin in such a way. But still, there were migrants from both sides with a plan to return back home once they have enough capital to commence the project they have planned before and after their migration to Addis Ababa. Limited number of job sectors and lack of opportunity to work in these different sectors, poor quality of life, and cheap labor or unsatisfactory payment is some of the grounds based on which they justified such an image of their home. On the contrary, migrants' positive characterization of their hometowns and villages has been founded on their attachment to their communities, the natural environment, the culture (hospitality and generosity are repeatedly mentioned), and easy access to shelter. This last feature is the result of migrants' evaluation of their current situation at the destination.

Overall, socio-economic bonds are mutable. Most young migrants from both groups of the study delineated the strong attachment they have with their families, neighbors and relatives as a bridge that links them with their home. Currently, such bond, at least temporarily, is unavailable due to migrants' physical absence from their home. However, such bond seems to be partly reproduced among Gurage migrants as there is a larger and settled Gurage community in Addis Ababa. As an indication of the complexity of the idea of home, young migrants from both groups stated that, "the social bonds at the destination may not be sufficient to feel at home." At times, natural environment, different social activities they involve in, and generally, what they termed as "memories of home" constitute young migrants account of home. Barkan *et al* (1991) describe hometown associations as "communities of memory that reaffirm people's sense of place and attachment to their hometowns or origin" (pp: 460).

Migrants' attachment with their home as well as their destination influences their decision to migrate permanently or not. With regard to this, migrants' lack of strong attachment with the destination has urged them to rule out permanent migration. For instance, rural-urban migration in china is characterized by circular migration and temporary return. According to Hare (1999), labor migrants in China tend to have little attachment to destination cities and return home frequently during a year (Hare, 1999 cited in Chen, 2009: 6).

Despite the predominantly positive perception they have about their hometowns and villages, young migrants from both groups were hard-pressed and enticed by other factors at home and their destination. For the most part, the positive image that migrants have about their hometown did not necessarily trigger returning back to home as their first alternative. Positive perception of home has been only a sufficient condition in the decision to return back to home. Particularly, young migrants from the Gurage area mentioned the issue of returning back home only rarely.

Social Networks and Migratory Projects: Purpose and Scope

Social networks had different roles in the migration decisions and migratory projects of young migrants from both groups of the study[3]. As compared to those from the Gurage area, social networks had limited purposes among young migrants from the Wolayita area. To be precise, networks have been used to exchange information about job opportunities, housing, and very rarely, food options (both in terms of affordability and quality). Networks served wider purposes among migrants from the Gurage area. A young migrant from the Gurage area claims, "what my sister's husband told me has encouraged me to migrate to Addis Ababa. He assured me that, I can work in different job sectors and make enough money for covering my living expenses as well as start my own small business given I carefully utilize the money I make. Additionally, as he has been living here in Addis Ababa for the last five years, he has helped me to switch between jobs." Those at the sending end of the networks have also covered the costs for migrant's initial mobility from home to the destination. Young migrants from the Gurage area were the ones who benefited from such support offered by those in their networks. Furthermore, among those from the Gurage area, networks were not only channels of communication but also instruments of assistance in the realization of migratory projects.

According to some migrants from the Wolayita area, the lack of trust among them has partly affected the possibility of higher cooperation and assistance that young migrants from the Gurage area claimed to have. As stated by a migrant from the Wolayita area, "people are not willing to contribute money that may help others to start businesses and realize their ambitions. They are skeptical about their money being returned." Conversely, migrants from the Gurage area pointed out that, the cooperation among them extends up to contributing the initial capital for their friend's investment or business. In addition, as

[3] The notion of migratory projects refers to the aims that migrants want to realize by using migration to the chosen destination as a means. This project could be maintained, expanded, and changed. Those who have decided to move for economic reasons might later on aspire to realize other projects.

opposed to the conception of migration as a project embracing both individual and communal benefits, the understanding of migration as an exclusively individual passage to success halted the extension and maximum utilization of networks in the post-migration realm.

Limitations in communal and kin based networks were among the factors that compelled young migrants from the Wolayita area to form additional networks. Those who are self-employed and working as employees in different sectors were able to form additional networks at their work places. The gap in kinship and community-based networks has been overcome by the strategy that individual migrants have devised after their arrival at the destination. Securing better paying jobs and getting financial assistance, which is necessary to start different small businesses at the destination, were the purposes that additional networks served among those from the Wolayita area. In other words, additional networks were intended to contribute to the realization of migratory projects. On the other hand, young migrants from the Gurage area engaged in forming additional networks very rarely.

Success stories were a common denominator in the migration decisions of young migrants from both groups of the study. The equation of success with financial well-being happens to be the predominant understanding among young migrants from both groups. Most young migrants from the Gurage area attributed success a multitude of features (even within the economic sphere) while most of the youth from the Wolayita area defined success in terms of limited markers. For example, a young migrant from Wolayita area mentioned that, having worked in Addis Ababa, some of his friends bought a motorcycle and provide local transportation service at home.

The threshold of migratory projects has been mostly based on the achievements of prior migrants. For instance, a young migrant from the Wolayita area said, “when our friends came home to visit their parents during holidays, they show-off the clothes they have, their money, and so on.” This being one conceptualization of better quality of life, a young migrant from the same area, indicating the improvement in his life and by implication corroborating the already formed discourse of better quality of life, said, “when I first came to Addis, I did not have a shoe or even a nice trouser. But now, I am able to buy a shoe.” To be precise, the migrant has set the verge of his migratory project and what a success means to him; and he aspires to follow the footsteps of those who have passed through this journey. Differences in the scope of migratory projects have been noted among different age groups. Younger migrants from both groups of the study aspired to achieve smaller aims, while older migrants targeted bigger goals. Experience in life, expectations about the destination, circle of influence, duration of stay, and maturity seem to partly explain such differences in migratory projects.

As uncertain as it may be, unlike those from the Gurage area, most migrants from the Wolayita area have a time-bound and short-term plan of staying at the destination. Young migrants from the Wolayita area predicated the duration of their stay on finding an initial capital that would enable them to start a business at home or achieve their migratory goals. For example, they have a plan of working and saving money for buying motorbikes, an initial investment to open a retailer shop, and occasionally to buy an ox for farming. Having attained their migratory projects, most migrants from the Wolayita area have a plan of returning back home. They believed, given they are able to achieve their projects; starting a business back home would be more profitable as there are no many competitions in their hometowns and villages. In other words, they believed to have the opportunity to be among the few who can provide different services. To an extent, the realization of migratory projects combined with migrants' positive perception of home has contributed for their stance on returning back to home. In view of that, cost-benefit analysis plays a role not only in decisions to migrate but also in decisions to stay as well as return.

By and large, the transition from would-be migrants to migrants may not be fully explained only in terms of social networks. But still, social networks were of paramount importance in the migration decision of young migrants from both groups. Regardless of the unmeet expectations of some migrants from the two groups, the availability of different facilities or better quality of life (better income, water supply, electricity, food, and work environment), and aspiration to change has contributed to young migrants' decision to stay in Addis Ababa. On the other hand, some migrants seem to be trapped in various adventures of city life; such as, frequent drinking and partying, and engage in sexual promiscuity. As a result, the realization of their migratory projects seems to be jeopardized by such activities, which consumed their money and time, and hindered their industriousness. At times, initial migratory projects have been expanded to incorporate additional goals that migrants aimed to achieve simultaneously. For instance, having addressed part of their economic goals, few migrants who dropped out of elementary and secondary level of education began attending schools in non-working hours (commonly known as night or extension shift). Young migrants from the Wolayita area were the ones mostly found in this category.

The intertwined nature of social networks and the continuum within them has transformed those at the receiving end to the sending end of the network. Those who were would-be migrants and on the receiving end of the networks have now become providers of information for would-be migrants. Young migrants from both groups, whenever there is a need, informed their friends and relatives about the opportunities as well as the challenges in Addis Ababa. A young migrant from the Wolayita area states that, "a friend of mine back home asked what I do for living and I told him that I sell chewing gums, cigarettes, mobile cards, tissues (toilet papers) and condoms." Besides, "I have also told my friends

about the reduction in daily wages of laborers due to the presence of surplus labor force." Such communication takes place during holiday visits of migrants and telephone communication between migrants and their families, relatives, friends, and neighbors.

Conclusion

The decision to migrate, stay, and return has been motivated by socio-economic factors both at home and destination. Besides, factors, which transcend the traditional push-pull scheme, have also motivated migration decisions. Migration decisions were predicated on cost-benefit analysis (job opportunities, wages/income, assistance from their networks) of the circumstances both at home and the destination. Yet, migration decisions were not always driven by migrants' accurate perception of their destination. Migrants' perception of their destination consisted both down to earth and illusory characterizations. At times, migrants' decisions were founded on inaccurate depiction of their destination, a depiction, which they have built based on the information they have gathered as well as their assumptions. The disappointment, which emanated from misinformation and migrants' expectations, has initiated despair among some young migrants from both groups. As a result, they have reassessed the appropriateness of their decision to migrate to Addis Ababa and whether it is still a project worth pursuing. That is to say, combined with other push-pull factors, expectations which originated from the unrealistic characterization of the destination by those at the sending end of the network might have a sort of a boomerang effect on migration decision; particularly, on the decision to stay at the destination or not.

A comparative analysis of migrants' perception of their home and destination has revealed the complexity in how both home and destination are characterized as well as their differential role in migration decisions. While some connected their future to what they believed to be their home and considered their destination only as a transitory part to this future, others did not share such a stance for several reasons related to both home and the destination. Hence, positive perception of home has been only sufficient condition in migrants plans to return as it has occasionally failed to explain both the decision to stay at the destination and return to home. Both staying at the destination and returning back were dependent on other factors.

The utility of social networks has been partly wrought by the interests of those at the receiving end. Social networks served different purposes ranging from being a source of information to those at the receiving end of the networks up-to being a living evidence to validate the raw success stories circulated

through them. Moreover, networks have also sponsored the mobility of migrants as well as assisted their transitory phase. This has been one of the differences regarding the role of social networks among migrants from the Gurage and Wolayita areas. Social networks have partly shaped the scope of migratory projects. Yet, the decision to migrate did not always depend on the concrete support that migrants secured from those at the sending end of the network. As undeniable as the relevance of those at the sending end of the networks, their role has not been without limits. The limitations in communal and kin based networks have urged the formation of additional networks after arrival at the destination. Such efforts to fill the gaps in communal and kin based networks were not equally employed among individual migrants.

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Exploring the Usability of Guangua Badiya River Water for Agricultural Purposes

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Abstract

The quality of irrigation water directly influences the quality of soil and the crops grown in the soil. Quality of water used for agricultural purposes is directly proportional to the yield. The present study was conducted to find the quality of Gungua Badiya river water and its usability for agricultural purposes in Abaya district, West Gujji Zone, Oromiya Region, Ethiopia. To analyze the physicochemical parameters of the river water, nine samples were collected from upper, middle and lower parts of the river. The physicochemical parameters are analyzed to explore the usability of the river water are: pH, Electrical conductivity (EC), Total dissolved solids (TDS), Calcium (Ca^{2+}), Magnisium (Mg^{2+}), Sodium (Na^{+}), Chloride (Cl^{-}) and Residual Sodium Carbonate (RSC), Sodium adsorption ratio (SAR) and Soluble Sodium Percent (SSP)**.** After evaluating the parameters, it is found that the river water is usable to agricultural purposes and meet the standards directed by UCCC, WHO and FAO.

Keywords: Water quality, Gungua Badiya River, agricultural purposes, physicochemical parameters.

Introduction

Ethiopia is predominantly an agricultural country with potentialities of fertile land and abundant water resources. The food habits of people and the weather in Ethiopia also favours agriculture to be the major profession. Quality of water and quality of soil are major natural resources for crop production on which agriculturalists invest their time, resources and energy. However, in Ethiopia, surface water sources are affected by many anthropogenic factors such as pollution from industrial, commercial and residential areas, as a result reduction of agricultural crops, human health problem and aquatic ecosystems disturbance observed in different areas (Ranjeeta, Ratwani and Vishwakarma, 2011). Therefore, to improve the sustainable use of water resources for agriculture and satisfy the food demand of the ever-

increasing population of Ethiopia, attention is given to explore the available water resources that have quality to use for agricultural purposes.

Surface water quality is affected by natural and anthropogenic factors such as: geology, hydrology, natural hazards, sedimentation/erosion, agricultural activities, industrial, mining, fishing, sewage discharging/disposal, deforestation, and other commercial activities (Chaterjee and Raziuddin, 2002). The water quality is to be analyzed before we use it for the crops, as these factors aggravate the pollution of water body and greatly influence the agricultural yield. Muthana also opined in his research that the poor irrigation water quality has resulted in a negative effect on crop productivity, crop product quality, public health of consumers and farmers who are direct contact with the irrigation water.

Abaya district has many perennial rivers and most of these water sources are polluted, due to the discharge of untreated sewage, waste water from coffee processing industries and other industrial effluents. Simsek and Gunduz, (2007) pointed out that poor quality of river water has an effect on agriculture then, surface water resources have been polluted above the permissible limits that could no longer be used in agricultural uses. In the study area no data is documented about the quality Guangua Badiya River for agricultural use. Thus, the researcher felt to collect water samples from the river and to analyze systematically to find the quality of water to explore whether the river water is usable for agricultural purposes. Therefore, the main objective of this research is to evaluate water quality of Guangua Badiya River and to explore whether it is suitable for agricultural purposes.

The study findings will help the stake holders of Guangua Badiya River to take decisions based on the water quality for sustainable use. Moreover, the study will provide baseline information to woreda agricultural officials, experts and development agents plan to manage waste disposal from industries and agricultural activities, so as to maintain the quality of the river water for agricultural usage.

Materials and Method

Description of the Study Area

The experiment was conducted in Guangua Badia River, Abaya district, West Gujii Zone, Ethiopia in 2015/16 irrigation period. Abaya district is in Oroma Regional state, 06°11' 56"- 06°25'06"Latitude and 38°06'00"Longitude, and is located at about 430 km east of Addis Ababa. It has bimodal rain fall pattern, with annual average rain fall of 700 to 1200 mm and daily mean temperature of 27°C. A total population of 103,348, of whom 52,015 were men and 51,333 were women are residing in the place according to 2007 national census of Ethiopia. The district has a total area of 187134 ha of land, out of which, 60728

ha is cultivated land, 45275 ha is grazing land, 12404 ha is forest and bush land, 62925 ha is covered by Lake Abaya, and 5801 ha is allotted for other activities with 26 rural kebeles and 3 semi urban kebeles. Maize, Teff, haricot bean, groundnut, tomato, onion, potato, pepper, cabbage, coffee and Enset are the major crops grown in the area. Moreover, the district has more than twelve perennial rivers including the Gelana and Gidabo (ADBOA, 2014).

Location Map of the Study Area

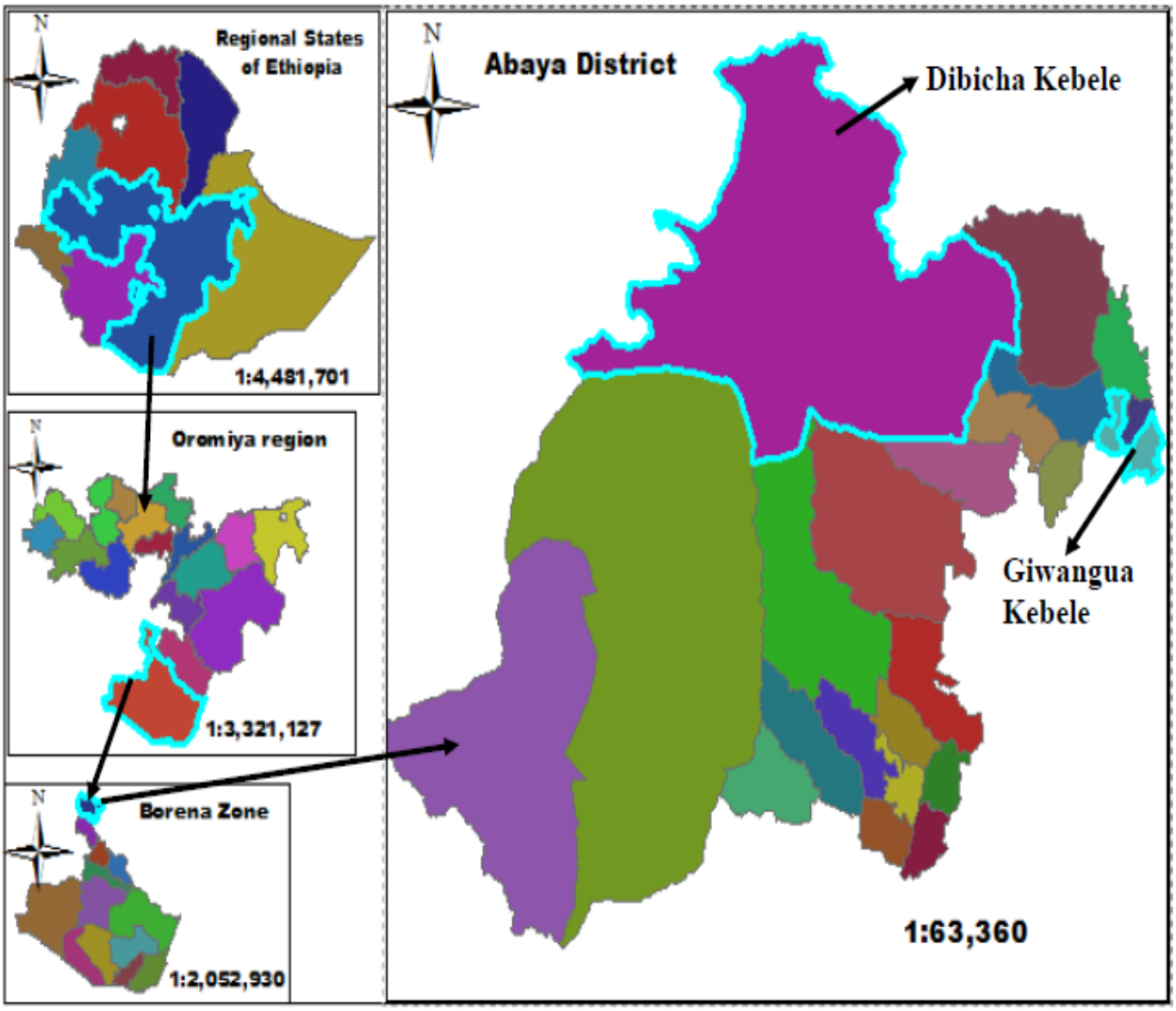

Figure 1. Location map of the study area

Water quality determination

Representative sampling points were purposively selected based on the use of river for agricultural purposes. The study was conducted strategically between December and February, 2015/16 during peak farming period. Samples were collected three times with a month's interval from upper, middle and lower selected sites. A total of nine water samples, with a depth of 30 cm were collected from the river sites which was predominantly utilized for agricultural use by the farmers.

Analysis of water chemical properties

The water samples were analyzed all physicochemical parameters viz. pH (H_2O), Electrical conductivity (EC) , Total Dissolved Solids (TDS), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Sodium (Na^{+}), Potassium (K^{+}), Chloride (Cl^{-}) and Residual Sodium Carbonate (RSC**)**. Furthermore, the quality of the water samples were assessed using Sodium adsorption ratio (SAR) and Soluble Sodium Percent (SSP). Then, ionic concentrations of Na^{+}, Ca^{2+}, Mg^{2+} and K^{+}. EC and pH (H_2O) were determined using electrical conductivity meter and pH meter as described by (Carter and Gregorich 2008). TDS were indicated by weighting the solid residue obtained by evaporation of a measured volume of water samples to dryness (Chopra and Karnwar, 1980). Soluble Na^{+} and K^{+} were determined by flame-photometer after proper calibration with combined Na-K standard solutions (Carter and Gregorich 2008). While soluble Ca^{+2} and Mg^{+2}, were analyzed directly by atomic absorption spectrophotometer (APHA, 1998). $C1^{-}$ ion was measured by the argentometric method, by titrating against silver nitrate standard solution with potassium chromate indicator (Greenbergs et al., 1992). SAR, RSC and SSP of water sources were calculated as suggested by Muthanna.

Statistical Analysis

The physical and chemical properties of the river water was subjected to analysis by using SPSS version 20 software and Microsoft Excel. The physicochemical parameters of the river water was compared with standard guideline values recommended by the UCCC, WHO, FAO, Ayers and Westcot, Eaton, Wilcox, Todd, Richards and Wilcox.

Results and Discussion

Irrigation water quality for the Gwangwa Badiya River

The quality of river water may be affected by salt that could eventually contributing to the accumulation of salinity. Irrigation must be accompanied by sufficient system of salt removal (Hergert and Knudsen, 1997). The summary of statistical parameters such as minimum, maximum and mean concentrations of physicochemical parameters are tabulated in Table 1.

Table 1. Statistical description of physicochemical parameters of Guangua Badiya River water (Mean±SE, n=9)

Parameter	Minimum	Maximum	Mean±SE
PH	6.55	7.25	6.85 ± 0.2
EC(dS/m)	0.07	0.27	0.16±0.0
TDS(mg/l)	131	146	139± 4.1
Na(meq/l)	0.24	0.30	0.26±0.0
Ca(meq/l)	0.38	0.47	0.43±0.0
Mg(meq/l)	0.37	0.51	0.44±0.0
K(meq/l)	0.26	0.29	0.27±0.0
Cl (meq/l)	0.14	0.25	0.19±0.3
SAR	0.37	0.43	0.40±0.0
SSP %	18.02	19.16	18.71±0.4
RSC(meq/l)	0.55	0.93	0.75±0.1

Water PH

The pH of the river water ranged from 6.55 to 7.25 with an average value of 6.85. High value of pH is due to high amount of waste water from coffee processing industries, which may dilute the alkaline substances or the dissolution of the atmospheric carbon dioxide (Sheikh Nisar and Yaregi, 2003). This value is considered to be safe for agricultural activities when compared with the standard value given by (UCCC, 1974, FAO, 1985 and WHO, 2006). The results are also within the values as determined by Vudhivanich, (1998) for agricultural water use (6.5-8.5).

Salinity hazard

The measurement of EC is directly related to the concentration of ionized substances in water and may also be related to the problems of excessive hardness and other mineral contamination. Excess salt induces artificial physiological drought condition by increasing the osmotic pressure of the soil water and produces conditions that withhold the roots from absorbing water. Even though the field appears to have plenty of moisture, the plants may wilt because the roots could not absorb enough water to replace water lost by transpiration.

The EC value of irrigation water of the study river ranges with a maximum 0.27 dS/m and minimum 0.07 dS/m, and with the mean value of 0.16 dS/m. Total dissolved salts in the river water ranges from 146 to 131 mg/l and the mean value is 139 mg/l. According to FAO (1985), UCCC (1974) and Wilcox (1955) the result of EC and TDS fall within the irrigation water quality classification of excellent category (Table 2). Furthermore, Hergert and Knudsen's (1997) thresholds for the classification of irrigation water shows into low, medium, high and very high salinity are < 0.75 dS/m, 0.75-1.5 dS/m, 1.5-3.00 dS/m and > 3.00 dS/m, respectively. Therefore, river water salinity level is excellent for agricultural purposes.

Table 2. University of California Committee of Consultants (UCCC) classification of water for irrigation use based on EC and TDS values (UCCC, 1974)

Parameters	***Excellent***	***Good***	***Permissible***	***Unsuitable***
EC (dS/m)	< 0.25	0.25-0.75	0.75-2.25	> 2.25
TDS(mg/l)	< 200	200-500	500-1500	>1500

Sodium hazard and Sodium Absorption Ratio (SAR)

Effects on soil permeability, infiltration, and aeration and tillage properties of soils are the main problems with high sodium concentration. Sodium toxicity is recorded as a result of high sodium in water as sodium percentage and SAR ratios. The sodium hazard of irrigation water is estimated by the sodium adsorption ratio - SAR. High SAR in any irrigation water implies hazard of sodium (Alkali) replacing Ca and Mg of the soil through cation exchange process, a situation eventually damaging to soil structure, namely permeability which ultimately affects the fertility status of the soil and reduce crop yield (Gupta, 2005). The SAR value obtained in the study area ranges from 0.43 meq/l to 0.37 meq/l with an average value of 0.40 meq/l (Table 1). According to the standard depicted by Ayers and Westcot

(1985); Eaton, 1950; Wilcox, 1950; Todd, 1980) and Richards (1954), the result obtained falls under the category C1S1 (Tables 3 and 4). That means the result indicating low alkali hazards and excellent irrigation water. The findings are also agreed with Sadashivaiah et al. (2008), who classified the water samples based on SAR as low (<10), medium (10-18), high (18-26) and very high (> 26). Thus the river water is suitable for agricultural purposes.

Table 3. Classification of water for irrigation use based on SAR and EC value (Richard, 1954)

Water class	**SAR**	**Index**	**EC(µS/cm)**	**Index**	**Category**
Excellent	≤10	S1	100–250	C1	C1S1
Good	10–18	S2	250–750	C2	C2S2
Fair	18–26	S3	750–2250	C3	C3S3
Poor	≥26	S4	≥2250	C4	C4S4

Soluble Sodium Percent (SSP)

Soluble Sodium percent is another important factor to study sodium hazard. It is calculated as the percentage of sodium and potassium against all cationic concentration. High percentage of sodium on irrigation water may stunt the plant growth, deflocculating and reduces the soil permeability (Joshi et al., 2009; Singh et al., 2008). It is also used for considering the quality of water for use of agricultural purposes. The analyzed water samples value ranged between 18.02% and 19.16% with an average value of 18.71% in the present study. According to the standards pointed out by Ayers and Westcot (1985); Eaton, (1950); Wilcox, (1950); Todd, (1980) and Richards (1954), Wilcox (1955), irrigation water is grouped under excellent category. Hence, based on the values of SSP, Gungua Badiya river water is usable for agricultural purposes.

Table 4. Limits of some parameter indices for rating water quality and its sustainability in irrigation (Ayers and Westcot, 1985;Eaton, 1950;Wilox,1950;Todd, 1980)

Category	***EC(µS/cm)***	***RSC(meq/l)***	***SAR***	***SSP (%)***	***Sustainability for Irrigation***
I	<117.509	<1.25	<10	<20	Excellent
II	117.509-508.61	1.25-2.5	10-18	20-40	Good
III	>508.61	>2.5	16-26	40-80	Fair
IV	_	_	>26	>80	Poor

Residual Sodium Carbonate

Residual sodium carbonate (RSC) indicates the amount of sodium carbonate and sodium bicarbonate in water. It is changing the quality of water through the precipitation of alkali earth elements (Ca^{2+}, Mg^{2+}) thereby increase the percentage of sodium (Eaton 1950). The irrigation water quality is influenced by the presence of high amount of RSC. The value of RSC of the river water samples ranges from 0.55 to 0.93 meq/l and mean value of 0.75 meq/l. According to the standard pointed out by Ayers and Westcot (1985); Eaton, (1950); Wilcox, (1950); Todd, (1980) and Richards (1954), Wilcox (1955), the suitability of RSC value less than 1.25 meq/l. Thus, river water is safe for agricultural purposes.

Magnesium content

Magnesium content in water is considered as one of the most important qualitative criteria in determining the water quality for agriculture. Generally, calcium and magnesium maintain a state of equilibrium in most waters. More magnesium in water will adversely affect crop yield, as the soil become more alkaline. In the present study, the magnesium content of river water samples values ranges 0.44 meq/l to 0.51 meq/l with an average value of 0.37 meq/l (Table 1). Therefore, according to the standard of FAO (1985), 0-5 meq/l this river water in terms of magnesium content is suitable for agricultural purposes.

Chloride Hazard

Chloride is essential to plant in very low amount and should be considered in irrigation water. Although chloride is essential to plant in very low amount, if it is present in excess amount can cause toxicity to sensitive crops. High amount of chloride contamination in leaves results leaf burn or drying of leaf tissue. Chloride in surface water may be from soil, and domestic and municipal effluents (Sarath Prasanth et al. 2012; Krishna Kumar et al. 2014). In the study area chloride found in the river water varies between 0.14 meq/l (4.97 mg/l) and 0.25 meq/l (8.875 mg/l). WHO (2011) and UCCC (1974) suggests the desirable limit and permissible limit for chloride are 250 and 1000 mg/l, respectively. It is evident that the values of Cl of the study area fall within desirable limit (less than 250 mg/l). Therefore, river water categorized as excellent for agricultural purposes.

Conclusions

The study was carried out to evaluate the physicochemical properties of Gungua Badiya river water to explore the suitability for agricultural purposes. The major ion concentration (pH, EC, TDS, SAR, SSP, Mg^{2+}, Cl^{l-} and RSC) suggest that the river water samples belong to the suitable category for agricultural purposes. The samples meet the standards of UCCC, WHO, FAO, Ayers and Westcot, Eaton, Wilcox, Todd, Richards and Wilcox. The statistical data, also show that the association of ions and they are very less influenced by the anthropogenic activities. The results show that proper management of the river water and periodic monitoring of quality parameters are required for the sustainable usage of the river water for agricultural purposes. Hence, further work is needed to investigate the detail water quality status of the river through taking more intensive sampling for a longer period and studies to measure any change of physicochemical properties of the river water in the soil and crop.

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Asian *Vitis* Species for Modern Grapevine Breeding and Wine Industry: A Review

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Abstract

Viticulture is one of the major horticultural industries of the world, with the area of grapevines cultivated exceeding 7.9 million hectare. The grapevines belong to the family Vitaceae, which are mostly woody, tree-climbing vines, though a few have a shrubby growth habit. They have tendrils and inflorescences opposite the leaves. The grapevine fruit is used in a wide variety of products, ranging through fresh fruit, preserves, juice, wine and raisins. This review paper attempts to address a potential Asian Vitis species, as there was no sufficient information and most of the species were ignored in modern viticulture and enology. Vitis amurensis, Vitis heyneana, Vitis davidii, and Vitis yeshanensis are the most common and most popular species in Asia. The Vitis genus contains more than 70 species, with centres of origin in South Europe, Asia Minor, East Asia, and North and Central America. Asia is one of the major gene centres of origin for more than 37 Vitis species. Asian Vitis species have strong resistance against such diseases like Anthracnose, Ripe Rot, Powdery Mildew, Crown Gall and they can withstand environmental stress. Their germplasms can easily be crossed with V. vinifera and American Vitis species. Additionally, the berries of Asian wild Vitis species do not have the undesirable "foxy" flavour compounds commonly existing in the berries of American Vitis species. As the European grapevines are not well tolerant to different diseases, Asian wild Vitis have captured scientists and breeders' attention in the grapevine breeding and wine industry.

Key words: Grape berry, grapevine, raisin, *Vitis* species, wine

Introduction

There are 12 genera within the Vitaceae family including *Vitis*, *Ampelocissus*, *Clematicissus*, *arthenocissus* (Virginia creeper), *Ampelopsis* and *Cissus* (kangaroo vine). The genus *Vitis* is the part of that family in which the grapevine industry is most interested and it consists of two subgenera, *Euvitis* and *Muscadinia* (Creasy and Creasy, 2009). The subgenera are distinct because they have different chromosome numbers (38 for *Euvitis* and 40 for *Muscadinia*) and morphological features (Einset and

Pratt, 1975). There are three named species in this group *Muscadinia rotundifolia, Muscadinia munsoniana* and *Muscadinia openoei*. Because of their different chromosome number, plants in this subgenus will not naturally interbreed with *Euvitis* species. However, some crossing is possible through tissue culture techniques (Alleweldt and Possingham, 1988). This may be important from the standpoint of producing grapevines with enhanced disease resistance or other desirable characteristics. *Euvitis* has many species, including Amur grapes (*Vitis amurensis*- the most popular Asian grapevine species), Common grapes (*Vitis vinifera*- the most widely grown grape species in the world) and *Vitis labrusca*, which is native to North America (Creasy and Creasy, 2009).

Eco-Geographic Distribution and Morphological Traits

Some species such as *Vitis pentagona*, *Vitis flexuosa*, *Vitis davidii*, and *Vitis wilsonae* have a wide eco-geographic distribution. Others, such as *Vitis hancockii*, *Vitis bellula*, and *Vitis sinocinerea* are known to have a narrow distribution. Species located mainly in subtropical middle China have tolerance to high moisture and have little cold-hardiness. *V. adenoclada, V. romanetii, V. wilsonae*, and *V. davidi* are examples of such species. Species with strong moisture and heat tolerance such as *V. pseudoreticulata, V. chunganensis, V. balanseana* and *V. retordii are* mainly found in Southeast China. The species *V. piasezkii*, *V. bryoniaefolia* and *V. yeshanensis* have strong winter hardiness as indicated by their distribution in North China. *V. amurensis*, the most cold-hardy species, concentrates in Northeast China. Species, such as *V. romanetii, V. seudoreticulata, V. balanseana, V. adenoclada and V. davidi* have a high resistance to grape diseases epidemic in warm-humid areas such as powdery mildew and ripe rot (Kong, 2004). Some species like *Vitis davidii* are known to have resistance to disease and abiotic factors such as cold or drought and some others like *Vitis pentagona* have fair disease resistance and good enological traits related to berry quality while still others like *Vitis amurensis* have strong winter hardiness and good wine quality (He, 1999a).

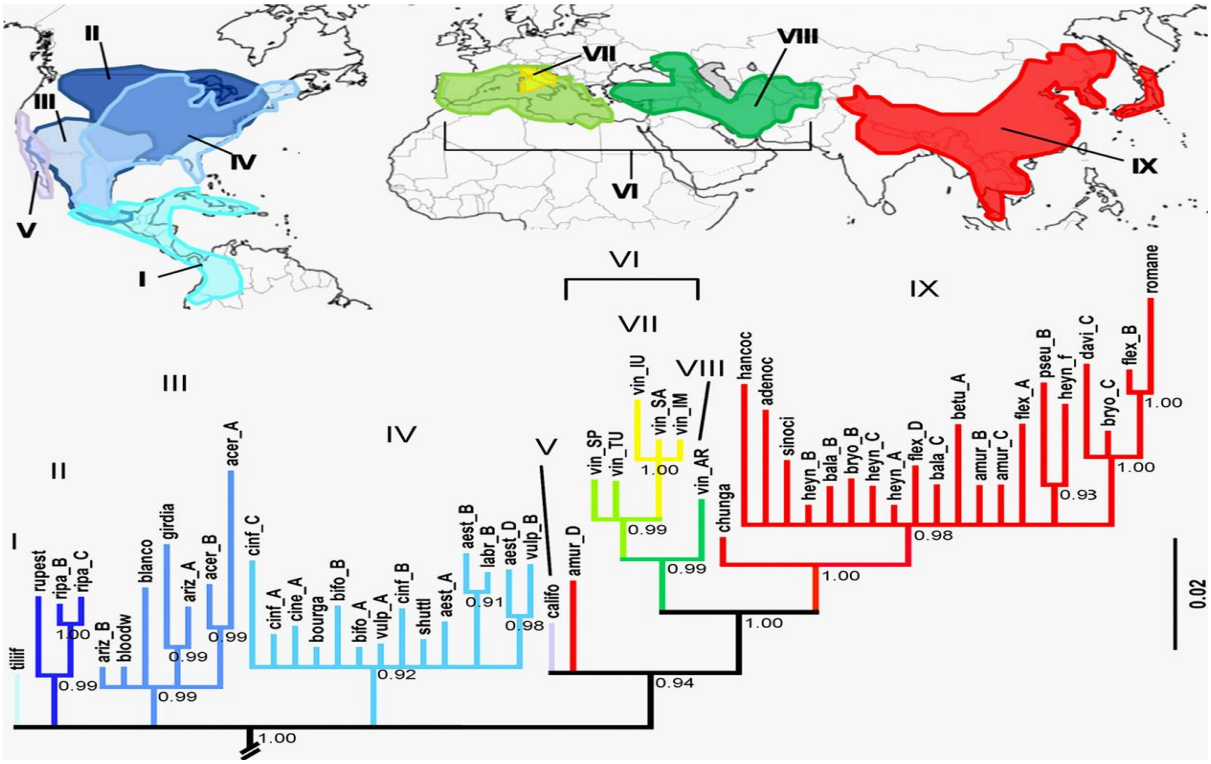

Figure 1. Phylogeny and geographic distribution of wild grapes (subg. Vitis). Blue tones=American species; red = Asian species; dark green=Caucasian wild grapevine; light green=Mediterranean wild grapevines (except Italian accessions); yellow=Italian wild grapevines.

Wild grapes show a marked geographic disjunction between the 34 American species (including subgroup *Muscadinia*), the 37 Asian species and the rare European–Middle Asian wild grapevine (*V. vinifera* subsp. *sylvestris*) which is believed to be the living ancestor of modern grapevine cultivars (This *et al.*, 2006). Asian grape species have two or more scientific names since scientists described the same species at different times, not recognizing that they were dealing with a species that had already been identified. For example, these species had been first named *Spinovitis davidii in 1881 and were later named Vitis davidii in 1886.* However, the latter is mainly used to refer the species as it is well described. To clarify the situation, it is important to prepare a list of primary scientific names of Asian wild grapes and their synonyms (Zecca *et al.*, 2012; Table 1).

Geographic isolation is the only factor that could lead to reproductive isolation between species within subgenus Vitus. Ecological and phenological barriers such as preferences for markedly different habitats or shifted flowering time, are the most probable causes for promoting and maintaining isolation between sympatric species. The old world grapes were grouped into two main sister clades. The largest one (IX in

Fig. 1) includes all Asian accessions except one individual of *Vitis amurensis* (amur-D); the smallest one (VI in Fig. 1) encompasses only *Vitis vinifera* subsp. *sylvestris* accessions. In the Asian clade, *Vitis chunganensis*, a species from south-eastern China, was found to be sister to the remaining species. Due to its strong moisture and heat tolerance, *Vitis chunganensis* might represent a preferential source of environmental stress resistance genes for grapevine cultivars. The Armenian wild grapevine specimen (VIII in Fig. 1) was found to be the oldest lineage of *Vitis vinifera* subspecies *sylvestris* (Wan *et al.*, 2008).

Table 1: Some of the annotated species of Asian wild grapes by morphological traits (Li et al., 2009; Wan et al., 2008; Fengqin et al., 1996)

Species Name	***Synonyms***
Vitis davidii	*Spinovitis davidii, Vitis armata, Vitis prunisapida*
Vitis romanetii	*Vitis rutilans*
Vitis balanseana	*Vitis flexuosa* var. *gaudichaudii*
Vitis betulifolia	*Vitis tricholada, Vitis hexamera, Vitis shimenensis*
Vitis piasezkii	*Parthenocissus sinensis, Vitis piasezkii*. var. *baroniana, Vitis tiubaensis*
Vitis pilosonerva	*Vitis davidii* var. *brachytricha*.
Vitis wilsonae	*Vitis reticulate, Vitis marchandii, Vitis flexuosa*
Vitis hancockii	*Vitis fagifolia, Vitis wentsaiana*
Vitis tsoii	*Vitis embergeri*
Vitis flexuosa	*Vitis wallichii, Vitis purani, Vitis parvifolia, Vitis vulpina* L.var. *parvifolia, Vitis flexuosa*
Vitis amurensis	*Vitis vinifera* L. var. *amurensis, Vitis amurensis* var. *genuine, Vitis thunbergii*
Vitis yeshanensis	*Vitis amurensis* var. *yanshanensis*
Vitis pentagona	*Vitis heyneana, Vitis lanata, Vitis ficifolia* var. *pentagona, Vitis kelungensis, Vitis coignetiae*
Vitis heyneana subsp. *ficifolia*	*Vitis ficifolia, Vitis thunbergii, Vitis labrusca* L. var. *ficifolia*
Vitis retordii	*Vitis lanata*
Vitis bellula var. *pubigera.*	*Vitis pentagona* var. *bellula* *Vitis quinquangularis* var. *bellula*
Vitis sinocinerea	*Vitis thunbergii* var. *cinerea* *Vitis thunbergii* var. *taiwaniana* *Vitis thunbergii* var. *adstricta*
Vitis bryoniaefolia	*Vitis adstricta, Vitis flexuosa* var. *mairei, Vitis thunbergii* var. *adstricta, Vitis novisinensis, Vitis thunbergii* var. *mairei, Vitis bryoniaefolia* var. *multilobata*
Vitis bryoniaefolia var. *ternate*	*Vitis adstricta* var. *ternate*
Vitis lanceolatifoliosa.	*Vitis piasezkii* var. *angustata*

Common Asian Vitis Species: Vitis amurensis (Amur Grape)

Phenology:

Vitis amurensis species commonly known as "Amur Grape" is native to the Asian continent, including parts of Siberia, China, Russia and Korea (Xiong and Zhang 2007). It is a kind of woody liana and is dioecious with light green, blunt and alternate simple leaves, rough leaf surface with soft, velvety white stinging hairs on the back and saw-toothed leaf margin (Fig. 2; Peng *et al.,* 2000). *Vitis amurensis* has high drought resistance; for example, the water efficiencies of spring, summer and autumn are 1.635, 1.174 and 4.347 mmol CO_2 $mmol^{-1}$ H_2O, respectively (Zhuang, 2008).

Figure 2: Vitis amurensis Species

Vitis amurensis has an extensive root system, which enables it to grow on lands of different soil types. However, it grows much better when planted in rich organic, ventilated and permeable soils. It gives maximum yields of high-quality berries when planted in sandy soils with a pH value of 6-7 (Song *et al.*, 2009). *Vitis amurensis* is more cold stress resistance than other species of the genus Vitis and can safely survive long, cold winters. Its branches have a relatively lower respiratory intensity with a lower active metabolism and longer dormancy compared with that of *V. vinifera* and *Vitis labrusca* (Peng *et al.*, 2000). *Vitis amurensis* is also resistant to fungus-caused grapevine diseases such as grape white rot, grape anthracnose, grape bitter rot and downy mildew (Xie, 2007).

Cultivation

Due to lack of hermaphrodite flowers, it is difficult to grow *Vitis amurensis* commercially in other countries such as Russia, Korea, Japan, Yugoslavia and the Czech Republic. It is known that only China has the hermaphrodite flower germplasm resource (Song *et al.,* 2009). Since the 1960s, studies on genetic resources of *Vitis amurensis* have been intensively carried out in China (Song *et al.,* 2002). In 1963, a survey of wild *Vitis amurensis* resources was evaluated botanical, biological and cytological characteristics of *Vitis amurensis* and it analysed the specie's genetics and resistance to adverse environments and pathogens. In this survey, a hermaphrodite flower cultivar 'Shuang Qing' was found (Song *et al.,* 1996), the discovery of which contributed to major developments in the viticulture and breeding of *V. amurensis*. Successful delivery of this cultivar led to the use of pollinisers in commercial production and considerably enhanced the productive potential of *V. amurensis*. In nearly 50 years, more than 380 vines of wild *Vitis amurensis* germplasm with different traits of flowers (hermaphrodite flower, female flower, male flower and some types between male and female flower) and leaves, cluster shapes and sugar contents have been collected and preserved (Shen *et al.,* 2006).

By the middle of the 1980s, another female flower cultivar, *'*Zuo Shan 1*',* was released and the next generation called 'Zuo Shan 2' was successfully selected from the wild *Vitis amurensis* resources. Since then, these two cultivars have been extensively cultivated in northeast China and greatly promoted the development of the *Vitis amurensis* industry. Using hermaphrodite flower genotypes as female parents and *'*Shuang Qing' as male parents for intraspecific crossing, research institutions in China achieved a number of elite cultivars containing bisexual flowers such as *'*Shuang Feng', *'*Shuang You' and 'Shuang Hong'. Breeding by interspecific crossing and backcrossing with *Vitis vinifera* cultivars such as 'Muller', 'Merlot', 'White Riesling', 'Cabernet Sauvignon' and 'Chenin Blanc', resulted in the production of numerous novel cultivars such as *'*Bei Chun', 'Bei Hong', 'Bei Mei', etc. Some cultivars such as 'Gong Zhu Bai' came from crossing between *Vitis amurensis* and *Vitis labrusca* (Song *et al.,* 2002). In China, *Vitis amurensis* is cultivated mostly in northeast areas, but Luo *et al.* (2009) reported that 'Shuang Hong' and 'Shuang You' can live through the winter without burying in the Gobi regions of western China, which have the worst environment for the European-Asian grapevine cultivars.

Thirty-eight *Vitis amurensis* hybrids were successfully selected by interspecific crossing of *Vitis amurensis* and *Vitis vinifera* in 2009. These new cultivars have a relative high sugar content (120-160 g/L) and low acid content (9-12 g/L), and can safely survive the cold winters of north China, such as in Heibei Province, without burying, and the extreme cold winters of Heilongjiang, Liaoning and Jilin Provinces by simply winter proofing (Li *et al.,* 2009). Cultivars of *Vitis amurensis* have diverse products for instance, 'Zuo You Hong' cultivar is mainly used for making dry red wine, while 'Shuang Hong' and 'Shuang You' is used for sweet red wine, and 'Bei Bing Hong' for ice wine. So far, China has the largest quantity of the preserved vines and cultivated areas of *Vitis amurensis* in the world (Fang, 2003).

Winemaking:

The main characteristics of *Vitis amurensis* grape vines are high acidity, high tannin and polyphenols, high dry extract and high nutrition; low sugar, low juice yield, and low fermentation temperature. (Li *et al.,* 2009). The average organic acid and sugar contents are 17.5 g/L and 140.6 g/L, respectively (Jie, 2008). Wines of *Vitis amurensis* are high in nutrition and contain abundant minerals such as phosphorus, iron, carotene, vitamin B, vitamin C, natural polyphenols, free amino acids, etc. Large amounts of tannin

and pigments come from the peel of *Vitis amurensis* berries make the wine darker in colour with a strongly astringent taste. A special dry red wine is successfully produced a nice ruby red colour, pleasant sweet flowery and fruity taste, greatly reduced bitterness and astringency (Wang *et al.,* 2008).

There are no major differences between making wine from *Vitis amurensis* and general wine making techniques. The only difference is *Vitis amurensis* needs de-acidification of free run juice before fermentation and then mixing it with pomace for further fermentation due to its high acidity and low sugar content (Lv *et al.,* 2005a). Jiang *et al.* (2008) used four physical and biological methods for de-acidification of wines from *Vitis amurensis*: cryothermal treatment, acid-decreasing yeast, extending the fermentation period and anion exchange high performance liquid chromatography column (HPLC). *Vitis amurensis* grapes have become more popular for making high-quality red wines due to their high nutritional value, unique fruit fragrance and distinctive taste. *Vitis amurensis* wines have a bright ruby red colour, fine fragrant aroma, a mellow and full-bodied taste compared with wines made from *Vitis vinifera* and are high in bioactive substances. To make high-quality dry red wines that do not taste very sour, producers try to reduce the acidity of the grapes and wines by delaying the picking time, girdling in different periods, root restriction, lactic fermentation and low-temperature treatment (Peng *et al.,* 2000).

Low-alcohol and non-alcoholic wines have been introduced in the past several years. More and more consumers, especially women, elderly people, and people who are allergic to alcohol prefer these wine products. These wines have changed the market trend from high-alcohol wines to low-alcohol or no-alcohol wines.However, brewing low-alcohol wine from *Vitis vinifera* grapes coastly because they have relatively high sugar content. *Vitis amurensis* is famous to making low-alcohol wines based on its unique characteristics. Low-alcohol dry red wine with an alcohol content of 8-9%, brilliant ruby red colour and perfect taste has been brewed from *Vitis amurensis* (Lv *et al.,* 2005b). *Vitis amurensis* is also an ideal grape to resist cold and make ice wine. Under rigorous ice-wine making standards, ice wine with a pleasant aroma and fine mouth-feel is made from *Vitis amurensis* (Jin *et al.,* 2004). It is also used for making functional juice, beverage, vinegars honeysuckle wine (Chi and Jiang, 2009) and functional juice beverage with nightshade (Yang *et al.,* 2010).

Assimilates

The main nutrients such as total sugars, vitamin C, pigments and free amino acid increased all the time, while tartaric acid and tannin are decreased (Li *et al.,* 2001). Research by Jiao *et al.* (2004) also confirmed the above results. They used the ^{14}C isotope method to follow the transportation and ration manner of accumulated ^{14}C-assimilates in different parts of *Vitis amurensis* vines and found that the distribution centre of the assimilates was in the leaves from florescence to beginning of veraison and then moved to the fruits. After harvesting, the main branches and roots turned to be the centres due to the backflow of nutrients. Song *et al.*(2009) also reported that, the separation of the progenies from intraspecific and interspecific hybridization (F_1-F_4) of *V. amurensis* trended to a continuous distribution of high acid and low sugar, the more parents with high acid and low sugar characteristics in cross combination, the more single vine with high acid and low sugar characteristics separated, and resulted as a quantitative inheritance controlled by polygene.

Bioactive Compounds:

Leaves, shoots and roots of *Vitis amurensis* have been used in conventional Chinese medicine. These parts of the plant and wines derived from the berries contain abundant bioactive natural substances, such as polyphenols, anti-oxidation and anti-aging capabilities, lower human blood pressure, and prevent cardiovascular disease (Zhang *et al.,* 2007; Gerogiannaki-Christopoulou *et al.,* 2006). Phenolic compounds in grapes are responsible for organoleptic properties of grape berries and wines, such as colour, bitterness, astringency, clarity, stability and aroma. Polyphenols of *Vitis amurensis* can prevent the formation of formazan, inflammation of endothelial cell, reduce hypertension, and also play a protective role in myocardial ischemia and chronic diseases (Zhao *et al.,* 2011; Zhang *et al.,* 2007).

Because of its phenols, tannin, (+) catechin, (-) epicatechin, gallic acid (in the forms of free radical, ester and glycoside), and two phenolic acids (caffeic acid and p-coumaric acid) at very low levels plays as a strong anti-free radical activities (Weidner *et al.,* 2007). Stilbenes and oligostilbenes found in *Vitis amurensis* have the physiological and pharmacological effects of anti-oxidation, anti-inflammatory, antitumor, platelet aggregation and nerve cell apoptosis inhibition, nerve structure protection and blood-lipid metabolism regulation. (Hou *et al.,* 2008; Dopico-Garcia *et al.* 2007). Four oligostilbenes, two resveratrol trimers of amurensins C and D and two resveratrol pentamers of amurensins E and amurensins F, separated from the roots of *Vitis amurensis* are also playing a great role in inhibiting biosynthesis of leukotriene B4 (Huang *et al.,* 2000). Yim *et al.* (2010) found that nine stilbenes polyphenols and oligostilbenes isolated from the leaves and stems of *Vitis amurensis* had the antimicrobial effects on the two oral pathogens, *Streptococcus mutans* and *Streptococcus sanguis*, which are associated with caries and periodontal disease, respectively. These results suggest that natural antimicrobial compounds derived from *Vitis amurensis* may help oral health as plaque-control agents and prevent dental caries and periodontal disease.

By-Products:

Compared to other grapevine species, *Vitis amurensis* have much higher procyanidin /condensed tannin/ and a member of phenolic polymer (Shen *et al.,* 2006). Procyanidin has multiple physiological functions, such anti-oxidation, anti-tumour and protecting vascular endothelial cells, etc. Further studies showed that the average and highest colour units from 116 vines of *Vitis amurensis* were 25.31 and 134, much higher than those of common grapes (Jie, 2008). *Vitis amurensis* berries are used as major materials for producing natural pigments, and anthocyanins extracted from the pomace are used as textile dyeing (Bechtold *et al.,* 2007). During winemaking process, up to 75% of the pomace from *vitis amurensis* may be seeds, are discarded (Zhao, 2008). However, Polyphenols in pomaces and seeds of *Vitis amurensis* have an outstanding anti-aging effect and have 14-20% oil. Maier *et al.* (2009) further reported that grape seed oil is also nontoxic, harmless and meets the required standards of food health and food application.

Vitis heyneana

Vitis heyneana species is endemic to Asia and is found in shrubby or forested areas from sea-level to 3200 meters above. It is known by its two subspecies: *Vitis heyneana* ssp. *Heyneana (*Fig. 3*)* and *Vitis heyneana* ssp. *ficifolia*. The former is called 'wool grape' with oval, ovate-oblong, to ovate-quinqu angular shaped leaves. The second subspecies is called 'mulberry-leaf grape', and its leaves are usually trilobate to cleft (Hei and Wen, 2007; Li *et al.*, 1996).

Figure 3.Vitis heyneana Species

Vitis davidii (Spine Grape)

Spine grape (*Vitis davidii* Foex), also known as Chinese 'bramble grape', belongs to the East Asian *Vitis* spp. As one of the main wild grape species growing in the East Asian region, its shoots are densely covered by spines at 1-2 mm long (Fig. 4), and become thick and hard on one or two-year-old canes. The spine grape is mainly distributed in the Lohsiao and Xuefeng mountain ranges, which are covered by the subtropical rainforest to the south of the Yangtze River (Hui and Wen, 2007; Kong, 2004). Because the spine grapes originate from the humid areas of Southern China, they are resistant to diseases such as spot anthracnose, white rot disease, and anthracnose (Meng *et al.*, 2013).

Varietal aromatic of *Vitis davidii* is one of the most important quality parameters due to their direct influence on important flavour characteristics. The distinctive aroma of spine grape fruits mainly manifests as wild rose, violets and wild strawberries (Noguerol-Pato *et al.*, 2012; Bao, 2010).

Figure 4: Vitis davidii Species

Vitis davidii is excellent tolerant of humid, shaded conditions as well as hot and dry climates. It is also long lived species and gives high yield. It is resistant to scab, anthracnose and other grapevine diseases and insect pests. In Nanjing Sun Yat-sen Botanical Garden of China, *Vitis davidii* has been used as a pollen parent in breeding for different grapevine diseases (Liu *et al.*, 2012; Fengqin *et al.*, 1996).

Vitis flexuosa (Creeping Grape)

Vitis flexuosa is a species of liana in the grape family. It has a very large native range in Asian tropical and temperate climate zones, including East Asia (Taiwan; and the Chinese provinces of Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan,Jiangsu, Jian gxi, Shaanxi, Shandong, Sichuan, Yunnan and Zhejiang; the Japanese prefectures of Hokkaido, Honshu, Kyushu, Shikoku and the Ryukyu Islands; and the Koreas), Indochina (Laos; Thailand; and Vietnam), the Indian Subcontinent (The Indian states of Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Uttar Pradesh and West Bengal); Nepal; and north Pakistan), and Malesia in the Philippines.

Figure 5: Vitis Flexuosa species

Vitis flexuosa has biological characteristics of cane scent young shoot, slender vine, thin and long tendril, small leaf with wide cord-form or near truncate at the base, undulate leaf margin with uneven teeth (Fig. 5). *Vitis flexuosa* has a great sprouting potential, tolerates humid and hot climate, lives long, and is less resistant to scab than *Vitis davidii* and *Vitis adstrica* (Hui and Wen, 2007; Fengqin *et al.*, 1996).

Vitis ficifolia

Vitis ficifolia is a species of liana in the grape family native to the Asian temperate climate zone. The leaves of *Vitis ficifolia* are thick, scabrous, dark green, finely serrated, 11-25 cm long, most with 3 shallow lobes or entire (Fig. 6), and 5 deep lobes at lower part of vines (Chonghuai *et al.*, 2014; Hui and Wen, 2007; Fengqin *et al.*, 1996). *Vitis ficifolia* tolerates a temperature up to -20^{o}C. It is resistantce to scab, powdery and downy mildews. It is also a good high-yield, hardy and disease resistance parent for breeding (Hui and Wen, 2007; Fengqin *et al.*, 1996).

Figure 6: Vitis ficifolia Species

Vitis pentagona

Vitis pentagona has narrow ovate or pentagonal leaves, with or without three obscure lobes. The margin teeth are thin, shallow and obtuse (Fig. 7); It is resistant to scab and can be used as breeding material for disease resistance (Hui and Wen, 2007; Fengqin *et al.*, 1996).

Figure 7: Vitis pentagona species:

Vitis piasezkii

*Vitis piasezkii i*s native to loess plateau of Eastern Gansu province, China, used as a rootstock for wine grapes and table grapes. It has very high cold-resistance as well as good graft compatibility in grafting. Furthermore, it survives through low temperatures in winter without soil coverage and has good fruit quality of the cultivars grafted (Zhang *et al.*, 2009; Zhang *et al.*, 2006).

The young shoot and leaf stalks of *Vitis piasezkii* are covered with brown, puberulent and globular hairs. Almost all shoots sprouted from the canes bear fruit. Leaves are very variable in shape, either simple or compound on the same shoot. It has coarse teethed leaf margin, dark green upper leaf surface, light green with yellowish-brown tomentum lower surface (Fig. 8). It is resistant to fungus disease and besides for eating and wine making it is valuable for breeding (Liu *et al.*, 2012; Wan *et al.*, 2008; Hui and Wen, 2007; Fengqin *et al.*, 1996).

Figure 8: Vitis piasezkii species:

Vitis adstricta

Vitis adstricta is a synonym of *Vitis bryoniifolia* var. *bryoniifolia*. It is slender with ferruginous or pale pubescence young shoots, small leaf, entire and with few obtuse teeth (Fig. 9) and the lower surface is covered with rusty or cane scent pubescence. It is resistant to scab, and can be used as a parent for breeding new cultivars which are of good production and resistant to humid, hot climates and also to diseases (Liu *et al.*, 2012; Hui and Wen, 2007; Fengqin *et al.*, 1996).

Figure 9: Vitis adstricta species

Vitis pseudoreticulata

Vitis pseudoreticulata is Chinese wild grapevine having anti-fungal property under different abiotic stresses especially to *E. necator.* Wild grapevine germplasm resources of *Vitis pseudoreticulata offer* an opportunity to mine novel disease-resistance genes and so accelerate the genetic improvement of our existing *V. vinifera* germplasm resources. It is also of *excellent* resistance *to Powdery mildew* and strongly inhibit the growth of *B. cinerea* (Xu *et al.,* 2014; Wang *et al., 2014;* Weng *et al.,* 2014; He *et al.,* 2013; Xu *et al.,* 2011; Xu *et al.,* 2010).

Figure 10: Vitis pseudoreticulata species

Vitis pseudoreticulata has puberulent young shoots that are changed to glabrous during maturation. The leathery leaf is large, cordiform, cordate-pentagonal or reniform and margin entire with fine teeth. This species is well adapted and tolerant to humid and hot climate; it is useful for breeding new cultivars adapted to the climatic conditions of south China (Hui and Wen, 2007; Fengqin *et al.,* 1996; Fig. 10).

Vitis romanetii

This species is a sturdy woody climber, which grows vigorously. The leaf is large, thick obscurely shallow trilobed or entire, leaf margin is finely teethed; the tip is spiny; the upper surface is dark green, the lower surface is covered with light ferruginous, dense pubescence (Fig. 11) The species tolerates humid and hot climate and resist anthracnose (Liu *et al.,* 2012; Wan *et al.,* 2008; Fengqin *et al.,* 1996).

Figure 11: Vitis romanetii species

Vitis wilsonae

Vitis wilsonae is wild grape in Vitaceae family with heart-shaped (8-15 cm length, 5-10 cm width) leaves and 4-7 cm petiole (Fig. 12). *Vitis wilsonae* is a sun-loving vine, which does not tolerate shade and wet condition, but is resistant to fungus disease (Hui and Wen, 2007; Fengqin *et al.*, 1996).

Figure 12: Vitis wilsonae species

Vitis yunnanensis (Yunnan Grape)

Vitis yunnanensis is a species of liana in the grape family. It has small and thin leaf with coarse and large teethed margin. *Vitis yunnanensis* species tolerates drought and cold up to 25^{o}C and is resistant to diseases such as scab, white rot, downy mildew and anthracnose (Wan *et al.*, 2008; Fengqin *et al.*, 1996). There are also other Asian *Vitis* species including *Vitis mengziensis* (Mengzi Grape), *Vitis ruyuanensis* (Ruyuan Grape), *Vitis tsoii, Vitis adenoclada, Vitis balansana, Vitis barbata, Vitis betulifolia, Vitis chunganensis, Vitis chungii* (Fujian Jianxi Grape), *Vitis coignetiae* (Crimson Glory Vine), *Vitis fengqinensis* (Feng king Grape), *Vitis hui* (Mount Lushan Grape), *Vitis menghaiensis, Vitis silvestrii* (Hubei Grape), *Vitis sinocinerea* (Small-Leaved Grape) and *Vitis Wuhanensis* (Wuhan grape).

Conclusion

European and American grapevines are not well tolerant to different diseases and environmental stresses. Therefore, the Asian wild *Vitis* have captured scientists' attention in vine-wine industry as they have high yield potential, best quality and can withstand various environmental stresses.

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Assessment of Environmental Security from the Standpoint of Threat to National Security: The Case of Ethiopia

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Abstract

Different researches have revealed that Ethiopia has a number of environmentally-related problems that threaten national security. The country loses up to 2-6 percent of annual crop production due to climate uncertainties, with drought being the main national environmental challenge. Ethiopia has a high country risk index of 7.38, one of the highest in Eastern Africa, which underlies a high level of potential risk for conflict, both within the country as well as in the region. Again, Ethiopia has an environmental score of 7.67 which is a high risk level. Generally speaking, therefore, Ethiopia is identified as a hot spot for environmental concern. The main objective of this article is to present and discuss evidence of conditions of local environmental insecurity against the background of international experiences. This is with a view to justifying whether the country should consider or not the environment as a priority in its national security policy making and strategic planning. The article recommends reappraisal of existing environmental laws to take serious cognizance of environmental security as a major component of national security. The government is called to pay greater commitment and determination by establishing environmental security departments in the Ministry of Foreign Affairs, Ministry of Environment, Forest and Climate change, Ministry of Defense, and Ministry of federal affairs as well create common working platform among these ministries to provide intelligence and better readiness to combat any perceived threats emanating from the environment.

Key Words: Environmental Security, National Security, Institutions, Conflict, Policy

Introduction

The post-cold-war era brought new security challenges to the globe. The traditional state-centric and military-based approach to national security was no longer adequate because not only had it become redundant, albeit temporarily, but also it could not address emerging national, regional and international security threats. New global conditions like increasing population, industrialization, and globalization spurring greater economic, social and political interaction between and among nations and, thereby,

inducing new transnational threats such as environmental degradation, droughts, floods, diseases, ethnic violence, have given rise to the need to redefine security (Mathews, 1989). In response, scholars and politicians in the 1980s proposed a new thought on security called 'Modern View'. For example, Ullman (1983) discussed the concept of extended security that includes non-military threats comprising a range of policy options that directly or indirectly impact the quality of life for the national community.

Likewise, Mathews (1989) endorsed broadening the definition of security to include resources, environmental and demographic issues.

To date in security studies, there are two dominant schools of thought: traditional view and modern view. Traditional view, also referred to as a state centric view, focuses on the concept of the military in relation to the protection of the state. This view considers the nation-state as a reference object of security and the purpose is to summon military and economic power to safeguard the state, interests, as well as institutions and values. Although this view still dictates national security strategy of many countries, it has been criticized as narrow and too orthodoxy, that is blind to emerging national, regional and international security challenges. Conversely, the modern view recognizes that the stability and safety of a nation is shaped by multi-dimensional factors (UNDP, 1994). This school of thought, also known as the human-centered, takes the individuals as the primary reference object and concentrates on how best to protect them (Hough, 2004). It deepens security from nation-state to society to individual and widens it to include non-military threats. It further considers the role of not only countries but also other players, NGOS, and multinational entities. The major drawback of this view is the fact that it incorporates many issues and, as a result, sorting between ordinary developmental agenda and national security agenda is not easy. Nevertheless, different, but related thoughts on this view of security, namely, common security, global security, international security now exist (Korany, 2010).

It is within the framework of human-security that the concept of environmental security has gotten its greatest significance. Myers (1993) equates security with human well-being not only to protection from harm and injury, but also access to water, food, shelter, health and employment.

Three areas of importance of the interaction between the environment and security can be identified. First, scarcity of environmental resources could cause conflict: an overuse of and/or depletion of resources could have serious negative social, economic and political consequences with a potential to ultimately lead to instability. Second, uneven distribution of environmental resources could trigger tensions and violence: unless there is fair distribution of profitable resources such as oil, minerals, timber, and water these resources might end up becoming sources of curse rather than a blessing. Third, reducing and controlling environmental damage from military conflict is important too: this entails environmental impact assessment and remedial measures that need to be in place during armed conflicts, arms production and military maintenance operations.

In the modern Ethiopia history, the period when strong central government has been established under the era of Emperor Minilik II, following the fuel wood crises, one of the first state concerns towards an environment in Ethiopia came to the stage. At the time, both the Emperor and officials became increasingly convinced the need to protect the forest resources of the country. In effect, the then Ministry of Agriculture, which was established in 1908, mandated to play environmental role too. Accordingly, three major responsibilities were given to the ministry: promoting good farming practices and increasing agriculture and livestock production, disaster monitoring and prevention and environmental protection.

The underlying cause for increased environmental concern and specifically forest resources could be, as might be guessed, is economical and environmental concern (Dessalegn, 2001).

Dessalegn (2001) described the environmental paradigm in the era of Emperor Hailesilassie, who is the successor of Emperor Minilik II, as frontier economics. This paradigm which was dominant in many other countries until 1960s too, considers nature as an infinite supply of resources and to be exploited by human and having limitless potential to sink wastes. Under the era the major reason to protect natural resources like forest and other wildlife was to raise government income. Thus, using the support of UNESCO and expatriate staff, several national parks and game reserves were formed in the second half of 1960s and early 1970s. The other major area of concern in the mid-1960s was forest protection when a series of forest legislations were issued by government. The legislation puts all forests except those owned by individuals under state control. Such endeavors experienced a lot of challenges from the farming community. Furthermore, the era was characterized by limited environmental awareness by policy makers.

However, after the mid 1960's the emergence of pollution and biodiversity loss were the driving forces which weakened the frontier economics paradigm and replaced by deep ecology, a paradigm that make a compromise between development and environmental protection. In the last quarter of 1970s encouraged by donors environmental management tools like EIA (Environmental Impact Assessment) were emerged though not practiced (Dessalegn, 2001).

In the communist regime, Derge, which follows the preceding emperors, the environmental thought was both a mixture of frontiers economics and environmental conservation paradigms. Nonetheless, the conservation policy was the dominant one, which used a top down approach and characterized by construction of physical structures using food for work (FFW) program. Desalegn(2001) described two varieties of environmentalism in this era: state environmentalism and Peasant farmer environmentalism. Through state environmentalism, the government is the owner of the resources, choose the appropriate technology and transfer to the population which is unilateral excluding farmers and finally undemocratic. Therefore, such approach was in a contest with farmers' environmentalism and faced many resistances. One the other hand, the major governments' program in the era: collectivization, villagisation, and resettlement were also posed serious challenges for the realization of such state environmentalism as the programs were in many cases were degrading the nature causing massive deforestation and soil erosion. Furthermore, such programs were not backed by legislation and relying on mass mobilization and forced labor campaigns.

As explicitly expounded above, the different regimes in Ethiopia in the past had never considered environment as a threat to national security. However, environmental problems have become more intense and more important across years in Ethiopia, as the country repeatedly and with great magnitude threatened harshly by environmental perils. Studies show Ethiopia experiences a loss 2 to 6% of annual crop production due to climate instability (GTP I, 2010). The country's location in the Horn of Africa makes it vulnerable to regional desertification with vast amounts of land lost annually as a consequence. An average of 400 ton fertile soil per hectare is lost every year (FDRE, 2003). The pastoral culture present in many border areas like the Somali region with its insatiable dependence on water and lush grazing land as a means of livelihood is both causal as well as a casualty to drought and famine.

According to Giessen(2011) Ethiopia is a hot spot for environmental concern. Some of the regions like the Ogaden, the Nile, Gilgel-Gibe Dams and the Bale Mountains eco-region are highly conflict-prone

Therefore, the purpose of this article is to assess how the current Ethiopian government treats the environment as well as to contribute to the discussion by asking, 'Does Ethiopia has to consider environmental security as one of its major priorities in national security policy and strategy? The objective of this article is to review the current security situation in the light of the imperative need for Ethiopia to reform and strengthen its national security by incorporating environmental security in its overall security policy.

Study Area

Ethiopia is the second most populous country in Africa next to Nigeria, with an annual growth rate of more than 2%. According to UNDP(2015), the Ethiopian population estimated to reach 100,658,562 as of January 2016; it is also expected to have more than 120 million people by 2030. It is a multi-ethnic country as well as Christianity and Islam live side by side peacefully. Ethiopia is among one of the world's lowest urbanized countries, only 17 % of the population live in urban areas and of which a half lives in the country's capital Addis Ababa (CRGE, 2012).

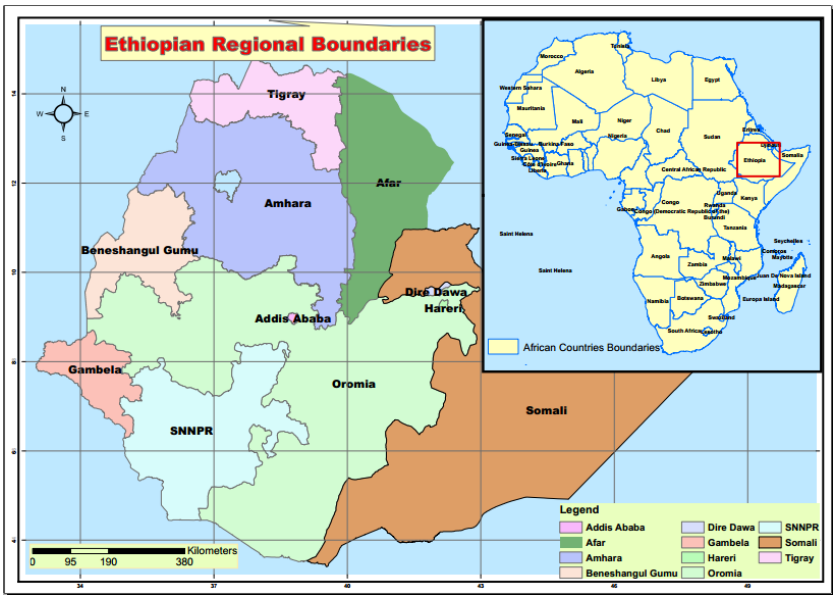

Figure1. Location map of the study area Source: DIVA-GIS and Ethio-GIS

Research Method

The research used key informants as primary data sources while review of secondary literatures was the secondary data source. Key informants, who are senior professionals in areas related to environmental policy and security, were purposively contacted from the major stakeholder of this research, including the Ministry of Environment, Forest and Climate change, the Ministry of Foreign Affairs and the Ministry of Federal affairs; and semi-structured interview method was employed as data collection tool. Review of the literature was performed under two categories. First experiences showing how countries as well as international institutions considered environmental security in their national security policy and institutional arrangements were organized and disclosed. Second, various studies which were conducted in national (Ethiopia) and regional (Horn of Africa) context that displayed the past, present and forthcoming threats of environmental insecurity were rigorously described. Finally, both information from key informants and literature review were put together and synthesized to achieve the research objective.

Result and Discussion

Environment under EPRDF

Constitution and Environmental Policy

Ethiopia is repeatedly threatened on a massive scale by environmental problems viz., soil erosion(with associated land degradation), drought, deforestation, and floods. To this end the nation has spelt it out clearly in the constitution, policy and development documents the concern about the environment. Article 44 of the FDRE Constitution addresses the protection of the environment and declares citizen's right to a clean and healthy environment. Since 1994, the country has taken important steps through the enactment of environmental rights under the constitution, the adoption of the Environmental Policy and Conservation Strategy of Ethiopia, the ratification of multilateral environmental conventions, and the establishment of the Environmental Protection Authority (EPA, 2004).

The pillars of national security policy of Ethiopia are good governance, poverty reduction and fostering democracy (FANSPS, 2002). The policy document described globalization as one of the foundations underpinning national security, and actually associates globalization with global warming and trans-boundary rivers. It further details out climate change adaptation and mitigation of greenhouse gases.

The most important step in setting up the legal framework for the environment in Ethiopia has been the establishment of the Environmental Protection Authority (EPA) by Proclamation No. 9/1995 (EPA, 2004). The EPA has the powers and duties to prepare environmental protection policy and laws and implement them, to prepare directives and systems necessary for evaluating the impact of social and economic development projects on the environment, and to follow up and supervise their implementation (GISW, 2010).

The Environmental Policy of Ethiopia, 1997 constitutes eleven-sector and eleven cross-sector policy elements. Its overall policy goal is "to improve and enhance the health and quality of life of all Ethiopians, and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole, so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs" (EPA, 2004).

The sector policies include soil conservation, genetics, species & biodiversity, water resources, energy resources, mineral resources, control of hazardous materials and pollution from industrial waste, atmospheric pollution and climate change, cultural & natural heritage, forest & woodland, human settlement & urban environment. The cross-sector policies are population, community participation, gender, environmental research, environmental education, environmental information system, environmental economics, environmental impact assessment, land use, tenure & access (Miskir, 2008).

The Growth and Transformation Plan

In 2010, the Ethiopian government has endorsed Growth and Transformation Plan (GTP I) as major national development working document. Accordingly, the document states the environment was considered as one of the cardinal issues determining the country's future, stating "climate change decisively influences sustainable development, the need for the development of green economy as well as the strong enforcement of the already formulated environmental laws and regulations" (GTP I, 2010).

Following the ending period of the first GTP document, the government of Ethiopia endorsed GTP II, which will cover 2015/16-2019/20 (GTP II, 2015). GTP II has set its objectives as the realization of the country's visions becoming a lower middle income country by 2025. The Plan, which has nine pillar strategies, described "building climate resilient green economy "as one of the priorities. The document listed out the major activities or sectors: adaptation to climate change and mitigation of greenhouses gases, protection of forests for their economic and ecosystem services, expanding of electricity generation from renewable sources etc.

The plan has put its strategic directions: enabling the community to actively involve in environmental protection in general and forest development in particular, promoting mixed farming, implementing climate resilient green economy strategy at all administrative levels; and embarking on environmental protection and forest development.

Climate Resilient Green Economy (CRGE)

Even though Ethiopia is yet one of the least developed countries, as a responsible member of the world, designed green economy development path avoiding the conventional development path, which was pollutant wherever else in the globe. CRGE (2012) unveils "Ethiopia's ambition to become a "green economy front-runner" is an expression of its potential for and belief in a sustainable model of growth". The CRGE development path is designed to be well assimilated with the national development goals and objectives namely the GTP II. The underlying reason for why the country opted for such developmental path is associated with the fact that the country has already experienced the adverse effects of climate change: increased temperature and a change in rainfall pattern; and furthermore climate change presents

the obligation and opportunity to shift to anew sustainable development model. The document stressed that the country should follow a sustainable developmental path against the conventional developmental path.

The green economy plan is based on four pillars: enhancing crop and livestock productivity while reducing emissions, development of forest resources for economic and ecosystem purposes as carbon stock, tapping electricity generation from renewable sources and promoting energy efficient technologies in transport, industry and buildings.

The initiative chosen sectorial approach and identified more than 60 initiatives which enable the government to achieve the national development goals while limiting emission rate at 250 Mt CO_2 by the year 2030.To realize such initiatives, the government has called the international community to support it like the climate finance schemes, bilateral and multilateral development partners as well as private sectors too.The CRGE initiative also outlines the structure of a permanent institutional setup to drive implementation, and to promote the participation of a broad set of stakeholders (Ibid)

Gaps of the main governmental institution in regard to Environment

The Ministry of Environment, Forest and Climate Change

By proclamation No.916/2015, which defines the powers and duties of the executive organs of the federal democratic republic of Ethiopia, the Ethiopian government established the ministry of environment, forest and climate change. The proclamation offered the newly established ministry sixteen major powers and duties and with especial connection to environmental security the mandate includes setting out favorable condition that promotes social, economic and environmental justice, formulation of environmental safety policies and laws on the production, importation, management and utilization of hazardous substances or wastes, propose incentives or disincentives to discourage practices that may hamper the sustainable use of natural resources or the prevention of environmental degradation or pollution, have paramount importance to focus on among the sixteen areas (FNGFDRE, 2015).

The ministry set its vision: to realize a county, by the year 2017, that attained middle income and green economy, which is not vulnerable to climate change, via securing sustainable environment and forest management, development of these resources and utilization. The objective that emanates from the vision is focused mainly on forest sector development and management. This is manifested through addressing the forest sector in separate while it treats the rest of the environment as a whole.

The Ministry being the primary executive governmental organization with regard to the environment, the technical unit exclusive of the support unit is organized into two major sub sectors that are accountable to the minister: forest and environment and climate change; each of the sub sectors comprised of four major directorates and that in turn each of them embraces directorates. It also encompasses two other technical departments that are directly accountable to the minister. With especial interest in relation to

environmental policy the directorate of study and research on policy, law and standards is one of the two such directorates; and one of its primary tasks is to discern new and emerging issues and problems of environment and forest with collaboration with the stakeholders. As forwarded by key informants, also this explicitly indicates the level of concern and practical measures the government issued policy issues, as it organizing it as a separate organizational entity. Moreover, as key informants assert too, furthermore, it manifests the stance of the government the need to research and incorporate new and contemporary environmental policy issues as well as its recognition of the progressive and dynamicity of environmental policies.

Despite, the new reorganization of the Ministry could be praised in many ways; yet, with regard to dealing with environmental security, based on the key informants' response, the Ministry does not have a permanent organizational working setup to work closely with major stakeholders such as the ministry of foreign affairs, the ministry of federal affairs and the ministry of defense. In the absence of such common platform, it is very unlikely to address cross sectorial issues of environmental security.

The Ministry of Federal Affairs and the Ministry of Foreign Affairs

The Ministry of Federal Affairs, which analyzes conflict from multi sources, is another major governmental executive organ to be considered with regard to environmental security. The directorate general of conflict prevention and resolution mandated different tasks in line with addressing the consequences of environmental insecurity. Conducting of conflict survey and analysis and providing recommendations for decision making and early warning at all levels is vital to be mentioned. The Ministry listed out its stakeholders including pastoralist societies, citizen, development partners among others; whereas, it overlooked the ministry of environment, forest and climate change. This explicitly implies the focus of the Ministry in dealing with conflicts emanating from environment is inclined to managing the conflict of pastoralist societies. Thus, conflicts induced in non-pastoralist communities that take the predominant share in the country in relation to environmental insecurity not only underestimated but also could be totally unnoticed.

The Ministry of Foreign Affairs, being one of the pertinent governmental bodies dealing with national security, is the other institution included in the study. With respect to environmental security, it established directorate general for Boundary and Trans Boundary. The directorate general besides dealing with other trans boundary issues, it engaged in analyzing and securing the country's interest on its trans boundary resources. In this regard the major focus has been the fair and the just utilization of its major trans boundary river: the Blue Nile. Though, the lion share of the Ministry's tasks are inherently external issues, and environmental security is not an exception, and it allocated the department accordingly; still, unless it meticulously work together with the major stakeholders such as the Ministry of Environment, Forest and Climate Change and the Ministry of Defense, it possibly will not be sufficiently deal with trans boundary resource issues as the sustainable and effective management of natural resources should consider all the stakeholders that often spans for large area. Key informants, both from the Ministry of the Federal Affairs and the Ministry of Foreign Affairs in agreement with the key informants from the Ministry of Environment, Forest and Climate Change confirmed the lack of common and permanent platforms for such ministries to address environmental security. Therefore, it is clear that such institutions are engaged in environmental security issues separately; and they overlooked

the urgent need of having not only coordinated and focused but also permanent and long standing working environment that ultimately end up un tackling environmental insecurity.

Environmental Perils Facing Ethiopia

Country Risk Assessment Report

A Country Indicator for Foreign Policy (CIFP) of assessing Country Risk in the regional context released a report in the year 2002 (Caroline and Sonja, 2002). The report revealed an indicator-based assessment of conflict risk in sub-Saharan Africa from the cross analysis of nine interrelated issue areas identified as underlying potential for conflict development: history of armed conflict, governance and political instability, militarization, population heterogeneity, demographic stress, economic performance, human development, environmental stress and international linkages. Risk indices register on a scale of 0 to 12 where 0 to 3.4 are considered low risk, 3.5 to 6.4 are considered medium risk, 6.5 to 9.4 are considered high risk, and 9.5 to 12 considered very high risk. In general terms, the factors that contribute to conflict escalation are categorized as "structural factors", "accelerators" and "triggers". Structural factors or "root causes" are those factors that form the preconditions of crisis situations such as systematic political exclusion, shifts in demographic balance, entrenched economic inequities, economic decline and ecological deterioration; "Accelerators" or "precipitators" are factors that work upon root causes in order to increase their level of significance and "Triggers" are sudden events that act as catalysts igniting a crisis or conflict such as the assassination of a leader, election fraud or a political scandal.

Country	**Total score**	**Level of risk**
Djibouti	5.75	Medium risk
Eritrea	7.47	High risk
Ethiopia	7.38	High risk
Somalia	5.43	Medium risk
Sudan	6.98	High risk
Kenya	6.18	Medium risk

Table 1. Country Risk Assessment for some East African countries

As shown in Table 1, East Africa is highly susceptible to conflict and in particular countries such as Ethiopia, Eritrea and Sudan have got high risk ratings. On the other hand, other important parameters called environmental score, which composed of three sub indicators: rate of deforestation, people per square kilometer of arable land, and fresh water resources unveils similar scenario. The following table revealed the environmental stress output forEast African countries.

Country	**Environmental Score**	**Level of risk**

Djibouti	6.00 (using one indicator only)	Medium risk
Eritrea	8.00	High risk
Ethiopia	7.67	High risk
Somalia	7.5 (using two indicators only)	High risk
Sudan	5.33	Medium risk

Table 2. Country Risk Assessment for some East African countries (for environmental stress indicator).

As shown in table 2 except Sudan and Djibouti, all the countries are facing a high risk using the environmental score indicator. Generally the above tables indicated that EastAfrican region as a whole including Ethiopia is facing a high risk of conflict.

Conclusion and Recommendation

With a higher country risk index value of 7.38, which is the highest in Eastern Africa, Ethiopia faces a high level of risk for conflict as a country. Likewise, the country's environmental score of 7.67 is a high risk level and Ethiopia is identified as a hot spot for environmental concern.

To date countries such as USA, UK, China; and international institutions: UNEP, NATO, IGAD, and the African Union has paid due attention to the very importance of environmental security as a national or international threat.

Ethiopia is also currently considers the human-angle security school of thought with scant regard for environmental security and it paid due consideration to the development of a green economy. Yet there is a huge gap in terms of strengthening the national security policy with regard to environment as well as establishing of the institutions. That is the pertinent governmental institutions on environmental security work separately and their efforts are uncoordinated; and common working platforms are absent. In this regard, the following recommendations are considered to be critical.

First, the Ethiopian government further should clearly and without ambiguity state on the national security policy the urgency of environmental security as a major national threat to equal status that it endowed to poverty reduction, good governance and democracy.

Second, in all of the major governmental institutions engaging in environmental security: the Ministry of Environment, Forest and Climate Change, the Ministry of Federal Affairs and the Ministry of Foreign Affairs, the organization of directorates and departments working on environmental security should be reconsidered for better strengthening and capacitating them with strong consideration of environmental security as a national threat.

Third, a strong and permanent working institutional linkage that creates a common platform for such institutions is compulsory as well. The Ministry of Environment, Forest and Climate change, and the

Ministry of Federal Affairs should work together creating enduring common governmental structure that replace the so far their sole addressing of environmental security issues.

Fourth, the Ministry of Defense ought to strengthen its attention to the links between security, environment and social pressures. Hence, it requires to devise common working podium with the Ministries of Foreign Affairs, Environment, Forest and Climate Change appreciating enviromental security as a major national security threat.

Furthermore, taking the lesson from china the national defense of Ethiopia must create an organizational capacity, which focuses on studies of the impact of climate change on military operations and to serve as intelligence for future strategic planning.

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