Addis Ababa University
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The Status of Environmental Issues in Selected Agricultural TVET Courses towards Poverty Alleviation and Sustainable Development

By
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THE STATUS OF ENVIRONMENTAL ISSUES IN SELECTED AGRICULTURAL TVET COURSES TOWARDS POVERTY ALLEVIATION AND SUSTAINABLE DEVELOPMENT

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Table of Contents

List of Tables

Lists of Appendices

Acronyms

AET	Agricultural Education and Training
ARDU	Aresi Regional Development Unit
ATVET	Agricultural Technical Vocational Education and Training
CADU	Chilalo Agricultural Development Unit
DAs	Development Agents
FAO	Food and Agriculture Organization of the United Nations
MOARD	Ministry of Agriculture and Rural Development
MoE	Ministry of Education
MoFED	Ministry of Finance and Economic Development
MPP-I	Minimum Package Project I
MPP-II	Minimum Package Project II
OECD	Organization for Economic Cooperation and Development
PADETS	Participatory Demonstration and Training Extension System
PADEP	Peasant Agricultural Development Program
PMAC	Provisional Administrative Council or 'Derg'
SSA	Sub-Saharan Africa
TYPP	Ten-Year Perspective Plan (1984/85-1993/94)
WADU	Wolayta Agricultural Development Unit

Abstracts

The purpose of the study was to assess whether the courses of Agricultural Technical Vocational Education and Training (ATVET) colleges included environmental issues such as land degradation, deforestation and depletion of biodiversity. In order to assess the courses, data were gathered through curriculum analysis, questionnaires, interviews and, classrooms and sites observations. Three curriculum guides were selected with sampling techniques from the three departments that were included in the research. Three colleges were selected among the twenty-five existing ATVET colleges. From the three colleges 53 instructors and 334 trainees were participated. The data obtained through the various instruments were analyzed both quantitatively and qualitatively. The findings showed that the courses are addressing environmental issues especially land degradation. The teaching methods that are included in the courses are appropriate to achieve the objectives included in the curriculum. However, it was dominated by lecturing. The finding also showed that there is a statistically significant mean difference between the achievement test scores of male (M=56.60, SD=12.655) and female (M=49.24, SD=12.747), $t(332)=4.227$, $p\angle 0.05$. But there is no statistically significant mean difference among colleges and departments in their level of awareness about natural resources management. The finding also indicated that the trainees' moral, capacity and courage to work in rural areas were not satisfactory. And there is no appropriate criterion to select candidates for ATVET colleges. The ATVET colleges are not well furnished and equipped to give adequate services to the trainees. Based on the findings, the researcher recommends that: future curriculum revision might include clearly stated objectives, teaching and evaluation techniques that are related to environmental education; focus should be given to training of teachers on how to teach environmental issues; select candidates based on knowledge and competences; and allocate enough spaces for demonstration sites of the colleges.

Chapter One

Introduction

1.1 Background

The majority of developing countries depend on subsistence agriculture by tilling lands with traditional farming system. The continuing exploitation of the life supporting system accelerates to satisfy the increasing demand for foods, fuel and grazing. The whole process exacerbated with increasing population growth to the further expansion of cultivable land to more ecologically fragile areas. The unsustainable utilization of natural resources coupled with natural disasters such as drought and famine hinder the capacity of the human occupant to fulfill the basic necessities of life such as food, cloth and shelter. Scholars such as Huijsman and Savenije (1991) concluded that countries found in the Third World regions fall in the trap of poverty. And to change their situation they further exploit the environment.

To change the conditions in Third World countries varieties of solutions proposed since the 1950s. Almost all the development theories that were forwarded, though followed different approach, they are the same in their underlying assumption about development. They assumed that people of the Third World countries are backward and agrarian which need to be modernized and urbanized (Shakoori, 2001). One of the lines of action that was proposed was to modernize the agricultural sector and increase productivity through land augmenting technologies such as fertilizers and pre and post harvest pesticides. To realize this, host of cadres that are capable to transfer the modern technologies to the vast majority of rural people has envisioned. The adopting of land augmenting technologies will increase productivity and halt spatial expansion of farming practices into ecological fragile areas. However introducing farm

technologies necessitate the creation of favorable socio-economic conditions so that no one in the society especially the poor are excluded from the benefit of modernization.

According to reviewed literatures written on Ethiopia, modern agriculture was introduced in the 1950s with the establishment of agricultural training institutions in Alemaya, Ambo and Jimma. In addition to these comprehensive 'adaptive' projects were implemented in different regions of the country in the hope that could serve as a basis for a wider application of the lesson learnt from these projects (Berhanu et al., 2006 & Goshu, 1994). However, modern extension was not started until the end of the 1960s. In general it can be said with confidence that extension was a much neglected issue during the Imperial Era though some success was scored in commercial farming. Extension program during the Derg regime (1974-1991) suffered from ideological problems, successive drought, war, and budget constraint. Like the extension programs in the Imperial era, the extension programs that were introduced during the Derg regime were exclusive (Muluneh, 2003). They favor cooperative at the expense of small landholders. Moreover, the various programs such as villagization and resettlements have resulted in adverse effect on the country's environment and economy.

The existing reality that manifests in the country is a real testimony for the failure of development programs that were followed for the past five decades. Today, Ethiopia is one of the poorest countries that are found in Sub-Saharan Africa. The majority of the population lives in rural area making subsistence farming its main stay. The life of the people is characterized by recurrent famine and drought. According to Aklilu (2001) Ethiopia has suffered for centuries from severe natural resource degradation. And the consequences of this natural resource degradation, as the same author wrote, are decrease in farming production and famine followed by drought. Thus, Aklilu continues, famine has made itself the symbol of the country. The main

reasons for this alarming natural resource degradation, among others, would be over exploitation and improper utilization of the natural resources to meet the need for food, fuel and grazing (Medhin, 2002). Costantinos (1995) adds that the sufferings of the people of Ethiopia are caused by "inappropriate and unsustainable exploitation of life supporting systems which is apparent in the incredible rate of loss of biomass cover, soil erosion, irregularity and lack of precipitation, climatic change and creeping desertification". For a country which depends on rain-feed agriculture and when the majority of the population depends on it the unwise use of natural resources backfired and threatened the very life of the people. Therefore, the main environmental issues in the country at this juncture would be "sustainable land use and food security at national, regional, local and household levels" (Medhin, 2002).

Economically, the country is one of the least-developed nations in the world (MoFED, 2000). Its per capita income is among the lowest of the least-developed countries, and its reliance on agriculture among the highest in the group (MoFED, 2000). According to the Ministry of Education (2005), 85 per cent of the population earns its living from rain fed subsistence agriculture which constitutes 42.1 per cent of the GDP. Ethiopia is the second-most populous country in Sub-Saharan Africa and one of the most impoverished ones (Pact Ethiopia, 2006). 44 per cent of the population lives below the poverty line (MoE, 2005). Poverty in Ethiopia is widespread and multi-faceted (MoFED, 2000). The current demographic and economic growth indicates that it is likely that the trend will continue in the coming decades (Brandt and Otzen, 2004). Therefore, Ethiopia has no option but to depend on agriculture to feed its fast growing rural population. An official strategic document by the MoFED (2006) accepts this tantalizing reality in the following words:

> Agriculture plays a significant and decisive role in the social and economic development of the country. However, owing to natural and man-made causes the country has not properly benefited from its abundant natural resources conducive to agricultural development, and consequently failed to register the desired economic development that would enable its people pull out of the quagmires of poverty (MoFED, 2006, p.67).

According to this same document the "major impediments to agricultural development" among others, are "the predominance of subsistence agriculture;" "adverse climatic changes;" and "failure to use agricultural land according to appropriate land use management plan and resource base." The prime solution to resolve the above-mentioned problems and bring about tenable changes and sustainable development in agriculture is to develop appropriate human resources. Adequate capacity building through the implementation of relevant training programs such as TVET colleges are becoming the main lines of action that are undertaken by the government of Ethiopia. To ensure this, the government established and upgraded 25 Agricultural Technical Vocational Education and Training Colleges that would train candidates for three years (MoFED, 2006).

1.2 Statement of the Problem

Ethiopia has repeatedly undergone through recurrent drought and famine. Unless miracle happens impoverishment will remain the plight of the majority of the people until the second half of the twenty first century. The degraded environment will no longer bear any additional irresponsible action. Aware of this reality the government embarked on producing hosts of development agents who will assist the agricultural sector at local level.

However, the training is suffered from many problems. The most notable one is the low level of knowledge, capacity, morale and interest of the trainees. It is a well known fact that those who

are joining TVET colleges in general and ATVET in particular are low achievers of grade 10 national examination. It could be the last option that may attract those who could not able to continue in their academic streams. That means these institutions are not able to attract motivated and capable individuals.

In addition to this, shortage of teaching staff and demonstration facilities in the colleges do not help trainees to receive practical education (Berhanu et al., 2006). And these authors recommend the "need to evaluate the skills …of the DAs, and the relevance of their training" to solve farmers problems (Berhanu et al., 2006). The purpose of the study was to assess the courses that are given to these development agents in ATVET colleges whether they are designed in such a way that the trainees would get the necessary environmental knowledge and skills that are relevant to the farmers. Therefore, the research was intended to assess whether the main environmental problems such as land degradation addressed in the courses. Especially the impact of land degradation on crop production and productivity and its implications on the country's plan to become self sufficient was addressed.

1.3 General and Specific Objectives

The general objective of the thesis research is to investigate to what extent the courses of the ATVET colleges included environmental issues that would help trainees to acquire the desired knowledge and skills about the environment. The research has the following specific objectives:

a) To examine whether the general and specific objectives of the curricula guides of ATVET courses are addressing environmental issues adequately and helping the country in combating poverty and ensure sustainable growth;

b) To identify whether the teaching methods and evaluation techniques that are included in ATVET courses enhance the trainees knowledge and skills to protect and conserve the environment;

c) To assess whether ATVET colleges have the necessary physical facilities and demonstration sites that augment the trainees' environmental awareness; and

d) To identify the level of environmental awareness between departments in ATVET colleges.

1.4 Basic Research Questions

In addressing the above mentioned objectives, the research attempted to answer the following basic questions:

1. Are the courses designed in line with the objective of the country's economic plan to reduce poverty and ensure sustainable development?
2. Are the crucial environmental problems addressed sufficiently in the courses?
3. Are the teaching methods and evaluation techniques used by the teachers helping trainees to get the necessary knowledge, skills, and to grasp basic concepts?
4. Do the trainees have the necessary traits to work in rural areas? That means do they have the capacity, moral and courage to face hardship?
5. Are there appropriate criteria to select candidates of ATVET colleges?
6. Are ATVET colleges adequately furnished with the necessary physical facilities that could enable them to discharge their responsibilities?
7. Is there any difference among the trainees of the three departments in their level of awareness about the environment?

1.5 Significance of the Study

The prime beneficiaries of the research would be curriculum experts and implementers in the Ministry of Agriculture and Rural Development. The study was conducted at a crucial time when the Ministry is going to conclude the TVET project which was initiated in 2001 and is expected to end in 2009. Before embarking to the next phase it might be paramount to reflect on the weakness and strengths of ATVET program. One of the crucial elements in the program that needs immediate attention is the teaching-learning process in the colleges. Though the research is primarily focuses on Agricultural TVET, the findings could also be applicable to other Technical Vocational Education and Training colleges. As it is mentioned above the research focused on the training of agricultural extension workers. Its application to rural related training and education could, therefore, be immense.

1.6 Delimitation and Limitation of the Study

The assessment of environmental issues in selected agricultural Technical Vocational Education and Training courses' focused on three colleges –Alage, Assela and Holeta. And three departments were selected for the research purpose. These are Natural Resources, Plant Science and Animal Science. From each department three courses were selected using sampling techniques. The colleges selected for the research purpose were based on their proximity to the researcher. The two colleges –Assela and Holeta –are under the Oromia Regional State. The majority of the students are coming from this region. Therefore, there were few trainees who hardly understood the questionnaire which was prepared and administered in Amharic. And the researcher faced difficulties in obtaining materials written on environmental education and training at college level.

Chapter Two

Review of Related Literature

In this section the development theories that have evolved since the end of the Second World War will be presented with particular reference to the developing countries in general and Ethiopia in particular. Since agriculture has been envisioned as one of the pivotal strategy to transform the backward conditions of the developing world, the various agricultural approaches will be discussed in detail. Extension has been one of the most prominent programs of the agricultural sector which sought to transfer western technologies to increase crop productivity to feed rural population and the burgeoning urban dwellers. Thus it is assumed that development theories and agricultural policies and strategies in developing countries intertwined and go hand-in-hand. The current development theory gives emphasis to sustainable use of natural resources. That means environmental issues are at the centre of any development activity including agriculture. The review literature, then, presents broad development theories and their implications on modern agriculture in general and extension service in particular. The last section will present the Ethiopian experience since the 1950s.

2.1 Development Thought: Theoretical Framework

2.1.1 Economic Growth: The 1950s and 1960s Development Approach

According to Sharkoori (2001) in the 1950s and 1960s development was defined as an increase in gross national product and an increase in investment and consumption. According to the same author this assumption is inspired by the experience of developed countries. In the 1960s there was that economic growth would result in the transformation of both traditional societies and the static and retarded economy, and that poverty would be eradicated as a result of the trickle-down

effect (Shakoori, 2001). Todaro (2000) on his part wrote that it was economic growth that dominated the development theory of the 1950s and 1960s. He said that the purpose of economic development is to generate and sustain an annual increase of a country's gross national product. This conception of development was sought to alter "the structure of production and employment so that agriculture's share of both declines and that of the manufacturing and service industries increases. Development strategies have therefore usually focused on rapid industrialization, often at the expense of agriculture and rural development" (Todaro, 2000: p.14).

The idea behind this development perspective did not come out of the bloom. It assumed that there are countries who experienced economic growth by following a certain path that could be treaded by those who lag behind to achieve the same. It "is assumed that some nations have advanced or changed than others, and indeed these nations are often used as model for other, developing, nations to follow" (Oakley and Garforth, 1985, p.1). The widely held assumption was that countries which depended mainly on agricultural production and agricultural employment were backward, and the way to progress lay in industrialization. That means industrialization would provide new inputs such as machinery and fertilizers to increase productivity in agricultural sector (Shakoori, 2001).

Therefore, the idea of development is "largely focused on the new nation states, and tends to assume that what occurred in the West can be repeated elsewhere" (Shakoori, 2001: p.10). For the envisioned growth to take place what characterize the industrial system such as high level of technology, growing specialization and growth in scope and complexity of the major markets for

goods, labor and money should be in place. Moreover associated changes are expected in other institutions to sustain the process of modernization (Shakoori, 2001).

To benefit from modernization necessary changes are expected to occur in agriculture. These includes, among other, "the evolution from subsistence farming to commercial agricultural production, which means specialization in cash crops, the purchase of non-agricultural products in the market and often agricultural wage labor" (Shakoori, 2001: p.13).

According to the modernization theory "the primary cause of mass poverty and economic stagnation in underdeveloped countries is the backward nature of their economies in the field of subsistence production, the use of primitive technology, conservative attitudes, low level of aspiration, an inability to save, a selfish preoccupation with family welfare and parochialism" (Shakoori, 2001: p.18). He thus tailored the corresponding qualities that should characterize a modern person for development to occur: "A modern person is someone who is informed, open to new experiences and willing to try new activities or develop new ways of doing things; … who believes that human beings can conquer nature; … is ambitious and eager to climb the occupational ladder" (Shakoori, 2001: p.14).

And it was believed that rapid economic growth and sustained development cannot take place without the widespread diffusion of these qualities across the population. Adoption and diffusion are the main means by which development occurs in the underdeveloped world (Shakoori, 2001).

In general, in the 1950s and 1960s "development was nearly always seen as an economic phenomenon in which rapid gains in overall and per capita GNP growth would either 'trickle down' to the masses in the form of jobs and other economic opportunities or create the necessary conditions for the wider distribution of the economic and social benefits of growth" (Todaro, 2000: p.14).

However, as we shall see in the following section the fads and fashions of technological packages and programs that were pursued in rural development in the 1950s and 1960s were ended up in failure. To this effect Chamber wrote that the "community development ethos and programmes of the 1950s, and the stress on agricultural extension and the dissemination of innovations of the 1960s, look dated and wrong now, even naïve, with their stress on cultural obstacles to change, on community self-help construction, and on early adopters and laggards" (Chamber, 2006: p.58).

2.1.2 Redistribution with Growth: The 1970s Development Approach

According to Todaro (2000) the development strategy of the 1950s and the 1960s was not successful in bringing about the intended results. Rather "the levels of living of the masses of people remained for the most part unchanged, signaled that something was very wrong with this narrow definition of development" and this forced economist and policy makers to turn their attention to "direct attacks on widespread absolute poverty, increasingly inequitable income distributions, and rising unemployment" (Todaro, 2000: p.14). It "was broadly accepted that application of the development theories of the 1950s and 1960s could not lead to a positive outcome, because as GNP increased, so too did poverty, inequality and underdevelopment" (Shakoori, 2001: p.19).

Thus in the 1970s, "economic development came to be redefined in terms of the reduction or elimination of poverty, inequality, and unemployment within the context of a growing economy" (Todaro, 2000, p.14). The key phrase that summed up the concept of development approach of the 1970s was Redistribution with Growth (Todaro, 2000 & Chambers, 2006). One of the dominant issues during this period was "growth versus equity." In this new strategy, emphasis was put on poverty-oriented policies (Shakoori, 2001). Accordingly, Todaro defines development as "major change in social structure, popular attitudes, and national institutions as well as the acceleration of economic growth, the reduction of inequality, and the eradication of absolute poverty" (Todaro, 2000: p.16).

Thus scholars of the time defined development with particular emphasis on redistribution. Seers (1979) defined development as "a process that involves not only economic growth, but also adequate food and job provision and the reduction of income inequality" (cited in Shakoori, 2001: p.20). Haq (1976) also gave special emphasis to 'what was produced and how it was distributed' than 'how much was produced and how fast' (Shakoori, 2001: pp.20-21). Other scholars emphasized on the equality of life. A strong argument was put forward by Sen who "defined development as the process of enhancing the entitlements and capabilities of people" (Shakoori, 2001: p.21).

Redistribution with Growth was then "targeting the rural poor, asset distribution through land reform was stressed, together with services specially for small farmers" (Chambers, 2006: p.59). To provide these services, new organizations were suggested –'wholly new institutions endowed with ample resources and the best cadres. An agency for Small Farmers would conduct a co-

coordinated programme with a package combining credit, crop extension, crop insurance, and input supplies' (Chenery et al., 1974 cited in Chambers, 2006: p.59).

2.1.3 Structural Adjustment: The 1980s Development Approach

In the 1980s almost all Third World countries fall into unprecedented debt crisis. Thus international bilateral agencies advised these countries to reduce their public expenditure so that they could able to service their debt and divert the meager resource they had for economic growth. Chambers (2006) wrote 'if the 1970s were the decade of equity, the 1980s were the decade of efficiency'. In the 1980s governments especially in Sub-Saharan Africa were become inefficient, corrupt and costly. The solutions introduced in structural adjustment included "devaluation, which raises agricultural incomes from exports, higher domestic prices for agricultural produce, derestricting food grain movement, and deregulation of prices" (Chambers, 2006: p.60). According to FAO (2001) "the developing countries have implemented structural adjustments that have made them reduce public spending on services".

2.1.4 Sustainable Development: The Current Development Approaches

The concept of sustainable development refers to the desire to balance between economic growth and environmental preservation (Todaro, 2000). The widely quoted definition of sustainable development can be read as "meeting the needs of the present generation without compromising the needs of future generations" (Todaro, 2000: p.411).

Economic activities, in one way or another, entail the use of resources. The most important resource that directly used for farming is land. According to Todaro (2000) knowingly or unknowingly "communities may inadvertently destroy or exhaust the resources on which they

depend for survival". He also mentioned that the unwise use of natural resources may exacerbate the poverty, income inequality and compromises the potential for future growth. Then it can be concluded that poverty and environmental degradation are interlocked in "a self-perpetuating process". Environmental degradation slowdowns "the pace of economic development" by reduce the productivity of resources such as soil, water and forest (Todaro, 2000).

According to Todaro (2000), the primary reason that leads to environmental degradation is population pressures on marginal land. The consequences are falling farm productivity and per capita food production. In the following paragraphs issues such as sustainable development and the linkages of environment with population, poverty, economic growth and rural development will be discussed.

There is a widely held assumption that resources are limited and peoples' needs are unlimited. Unless mankind curb its greed and use the existing resources wisely, sooner or later "we may reach a limit to the number of people whose needs can be met by the earth's finite resources" (Todaro, 2000: p.412). This same author explains the interaction of rapid population growth and environmental degradation as follows: "Rapidly growing Third World populations have led to land, water, and fuelwood shortages in rural areas… In many poorest regions of the globe, it is clear that increasing population density has contributed to severe and accelerating degradation of the very resources that these growing populations depend on for survival" (Todaro, 2000: p.412).

However, taking population growth as a problem that would exacerbate low agricultural productivity and rural poverty would not be acceptable without scrutiny. According to Savenije & Huijsman (1991) "there is no reason that increasing man-land ratios must become a cause for

environmental degradation, as long as the productivity of natural resources is developed in line with demographic growth" (Huijsman & Savenije, 1991: p.16). Budelman and Huijsman (1991) acknowledging the complexity of the relationship between population pressure and environmental deterioration, they argued that there is no problem as long as institutional and technological capacity advance faster than population growth.

The productivity of natural resources such as land could be increased through applying farm technologies such as fertilizers, insecticides, pesticides and others natural land augmenting practices. But according to Huijsman and Savenije (1991) in many marginal areas agricultural production has been realized on the basis of expanding the existing farming practices, rather than increasing productivity per unit of land. Thus to meet expanding needs in Third World countries it is necessary to limit excessive population growth, halting environmental devastation, increase the productivity of existing resources further so as to benefit more people (Todaro, 2000). It is imperative to think that if food production is not in excess of the population growth, "per capita levels of production and food self-sufficiency will fall. Ironically, the resulting persistence of poverty would be likely to perpetuate high fertility rates" (Todaro, 2000:: p.412). As result countries may fall into a 'demographic trap', because the "constraints are so great that a demographic transition towards a stabilizing level of population is unlikely to occur before excessive pressure is exerted on the ecological support system" (Budelman & Huijsman, 1991: p.35).

The relationship between poverty and the environment deserve discussion. According to Budelman and Huijsman (1991) poverty and environmental degradation are related phenomena.

Todaro (2000) stated that both environmental destruction and high fertility are the outgrowth of absolute poverty. Budelman and Huijsman (1991) explain the cyclical nature of poverty and environmental degradation saying: "Those affected usually have neither the opportunity and means to stop causing degradation, not the freedom to move elsewhere. And at the heart of the rural poverty problem lies a combination of low agricultural productivity and unfair returns to farm labor" (Budelman and Huijsman, 1991: p.35). These same co-authors identified three factors that help to understand the unfortunate relationship between poverty and environmental degradation:

> (a) even though levels of taxation in rural areas tend to be relatively high, too little of the revenues are reinvested in developing infrastructure in agriculture; (b) nutrients extracted by and transported with crops sold and consumed elsewhere (urban centers and overseas markets) are seldom sufficiently compensated; and (c) research has little to offer farmers in developing countries who depend on rain-fed crop cultivation in terms of sustainable and productive agricultural technology (Budelman & Huijsman, 1991: pp. 35-36).

These authors argued that farmers could not cultivate in a sustainable manner because political and economic circumstances (Budelman and Huijsman, 1991). Therefore, according to Todaro,

> For environmental policies to succeed in developing countries they must first address the issues of landlessness, poverty, and lack of access to institutional resources. Insecure land tenure rights, lack of credit and inputs, and absence of information often prevent the poor from making resource-augmenting investments that would help preserve the environmental assets from which they derive their livelihood. Hence environmental degradation is more often a matter of providing institutional support to the poor than fighting an inevitable process of decay (Todaro, 2000: p.412).

2.2 Agricultural and Rural Development

The agricultural strategies that were pursued since the Second World War were the direct reflection of the development theories that were evolved since then. Todaro (2000) mentioned that there are two kinds of agriculture in the world. They are the highly efficient agriculture of

the developed countries, and the inefficient and low-productive agriculture of developing countries. Thus the whole concept of agricultural development was then the transformation of the inefficient and low-productive of agriculture of developing countries to the highly efficient of agriculture of the developed countries (Todaro, 2000).

The low productive agriculture is characterized by subsistence farming; the use of simple and traditional methods and tools; minimal capital investment; land and labor are the principal factors of production; technological limitations, lack of communication and information, fragmentation of farm plots and uncertainties of variable rainfall (Todaro, 2000). The agriculture of the developing countries is found in subsistence level. In this subsistence level risk and uncertainties are high and a "farmer may be very reluctant to shift from a traditional technology and crop pattern that over the years he has come to know and understand to a new that promises higher yields but may entail greater risks of crop failure" (Todaro, 2000: pp.385-386). The peasant farmers could be unresponsive for new technologies:

> If peasants sometimes appear to be unresponsive or hostile to proposed technical changes, it is probably because the risks are high, the returns to the cultivator are low –for example, because of local custom or land tenure conditions, or because credit facilities and marketing outlets are inadequate and the necessary inputs including knowledge are missing (Griffin cited in Todaro, 2000: p.386)

Thus efforts to minimize risk and remove commercial and institutional obstacles to small-farmer innovation are therefore essential requirements of agricultural and rural development. Until this day the agricultural system in the developing countries is dominated by peasant subsistence and small-scale mixed family farms. Thus large-scale commercial farms will not be a viable alternative of agricultural development strategies in developing countries (Todaro, 2000).

The situation that most developing countries found themselves after decades of development intervention was in "marked contrast to the historical experience of advanced countries" (Todaro, 2000). The widespread poverty, growing inequality and rising unemployment were profound testimonies to the stagnation of economic life in rural areas (Todaro, 2000). The underlying cause for this unfulfilled dream is the misconception that was held by the development proponents of the time. The development thinking was the continuation of colonial mentality that regarded the non industrial countries as backward and underdeveloped. From the very beginning it was assumed that industrialization was considered as the only option to lift up the retarded economy of the Third World countries. Accordingly "the role of agriculture in economic development has been viewed as passive and supportive" (Todaro, 2000: p.364). It has been seen as a source for surplus labor and cheap food producer that fuel the rapid industrial growth (Todaro, 2000).

Though rural and agricultural development did not get the attention they deserve in the 1950s and 1960s, it was understood that the former is dependent on the latter. Then, it was assumed for development took place in third world countries the adoption of Western technologies were preconditions. To increase agricultural output "the emphasis was on liberal capitalist ideology, competition, the free market and private property. Land ownership was highly concentrated in plantations, large-scale farms and large corporate farms" (Shakoori, 2001: p.21). Thus the development approach of rural areas focused on:

> (1) settlement and land colonization schemes that necessarily served political purposes and benefited a small or privileged population; (2) agricultural programmes that emphasized high technology, high yielding crop varieties, extension services, especially for cash crops; and (3) large capital-intensive projects with a technological emphasis" (Shakoori, 2001: p. 22).

The strategy that was adopted during the 1950s and 1960s "failed to alleviate unemployment and poverty or to pass on the benefits of growth to the most backward areas" (Shakoori, 2001). Today development proponents realized that "the agricultural sector in particular and the rural economy in general must play an indispensable part in any overall strategy of economic progress" in developing countries (Todaro, 2000: p.364). According to the same author sustainable development will have to start in the rural areas in general and the agricultural sector in particular (Todaro, 2000). In the 1970s "rural development came to be defined as a comprehensive approach that incorporated but was not restricted to questions of agricultural change and development" (Shakoori, 2001: p.22).

From the foregoing discussion it is possible to make a distinction between rural and agricultural development. According to Shakoori (2001) they are "overlapping concepts".

> However, rural development refers to broader issues and is more specific than agricultural development, in that the former entails much more than the development of agricultural production. Rural development, therefore, is an interdisciplinary approach in which social and political factors interact with economic ones (Shakoori, 2001: p.23).

Though it seems that agriculture is a subset of rural development, it remains at centre of the economic activities of most Third World countries. Even though the development theories over the decades gave particular attention to agriculture, they regarded it as a stage of development that should be transformed based on the experience of developed nations. Different theories were forwarded and varying numbers of agricultural and rural development programmes were proposed and implemented over the decades since the dawn of the development era. The most prominent development approaches were the Green Revolution, Integrated Rural Development and Basic Human Needs. A brief exposition of each presented below.

2.2.1 The Green Revolution

The first two decades of the global development enterprise saw the gradual emergence of what has become known as the Green Revolution. The central ideology behind this 'cherished' development theme was economic growth and the question of technology (Arbab, 2001). According to Todaro (2000) "new agricultural technologies and innovations in farm practices are preconditions for sustained improvements in levels of output and productivity". Agricultural technologies referred in the Green Revolution are land augmenting that improve the quality of existing land by raising yields per hectare. The major scientific advances in agriculture include improved seeds; advanced techniques of irrigation and crop rotation, the increasing use of fertilizers, pesticides, and herbicides; and new development in veterinary and animal nutrition. Unlike heavily mechanized agricultural techniques (like huge combine harvester) these technological inputs, at least in theory, can be "applied equally effectively on large and small farms (Todaro, 2000).

According to Akhter (2006) the Green Revolution was introduced in the name of increased food production, agricultural development, and even as part of rural development strategy. However according to this same author it "was only to change the mode of agricultural production from traditional system to chemical based agriculture. It brought forth the changes in rural infrastructure to suit the needs of the new mode of agricultural production" (Akhter, 20006: p.95).

The Green Revolution involves certain elements as preconditions for the desired change to come. Akhter (2006) identifies three things.

> (1) Learning about technology such as higher yielding variety of seeds and chemical fertilizers through continuous training and imparting of the information; (2) The technologies such as pumps, tractors, seeds, fertilizers had to be acquired and installed; and (3) At the national level, fertilizer factories were set up and seed distribution centers were installed (Akhter, 2006: p.96).

According to Arbab (2001) it was Theodore Schulz (1979) who influenced the direction of the Green Revolution. In one of his work Schulz exposes the inability of traditional mode of agricultural production. According to him while a 'man who farms as his forefathers did cannot produce much food no matter how rich the land or how hard he works,' the 'farmer who has access to and knows how to use what science knows about soils, plants, animals, and machines can produce an abundance of food though the land be poor' (Schulz cited in Arbab, 2001: p.44).

Arbab (2001) summed up the concept of the Green Revolution in the following words:

> The problem with traditional agriculture, then, is not the inefficient use of technology on which it is built –selection of seeds and animal race, fertilizers, ways of fighting pests and so on –but the nature of the technology itself. The basic proposal of the Green Revolution was to transform traditional agriculture through the introduction of new technology, the introduction of modern factors of production" (Arbab, 2001: p.47).

Unlike his predecessors who considered farmers who lack 'modern qualities', Schulz considers the small farmer as knowledgeable, thrift, hard working and profit seeking. And, therefore, a farmer can accept a new technology provided that it is profitable and 'with due allowance for risk and uncertainty' (Schulz cited in Arbab, 2001).

Be it as it may the Green Revolution did not bring the desired result. The main beneficiaries of the Green Revolution were the larger farmers who are clever enough to tape resources to their own advantage. Though production increases in absolute terms the relative increases among the

larger and small farmers worsened the situation of the small farmers and put them in a disadvantaged position. It was realized that the technologies of the Green Revolution were not the problems per se. Rather the institutions and government economic policies that accompany their introduction into the rural economy 'merely serve the needs and vested interests of the wealthy landowners (Todaro, 2000).

2.2.2 The 1970s: Integrated Rural Development and Basic Human Needs Approaches

The technologies that were provided during the Green Revolution were not scale neutral (Todaro, 2000). They were benefiting the wealthy landowners at the expense of the rural poor. The strategy to increase the income of the poor succeeded, it was not possible to improve the living condition of the poor and poverty still persists. Asset redistribution and providing basic necessities to life became the focus of development agenda.

In the 1970s aid agencies especially the World Bank "focused on the dimensions of world poverty, particularly on the very little done in the previous two decades to increase the productivity of subsistence agriculture in poor countries" (Robert L. Ayres cited in Arbab, 2001: p.106). As it was discussed above the Green Revolution increases income at all levels. But according to Ahluwalia and Chenery "the objective of distributive justice is more usefully conceived of as accelerating the development of the poorer groups rather than in terms of relative shares of income" (Chenery et al cited in Arbab, 2001: p.107). Income distribution is concerned with the level and growth of income in lower-income groups. The income of any household is derived from variety of assets such as land, privately owned capital and access to public capital goods. Therefore, much of the variation in income at the lower levels is associated with lack of

"ownership of physical capital and access to complementary assets and other inputs" (Arbab, 2001).

Among the inputs that the poor should get include basic services such as health and education so that their capacities may be increased and in turn their productivity may be enhanced. According to the World Bank "basic services such as health and education, cannot only directly improve the physical well being and quality of the life of the rural poor, but can also indirectly enhance their productivity and their ability to contribute to the national economy" (World Bank, 1975 cited in Shakoori, 2001).

2.3 Agricultural Practices and Environmental Degradation

Agriculture is at centre of economic growth in developing countries. According to Budelman and Huujsman (1991) for agricultural productivity to be enhanced in a sustainable manner the quality of the environment that supports the production process should be maintained. These same authors declare that productivity and conservation of resources, therefore, are two sides of the same coin. They define environmental degradation as "losses in quality of basic resources such as soil, water and vegetation" (Budelman and Huijsman, 1991: p.35).

According to Todaro (2000) some of the reasons for the 'disappointing negative growth of African per capita food production' include:

> insufficient and inappropriate innovation, cultivation of marginal and sensitive lands, severe deforestation and erosion, sporadic civil wars, and misguided (incentive-reducing) pricing and marketing policies –all of which exacerbated by the highest rate of population growth in the world (Todaro, 2000: p.368).

According to Todaro (2000) the "causes and consequences of rural environmental destruction vary greatly by region". Budelman and Huijsman (1991) state that the "observed lack of sustainability in agriculture partly stems from crop production strategies that fail to take into account the specific characteristics of local ecosystems".

The unsustainable farm practices failed to provide enough food. This is due to the unfertile nature of the land that is tilled by the peasants. When farmers failed to "increase the productivity of the land by allowing it to lay fallow or by making on farm investments in irrigation and fertilizer" will result in soil erosion and deforestation (Todaro, 2000).

According to Todaro (2000) soil erosion refers to the blown or washed away of precious topsoil through the agents of wind and water. Deforestation refers to the cutting of wood for fuel and to further cultivate virgin areas. He also mentions that the vast majority of wood cut in the Third World is used as fuel for cooking. Clearing of forests to satisfy the increasing demand of fuel shortage may lead to the "burning of biomass or natural fertilizers, such as manure, which are important on-farm inputs for maintaining crop yield" (Todaro, 2000: p.419).

Table 1: Common Environmental Problems and their Consequences in Developing Countries

Environmental problem	**Effect on Health**	**Effect on productivity**
Soil degradation	reduced nutrition for poor farmers on depleted soils; greater susceptibility to drought	Field productivity losses in range of 0.5% to 1.5% of gross national product (GNP) common on tropical soils; offsite siltation of reservoirs, river-transport channels, and other hydrologic investments
Deforestation	Localized flooding, leading to death and disease	Loss of sustainable logging potential and of erosion prevention, watershed stability, and carbon sequestration provided by forests
Loss of biodiversity	Potential loss of new drugs	Reduction of ecosystem adaptability and loss of genetic resources

Source: Adapted from Todaro (2000), p.416.

2.4 Human Resource Development and Agricultural Extension

2.4.1 Human Resource Development and Agriculture

In the foregoing pages it was possible to set a framework that agriculture is and continue to be Africa's dominant economic activity and higher agricultural productivity is a 'precondition for growth and development in most African countries, and increasing yields is the key to raising incomes in rural areas' (World Bank, 2007: p.XIV).

However, to increase yields per unit of land necessitate a well established agricultural education and training systems. Agricultural education and training (AET) "directly raises agricultural productivity by developing producer capacities and indirectly increases agricultural productivity by generating human capital for support services. Investments in AET clearly enable research, extension, and commercial agriculture to generate higher payoffs" (World Bank, 2007: p.9).

2.4.2 A Brief History of Agricultural Education in Africa

Though post-secondary agricultural education and training was established in Africa since the 1920s (World Bank, 2007 & Green, undated), it was intended to promote the sons of the middle class into public employment. This biased approach has hindered the development of agricultural education in Africa up to the present. However serious agricultural education and training has been put in place since the 1960s. This institutional building continued in the 1970s and 1980s until it declined in the 1990s (World Bank, 2007).

In discussing the historical background of extension service in sub-Saharan Africa Green (undated) writes that though agricultural extension activities in SSA begun in the 1920s, it expanded only after the Second World War. This same author outlines the evolution of extension service as follows:

> Initially most resources were devoted to soil erosion but from the mid-1950s and onwards methods to increase production increased in importance. During the 1950s the institutional principles of delivering extension advice was based on propaganda but in 1960s agricultural extension workers began to apply the so-called diffusion model, which meant that western technologies were delivered to farming communities through extension workers. In several countries parallel work with individual, so called progressive, farmers was introduced during the 1950s (Green, undated: p.3).

As it was mentioned earlier the growth strategies that were employed in the 1950s and 1960s did not improve the conditions of the majority. Rather it worsened in the 1970s. Therefore, it was necessary to change the lines of action of extension activities in the 1980s. Green (undated) describes the conditions in the following words:

> it became increasingly apparent in the 1970s that many community development programs failed to deliver the outcome initially hoped for. The result was a restructuring of extension work in the 1980s to a system whereby the extension

> staff would visit farmers on a more regular basis under a system called Training and Visit (T&V) (Green, undated: p.3).

The T & V approach emphasis on how to promote effective communication with farmers, strengthen linkage between research and extension, and improve extension based on training and visit as its name imply (Goshu, 1994). According to this same author the "central assumption in the T and V system is each front line extension agent passes the extension message to the contact farmer and the contact farmer relays the message to the other farmers known as the follower farmers. But the system does not have a mechanism for checking, whether the real message has reached undistorted the follower farmers or not" (Goshu, 1994: pp.11-12). The Training and Visit "was based on classical management principles that were unlikely to be viable in the developing countries - a lesson that was only fully appreciated in the 1990s and that has since led in part to the current emphasis on participatory management principles" (FAO, 2001).

However, due to the economic crisis of the 1980s the "role of the state is downsized and NGOs and international aid organizations became increasingly responsible for providing extension services to African farmers" (FAO, 2001). As a result a range of parallel extension methodologies were sprouting and participatory development paradigm employed as a dominant problem solving approach (FAO, 2001).

2.4.3 Agricultural Education and Economic Growth

Agricultural growth will be realized through increasing the human resource of a given country. According to the World Bank education is "a necessary, but not sufficient condition for economic development". For education to be effective it necessitates the creation of better

employment opportunities and the abolition of civil conflict, political instability and corruption (World Bank).

After consulting a wide range of literatures the World Bank (2007) states that human capital is a key determinant of economic growth. The World Bank cites an OECD study from 2000, which concludes that "the estimated long-term effect on GDP of one additional year of education in the population aged 15–64 is around 6 percent on average."

Another study with findings relevant for agricultural education in Africa concludes that "tertiary education plays a recognizable role in promoting economic growth", therefore "investing in tertiary education in Africa may accelerate technological diffusion, which would decrease knowledge gaps and help reduce poverty" (World Bank, 2007).

2.4.4 Curricula and Teaching Methods in ATVET

According to the World Bank (2007) in order to effectively implement the extension process it is important to reorient the curricula and modernize the teaching methods. The document states that agricultural innovation requires a cadre of professionals with a new skill and mindset. Agricultural education needs to move away from a mere transfer of information to the development of skills in accessing and applying available information for agricultural problem solving.

In ATVET the focus should be geared towards developing innovative capabilities and create learning opportunities among the different protagonists. According to the World Bank (2007), middle level agricultural training in Sub-Saharan "might emphasize interventions designed to

develop further the innovative capabilities of the region's human capital base. Such efforts would focus on the provision of learning opportunities geared to the specific needs of different actors in the innovation system".

Curricula

In order to improve the contribution of agricultural institutions to national development, their visions should be realigned with national development plan of a given nation. This alignment of institutional visions with the country's development objectives would have a "comparative institutional advantages" in "countries with extreme resource poverty and weak research capabilities such as Ethiopia and Mozambique" (World Bank, 2007: p.47). The content of the curriculum, according to the World Bank, may include farm production, alternative crops, post-harvest technologies, agribusiness, resource management for sustainability, and pertinent soft skills.

According to the World Bank the experience of our country 'displays elements of good practice':

> The revision of curricula for the midlevel training component of the Agricultural Technical and Vocational Education (ATVET) program in Ethiopia displays elements of good practice. Practical training has been strengthened by identifying the most essential skills in the professional courses, defining corresponding qualification standards, and establishing assessment methods (World Bank, 2007: p.48).

According to FAO (2001) "the concept and practice of agricultural education should be redesigned in the developing countries as education for rural development and food security". According to this same document the teaching should also be 'demand responsive' that required reorientation to address new and emerging needs. Hence, curricular reorientation should

incorporate both market-oriented and smallholder agriculture. Students should be exposed directly to farmers' circumstances (FAO, 2001).

Regarding environmental education Kostova and Atasoy (2008) said that the goal is to inculcate the essential knowledge and skills on the part of the trainees. According to them knowledge consists of a system of facts, concepts, laws, relations, the structure and functions of the biosphere and the interaction of society with nature. And skills refer to readiness for activities in protecting nature and for sustaining environmental equilibrium, and to participate in nature conservation activity.

Teaching Methods

The modern "pedagogy emphasizes that the teacher or professor is no longer the 'font of all wisdom' but is rather a facilitator providing students with the inspiration to explore for themselves the ever-expanding oceans of knowledge. The educator's role should be to promote analytical skills, self-esteem, a sense of personal competence, and the capacity to participate in community and national affairs, as well as to build interpersonal trust and satisfaction" (World Bank, 2007: p.50). Though most agricultural institutions do not include training in teaching techniques and use of instructional materials, among others, the Ethiopian case in mentioned as the only exceptional country, "where the higher education system has set up pedagogical resource centers within each university in order to improve the effectiveness of the teaching and learning processes. With technical assistance from the government of the Netherlands, these centers offer workshops to build up teaching skills, professional development through self-paced learning, and instructional equipment for academic staff" (World Bank, 2007: p.50).

And following the World Bank document we can identify three important features that characterize the new teaching method.

- It focuses more on practical training, with emphasis on competencies achieved and not on time spent in class,
- the modes of training shift from time based and lengthy training toward shorter learning modules that add up to some form of certification,
- It required adapting training content to local agro-ecological zones and indigenous knowledge (World Bank, 2007: p.50).

According to Aklilu (2001) teaching strategies play significant role in determining environmental critical thinking. Rao and Reddy (2005) said that "the methods used in environmental education are also those used in other types of instruction. …However, some methods require special adaptation when applied to environmental education, and contain strategies, such as the field trip and community studies are considered essential in environmental teaching" (p.197). Kostova and Atasoy, (2008) declared that successful learning in environmental education is closely related to methods used by the teacher and the learners. According to them successful teaching include: students working in small groups, debating, peer learning, cooperation, project work, problem solving, presentations, and motivation (Kostova and Atasoy, 2008). The teachers` role is to organize, direct, guide, help and support the inquiring cognitive activity of students. It is no longer enough for the teacher to know a lot, to be able to explain in a simple and interesting way, and to have personal charisma. He or she should facilitate and direct learning by stimulating students to ask questions, reacting to their answers, helping them accept challenges and disagreements, discuss contradictions, think critically and offer creative solutions (Kostova and Atasoy, 2008).

According to Rao and Reddy (2005) the teaching methods in environmental education should give great emphasis on learning by doing; focus on inquiry; connect to real life situation and encourage student to discuss freely issues that concern them. These authors recommend that a separate area should be set aside to establish sites to study about the environment and for agricultural use. They also suggest that it is important to provide an outdoor meeting place so that discussions can take place without returning to the classroom.

In order for the teachers to fulfill their duties effectively in teaching environmental issues they should develop certain skills. This could be done by preparing teachers through training. The teachers should be trained in a similar way that they are going to teach the students. Otherwise it would send 'double message' to the teachers and resulted in 'value discontinuity' (Rao and Reddy, 2005). According to these same authors "methodological ambiguity, emotionalism and a uni-disciplinary approach are indeed factors which impede the development of competent environmental education teachers. …This in turn contributes to an effective environmental preservation effort" (p.228). One of the constraints mentioned by these authors to make environmental education relevant to the students is related to the teaching-learning process. "The other constraints stem from the tentative and uncertain final nature of the solution of the problem. It requires moving from the area of definitive answer to many probably with none of the final solution. Teachers that are not trained and accustomed for this kind of situation may feel his/her position threatened" (Rao and Reddy, 2005).

In addition to what is discussed above teaching environmental issues required additional capability on the part of the teachers. According to Lea Filho and O'Loan (1996) the teachers should help their students so that they could enable:

a) to have role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences,
b) to discover the symptoms and real causes of environmental problems.
c) to understand the complexity of environmental problems and the need to develop critical thinking and problem solving skills, and
d) to learn about and from the environment focusing on practical activities and firsthand experience (Filho and O'Loan cited in Damtew, 2007: p.32)

How to maintain trainees' interest in agriculture?

Agriculture is not an attractive and inviting occupation in Africa in general and in Ethiopia in particular. It is rather taken as the "occupation of last resort" (World Bank, 2007). In order to improve the condition the Bank advices to change admission criteria that would allow students to choose agricultural studies, rather than be 'assigned' to them. In addition to this "it may be beneficial to recast agricultural education in more modern and appealing terms" (World Bank, 2007: p.51).

2.4.5 Agricultural Extension: Definition and Concepts

According to modernization theory the causes for the suffering and problems of Third World countries are due to the backwardness of farm techniques. Development theorists of the 1970s forgo the misconception that considers the people of the developing countries as lazy, unmotivated, and irrational. The proponents of this theory attach the problem that the farmers of developing countries are facing to technological backwardness. According to this theory if small farmers are provided with modern technological input they can produce excess that could enable to feed themselves and the burgeoning urban population. Therefore the underlying assumption

behind each technological package is to increase productivity and alleviate poverty. A statement by FAO well clarifies the purpose and rationale of agricultural strategy that was adopted during the 1996 World Food Summit. In this summit

> FAO member countries pledged their dedication to alleviating poverty using every means available. Agricultural and rural extension is one of the means available to help alleviate poverty and improve food security. It promotes the transfer and exchange of information that can be converted into functional knowledge, which is instrumental in helping to develop enterprises that promote productivity and generate income. In addition to technology transfer, agricultural and rural extension is a unique service in that it provides access by small farmers and the rural poor living far from the urban centers to non-formal education and information services (FAO, 2001: p.3).

According to FAO (2001) the long-term solution to world hunger lies in 'helping the poor to produce more and better-quality staple food more efficiently in order to take the first step out of poverty'. This implies the necessity of increasing farm productivity

However increasing agricultural productivity and generating more income do not guarantee food security and poverty alleviation. Institutional and socio-economic factors that tend to exclude individuals and groups from partaking in the development process should be dealt with (FAO, 2001).

Though extension as institution is one of the vehicles for fostering change in agricultural and rural development, its high economic rates of return indicate it has potential to bring about change. The experience of the developed countries proved that knowledge and the rapidity of its transfer and exchange is crucial to economic growth. Thus to improve their economy poor countries should provide the necessary knowledge through extension services. This may necessitate the poor countries to re-examine their extension institutions with a view to reforming

and revitalizing them so that they can provide functional knowledge which is central to economic success (FAO, 2001).

Definition of Extension

Christoplos (undated) defines extension as follows: "it is an institution through which poverty alleviation, environmental sustainability, gender equality and even democratization goals can and should be addressed in a practical and concrete manner".

For Oakley and Garforth (1985) extension "is essentially the means by which new knowledge and ideas are introduced into rural areas in order to bring about change and improve the lives of farmers and their families".

The term extension is derived from university extension (continuing education) and therefore can be applied to various areas of society and development (FAO, 2001). As a knowledge system it comprises research and agricultural education. The agricultural knowledge system "integrates farmers, agricultural educators, researchers and extensionists, enabling them to harness knowledge and information from various sources to improve farming and livelihoods" (FAO, 2001).

In its strict sense the purpose of agricultural extension is to disseminate information to raise the production and profitability of the farmers. In its broader sense, however, the purpose of agricultural extension is to enhance the whole range of agricultural development tasks and to

encourage “the empowerment of farmers in various ways, including participation in program planning and decision-making” (FAO, 2001).

Farmers will be empowered and encouraged to act when they made to realize their situation rather than when they are given ready made solutions. The definition given by Albrecht et al (1989) illuminates this fact:

> It is a process whereby the extension worker tries to motivate his extension partner and to give him the capability with the help of encouragement and ideas to act to solve his acute problems. The people concerned acquire a better insight into the network of problems and recognize the alternative solutions available. They gain from this both the incentive to embark on problem solving and the direction to take (Albrecht et al., 1989).

Christoplos (undated) states that “Extension is communication. In essence, the basis of extension is the two-way flow of information between farmers and those advising them”. The communication does not end in the relationship between the extension workers and farmers. Extension also serves to link “the agricultural vocational and higher education systems in the sense that these systems also produce the agents who work in extension”. In addition it relates to “agricultural research …because the knowledge that agricultural extension transfers is usually generated by agricultural research” (FAO, 2001). Oakley and Garforth (1985) state that “extension is not concerned directly with generating knowledge; that is done in specialized institutions such as agricultural centres, agricultural colleges or engineering departments. Extension takes this knowledge and makes it available to the farm family”.

In the previous discussion it was mentioned that rural development is more comprehensive than agricultural development. This comes from the assumption that the problems that rural dwellers

confronted could not be reduced to agriculture only. In addition it is well understood that all rural dwellers are not engaged in cultivating crops. According to FAO (2001) all rural people are not dependent solely on agriculture or natural resources for their livelihoods. Thus it is important to combine agricultural extension with rural extension goals, to reach everybody.

The diverse nature of rural people suggests that "Extension cannot offer a single 'package' advice, suitable to all farmers. Different groups need to be identified and the agent will have to develop programmes appropriate to each group" (Oakley and Garforth, 1985: p.16). In spite of the fact that rural dwellers are diverse and engage in variety of economic activities it is imperative to restate that since agriculture is "the basis of a rural economy, agricultural extension is the most common type of extension to be found in rural areas" (Oakley and Garforth, 1985: p.21).

2.5 Agricultural Practices and Environmental Degradation in Ethiopia

2.5.1 Background: Country Profile

Ethiopia is found in the North East Africa with the second most populous country in Sub-Saharan Africa. The country has a long history and diverse cultures. It has reasonably good resource potential for development-agriculture, biodiversity, water resources, and minerals. (MoFED, 2002).

Ethiopia has highly diverse topography with elevations ranging dozens of mountains with an altitude over 4600 meters above sea level, to the Afar depression at about 110 meters below sea level. The land area of the country is 1,098,000 sq. kilometers and much of it consists of high plateaus and mountains dissected by a number of streams feeding larger rivers, such as the Nile.

Since the country is located within the tropics, physical conditions and variations in altitude have resulted in a variety of physiography, climate, soil and indigenous vegetation (Ferguson and Romboli, 2004).

The climatic conditions are mainly determined by altitude. The mean temperature in the highlands is 16 C and in the lowland 31 C. There are two rainy seasons, the so called small rains March-April and the main rainy season from June to September. Ethiopia can be divided into three environmental zones; cool zones (Wurch and Dega), temperate (Woyna-Dega) and the hot (Kolla). The cool zone is generally above 2500 meters altitude. March to April are the warmest months and the average daily temperature ranges form close to zero to 16 C. Throughout most months of the year light frost occur at night and the highest altitudes have snow. The temperate zone consists of the lower areas of the plateau, ranging from 1500 to 2500 meters in elevation. The daily average temperature is 16-30 C. The hot zone consists of the Denakil Depression, the eastern Ogaden, the deep tropical valleys of the Blue Nile and Tekeze rivers and the areas along the Kenyan and Sudanese borders. The average annual temperature is about 27 C, but reaches up to 50 C in some areas. The humidity is very high in the tropical areas and daily temperatures vary more widely here than in the other two regions (Ferguson and Romboli, 2004).

Out of the total land size of the country about 73.6 million hectares (66%) is estimated to be potentially suitable for agricultural production. Out of the total land suitable for agriculture, the cultivated land is estimated to be 16.5 million hectares (22%). About 96% of the cultivated land area is under smallholder farming while the remaining is used for commercial farming (both state and privately owned). For over 80% of peasants, the average per capita land holding, including

grazing land is less than 2 hectares. Per capita cultivated land holding averaged around 0.5 hectare. The number is even substantially less in some densely populated high land areas (Voluntary National Report, 2007).

Like any developing countries Ethiopia too depends on subsistence agriculture. Agriculture is the main driver of the economy and is a source of income for the majority of the population. The sector contributes about 50% to total GDP, generates about 90% of export earnings and supplies about 70% of the country's raw material requirement for large and medium sized industries that are agro-based (Voluntary National Report, 2007).

2.5.2 Agricultural Practices since 1950s

In spite of the development efforts that were implemented since the 1950s the agriculture sector did not show substantial change and brought the desired result. The focus that was given to agriculture was minimal. According to Eshetu (2004) between 1961 and 1965 agriculture received only 5 per cent of the total monetary investment. According to the same author the average per capita rate of growth between 1961 and 1973 was less than 4 per cent. For the period from 1974-1990 it was 1.9 per cent.

The main reasons for the slow rate of growth are backward farming practices and archaic land tenure system. The land tenure system discouraged tenants to adopt output-increasing technologies, which in turn result in low agricultural productivity (Eshetu, 2004),

The declaration of 20 December 1974 of the Provisional Military Administrative Council (PMAC) brought under government control those "resources that are either crucial for economic

development or are of such a character that they provide an indispensable service to the community" (cited in Eshetu, 2004: p.100). Among those crucial resources land was the major one and it was distributed to tenants.

The land reform of the Military regime, however, did not bring substantial improvement in the life of the peasants. The land distribution was welcomed by the peasants and "did actually redistribute resources, giving peasant to eat (and to invest), by allowing them to keep those parts of their produce which earlier had to be delivered to landlords" (Pausewang, 1990: p.46). According to this same author the redistribution did not last long and offset when government increased taxes and contributions to satisfy the interest of the urban poor. In spite of this, "in most villages, there was not enough land available for redistribution to the poor who had been granted rights to land." Thus shortage of cultivable land was resolved "by ploughing up some areas of common grazing land" (Pausewang, 1990: p.45).

The Derg regime was characterized by a "drama of alternating fat and lean years" (Eshetu, 2004). It was in 1984/85 that Ethiopia experienced the most horrible famine which claimed the life of so many human beings and resulted in disastrous consequences for the economy and society. Amidst this famine the Worker Party of Ethiopia formulated the Ten-Year Perspective Plan (TYPP) 1984/85-1993/94. The TYPP had the objective of, among others, "accelerating growth of the economy through the expansion of country's productive capacity; conserving, exploring, and developing the natural resources of the country" (Eshetu, 2004: p.104). Agriculture was given top priority followed by industry. The main agricultural strategies, according to Eshetu (2004) were:

(a) the cooperativisation of peasants and the expansion of agricultural extension services;
(b) the expansion of irrigated farming which would permit the attainment of dependable and adequate domestic food supplies and enhance export capabilities;
(c) raising the quality of livestock through expanded veterinary services;
(d) forestry development, soil and water conservation (Eshetu, 2004: p.104).

The TYPP has also other objectives such as attainment of self-sufficiency in food, health coverage for 80% of the population, provide safe drinking water to 46% of the population, providing literacy education to 12 million people, and primary enrollment rate to 66.5% (Eshetu, 2004).

During the TYPP the share of agriculture declined from 52.5 to 43.6 per cent. According to Eshetu (2004) this was not the result of structural transformation that has been historically associated with industrialization.

2.5.3 Agriculture, Environmental Degradation and Poverty in Ethiopia

During the entire period of the Derg regime "agricultural output grew a mere 0.7 per cent, a full 2 per cent below the population growth rate and lower than the growth rate of all other sectors with the exception of construction" (Eshetu, 2004: p.105). The main causes that brought the country to the verge of survival are war, wrong policies such as resettlement and villagization, population growth and environmental degradation.

The prolonged civil war in the northern part of Ethiopia increased military expenditure and cut the share of social services such as health and education. It had also adverse effect on production and the environment. According to Eshetu (2004) "the war sucked up resources that could have served the ends of development; devastated already existing infrastructure of all types; and

robbed the country of thousand of youth. It was without doubt one of the major factors that drove the economy to ruins" (Eshetu, 2004: p.123).

Resettlement from the densely populated and degraded land through long period of cultivation of the northern part of the country to southern and western parts became one of the preoccupied tasks of the Derg regime since it assumed power in the middle of the 1970s. According to Brune (1990) resettlement serves as "the chief means of increasing agricultural production in developing countries". In Ethiopia with the proposal of the World Bank and US-AID to "relieve certain areas" that are found in the northern part of the country, a little more than 100,000 people were resettled in 1979 (Brune, 1990: p.26).

According to Alemneh (1990) the north-south movement of people is not a recent phenomenon. It has been undertaken by voluntary individual initiative since the 18th century though the expansion of Emperor Menelik gave impetus to it. The resettlement schemes during the Derg regime were taken to deal with emergency situation such as recurrent famine. However the resettlement scheme was not fruitful in terms of environmental rehabilitation, both in the northern and settlement areas. It did not ease the situation in the northern part due to three main reasons. First, it did not reduce the amount of human pressure exerted on the land. It is insignificant vis-à-vis the population growth. Second, resettlement has created uncertainty and insecurity among the peasants in northern part and reduces their motivation to undertake conservation activities. Third, it disregards land degradation process through overgrazing (Alemneh, 1990).

Land degradation in settlement areas was devastating. In the first place attention was not given in the selection and implementation of settlement sites especially to soil chemistry, land topography and slop gradient. The use of mechanized equipment in large scale settlements to clear forest indiscriminately removes the top soil or makes it susceptible to rain or wind erosion. The settlers were not willing to adopt the native staple food rather they stick to produce crop that necessitate the clearing of large areas of forest for agriculture. This expansion coupled with the absence of crop rotation has an adverse impact on soil fertility. The settlers have also a habit of cutting trees for many reasons –to construct houses, to make household items and farming equipment, and for fuel (Alemneh, 1990).

The villagization program "whose central aim is to move people into villages in order to provide them with essential services, including social and economic infrastructural facilities" was controversial. Some, including EEC, admit that the programs are "difficult to criticize in principle". It was SIDA who hurled criticism against villagization program. SIDA consider it as "an indefensible disruption of peasant production at a time when Ethiopia was desperately short of food" (Brune, 1990: p.26).

The other major cause for agricultural stagnation and poor economic performance is over population growth. Though it is a debatable issue it is understood that population growth exacerbated underdevelopment. Some argue that population growth decreases per capita farm land and result in low productivity. Still it is not tenable to conclude that "food production declined because of the fact that peasants operate [on] small plots, a phenomenon caused by high population growth" (Markos, 1990: p.160). The same author concluded that population growth

would pose a problem "as long as peasants lack access to technology and investment, increased area productivity cannot cope with population growth. And as long as peasants cannot find alternative employment, expansion of cultivated land cannot keep pace with the number of new families demanding land" (Markos, 1990: p.160). Eshetu (2004) on his part writes that "in this context, whatever economic gains were registered quickly wiped out by the much faster growth rate of population. This demographic dynamics, even if it did not directly cause underdevelopment, certainly exacerbated it and it also rendered the task of breaking out of poverty trap even more formidable than they already were" (Eshetu, 2004: p.123).

Environmental Degradation

According to Muluneh (2003) the natural capital base of the country is highly diversified due to its topographical and geological peculiarities, and its large area. However, the natural resources of the country have been seriously degraded and it started threatening the lives of the people of Ethiopia. Among others, according to the same author, "land degradation, occurring in many forms, is one of the most serious problems facing Ethiopian agriculture, more markedly in the highlands. Reduction in agricultural productivity occurs most severely through soil erosion that are induced by water and associated biological forces" (Muluneh, 2003: p.12). This same author identified two most important forms of environmental degradation in rural Ethiopia: the loss and depletion of soils and biodiversity. The causes of land degradation in Ethiopia could be attributed to physical (natural) characteristics, poor farming practices, overgrazing, high population growth, and unfavorable socio-economic and political policies.

At it is noted Ethiopia is a highland and mountainous country. This, coupled with deforestation, accelerates soil erosion. Moreover, the seasonal and highly concentrated rainfall is highly erosive and is capable to break up soil granules, reduce infiltration and increases runoff. Many of the soils in the highlands are clay loam type, which are susceptible to erosion in the absence of vegetation cover (Muluneh, 2003).

Human actions such as poor farming practices, the use of animal dung and crop residues as fuel, expansion of cultivation by clearing forest, etc contributed to land degradation. The cultivation of small-seed crops such as Tef requires the breaking of the soil now and then. This facilitates soil erosion. In addition to this the peasants in the highlands of Ethiopia are accustomed to rear cattle for multiple purposes. When the number increases leads to shortage of pasture and overgrazing (Muluneh, 2003).

It was also noted that high population growth can inhibit the economic growth of a given nation. It is assumed that high population growth can cause environmental degradation. This will happen when forests are cleared and slopes and marginal lands are cultivated to satisfy the increasing demand that comes as result of increasing population (Muluneh, 2003). In connection to this Daniel (1990) writes how population growth induces pressure on the environment:

> As a result of rural population growth, farm holdings get progressively smaller and production even at subsistence level becomes untenable. Intensification of land use and shortening of fallow periods leads to further deterioration in soil fertility. Ecologically marginal and fragile environments are occupied and farmed. Biomass is removed through land clearing for cultivation, overgrazing, and gathering of woods and shrubs of fuel. Shortage of wood fuel supply leads to the substitution of natural fertilizers, such as crop residues and animal waste, for wood fuel; which in turn leads to further deterioration in soil fertility and low productivity (Daniel, 1990: p.165).

Muluneh (2003) acknowledged that population growth can partly and adversely influence environmental degradation. However, according to the same author, it is possible to reduce environmental degradation through technological changes and by developing a more intensive and conservation oriented farming and environmental recovery schemes.

Regarding inappropriate policies and strategies it was noted earlier how the land tenure system, the resettlement and villagization programs created underdevelopment in Ethiopia. It was discussed how the resettlement and villigization programs brought havoc especially in the newly occupied territories. It was also mentioned how the government tried to favor the urban poor at the expense of the rural ones.

In relation to environmental degradation the poor peasants faced unfavorable conditions in the past two regimes. Farmers had difficulties in obtaining farm augmenting inputs such modern fertilizers to "enhance productivity, but also to make peasants less dependent on over-exploitation of degraded soils and marginal, fragile areas" (Daniel, 1990: p.166). During the last imperial regime agriculture was not get the attention it deserves. During the communist regime, due to budget constraints and ideological problems, agricultural extension remained short of hand (Muluneh, 2003).

2.5.4 Agricultural Education and Training in Ethiopia

As it was noted earlier the end of the Second World War witnesses the beginning of modern agricultural extension service institutes such as the Ambo Agricultural High School (1947), the Jimma Agricultural and Technical School (1952) and the Alemaya College of Agriculture (1956) (Goshu, 1994). In addition to these "some adaptive type of research" who were undertaking

"research on forage crops, farm implements, oil crops and horticulture" were established at the end of the 1960s and at the beginning of the 1970s (Goshu, 1994). The most notable of these projects was the Chilalo Agricultural Development Unit (CADU) which was established in 1967 /renamed later the Aresi Regional Development Unit in the 1980s/. Following the modernization spirit of the time, Ethiopia was attempting to expand commercial farms which showed a substantial increase in agricultural production (Eshetu, 2004).

In spite of the coming of different regimes with varying ideologies, "the extension service in Ethiopia has been focused on improving productivity and production" in line with the focus of government agricultural development programs on improving food security (Berhanu et al., 2006: p.3). According to these authors the focus of extension services on increasing production and productivity in achieving food security was continued until 2002.

According to Berhanu et al. (2006) "agricultural extension service in Ethiopia is said to have started in 1953 with the establishment of the then Imperial Ethiopian College of Agriculture and Mechanical Arts, currently known as Alemaya University". This college had three responsibilities: teaching, research and extension. "The extension mandate of the college included transferring local research outputs and technologies to farmers, and importing technologies and improved practices from abroad and introducing them to farmers" (Berhanu et al., 2006: p.9).

Though the mandate to provide extension given to the then Ministry of Agriculture (MoA) in 1963, the extension service was not very active until 1968 (Muluneh, 2003; Berhanu et al., 2006). According to these authors formal extension program came into being in 1968. They

identified five developmental stages: the Comprehensive Package Approach, Minimum Package Project I (1971-1979), Minimum Package Project II (1980-1985), Peasant Agricultural Development program (1985-1995) and Participatory Demonstration and Training Extension System (since 1995).

All extension programs shared similar characteristics: they were government driven; they were based on donor funding, except PADETS; they benefited the large and wealthy farmers or commercial farmers, with the neglect of smallholders; they gave focus to high potential areas; they were biased towards crop production, particularly cereals; they were top–down and non-participatory; and they were supply driven instead of being demand driven. Almost all the extension packages program used demonstration plots and model farmers to train farmers. The demonstration centers could be managed by development agents or the farmers themselves (Berhanu et al., 2006).

According to Goshu (1994) the then Ministry of Agriculture used different approaches to reach farmer. In the 1960s and 1970s intensive regional agricultural development projects were launched. These included the establishment of Chilalo Agricultural Developemnt Unit (CADU) in 1967, the Walyaita Agricultural Development Unit (WADU) in 1971, and Ada District Development project in 1971 (Berhanu et al., 2006 and Goshu, 1994). The Third Five Year Development Plan (1971–74) had aimed to modernize the Ethiopian agriculture through a comprehensive package approach. It was planned to implement in selected pilot areas and "eventually to be scaled up to cover about 90% of the farming community within 15–20 years time" (Berhau el al., 2006: pp.9-10).

The comprehensive package extension program was not an agricultural extension per se. The package components included, among others, crop and livestock production, rural infrastructure development and technological input supplies such as seeds and fertilizer. Since all of these programs and projects were operational to the specific regions where the projects were located, the vast majority of the country was out of their reach (Berhanu et al., 2006, and Goshu, 1994). Thus it can be said that the comprehensive package "approach did not benefit smallholders, and was too expensive to scale out and up both financially and in terms of manpower requirements" (Berhanu et al., 2006: p.10).

The Minimum Package Project I was the first nationwide extension program designed for the period 1971–1979. It has the objective "to provide smallholders with extension and input supply services" (Berhanu et al., 2006). Goshu (1994) also noted that MPP-I "was mandated for all small farmer-oriented rural development programmes of the country, and therefore all the intensive regional agricultural development projects like CADU, WADU and ADDU were included under" this program. Its major input was fertilizer followed by seeds and pesticides (Goshu, 1994: p.11)). However, it did not give attention to the livestock sector (Berhanu et al., 2006). Though this approach helps to the development and expansion of commercial farms prior to the revolution, the majority of the farmers were not benefited from it, except the model farmers and those who were accessible along the road side (Goshu, 1994).

The Derg regime continued with the MPP-I for four years since it assumed power in 1974. In 1980, the Minimum Package Project II (MPP-II) was developed. It aimed to improve, among others, crop and livestock productivity, enhance soil and water conservation activities, establish

various farmer organizations, and construct rural roads, grain stores and agricultural offices (Berhanu et al., 2006). Goshu (1994) writes that the "model farmers were used as the link for the distribution of technological inputs in MMPI while MPPII used the peasant association" (p.11). The MPP-II did not achieve its objectives due to shortage of extension personnel, and burdening extension agents with activities such as tax collection and organization of co-operatives (Berhanu et al., 2006).

In 1983 the Peasant Agricultural Development Program (PADEP) was launched. It intended to address, among others, input distribution and promote the role of cooperatives in rural development (Goshu, 1994). PADEP used the Training and Visit (T&V) extension approach to improve extension performance (Goshu, 1994, Berhanu et al., 2006). According to Goshu (1994) the T & V system narrowed the communication gap between the farmer and the extension agents. But the training of extension agents were not attractive and the "system was not supported by effective and strong technology-generating network" (Goshu, 1994: p.12). In addition to this because of the ideological basis of the Marxist military regime, most of the extension services and input supply went to the producer's co-operatives, and smallholders were again left out of the development process. It focused on the high potential areas of the country (Berhanu et al., 2006).

The present regime adopted Participatory Demonstration and Training Extension System (PADETS) in 1995. It "aimed at increasing productivity and production of smallholders, empowering farmers to be active participants in the development process, increasing food self-sufficiency, increasing the supply of raw materials for domestic use and export, enhancing the

rehabilitation and conservation of natural resource base, and encouraging farmer organizations" (Berhanu et al., 2006). The program provides "technology packages for wheat, maize, sorghum and *tef* in high rainfall areas. Later, the program …included technology packages for crop production for moisture stress areas, livestock, high value crops, post harvest technology, and agro-forestry, among others". In 2002 the number of participants reached 4.2 million. Accordingly the number of extension agents also increased to 15 thousand in the same year (Berhanu et al., 2006: p.12).

The current extension service is considered as an outgrowth of PADETS and it focuses in "farm households a choice from a menu of technology packages" such as water harvesting, dairy, apiculture, horticultural production etc (Berhanu et al., 2006: p.13).

Challenges and Prospects of the current extension service

The current extension service like its predecessors suffers from many interrelated problems. According to Berhanu et al. (2006) the most pervasive problems that the current extension service is confronted with problems that relate to budget, incentive structure and morale of DAs, and high turnover of same. Agricultural offices at district level are operating with only about 50% of their manpower requirements. The reason for this is either budgetary or the lack of suitable experts to hire (Berhanu et al., 2006).

There are also limitations in the number and capacity of development agents. According to Berhanu et al. (2006) some farmers claimed that they know better than the DAs in agricultural production. This lack of adequate capacity of the development agents was also confirmed by

themselves (Ibid). The low morale and high turnover of development agents is the most grievous problem that faced the extension service. The dissatisfied development agents quit their job to join better paying works. The sad fact is that they do it after they had gained experience in the field (Berhanu et al., 2006). According to the World Bank (2007) progress in agriculture will be much slower if agricultural education and training institutions failed to attract motivated and well prepared students.

The main focus of the current agricultural development strategy is "to produce enough food to ensure self-sufficiency in food production at household level and to support intensification of marketable farm products (both for domestic and export market)" (MoFED, 2006). According to the Ministry of Agriculture and Rural Development (2005) production of "skilled and productive workforce is one of the perquisites for any economic development". This necessitates increasing the number and capacity of the development agents who are capable to help farmers in their respective areas. In order to raise the capacity of development agents the Ministry of Agriculture and Rural Development established Agricultural Technical and Vocational Education and Training (ATVET) colleges. These colleges are considered as a timely and appropriate response to solve the problem of both the number and capacity of development agents (Berhanu et al., 2006). The main objective of ATVET training program is to produce middle level skilled competent motivated agricultural practitioners who would be potential teachers (for the junior level school leavers) and development agents at each farmers training center (MOARD, 2005). Moreover, Farmer Training Centers "are being established to transfer improved agricultural technologies and give adequate services within individual farmers reach" (MoFED, 2006).

ATVET was first introduced in 2000 by the Ministry of Agriculture (now Ministry of Agriculture and Rural Development) in 28 ATVET colleges. In 2001 the number of colleges reduced to 25 (MOARD, 2005). Today there are twenty five ATVET colleges in the country. In 2006 a total of 23,378 students have graduated. It was planned to increase the number to 55,000 by 2008. The training program at ATVETs was planned to give 30% theoretical and 70% practical training to the students (MoFED, 2006).

The training program of ATVET focuses on students who have completed the tenth grade education and existing development agents who are working at grassroot level. The training program is carried out on boarding basis and lasts for three years. The students will be awarded a diploma in five disciplines. The five major areas that offered by the training program include: Animal Science; Animal Health; Plant Science; Natural Resources; and Cooperatives (MOARD, 2005). Among the fields that offered in ATVET colleges that have direct connection to the research purpose of assessing the status of environmental issues in these colleges include Natural Resources, Plant Science and Animal Science (MOARD, 2005).

In spite of the designing and implementing of such an elaborate nationwide project there is a growing dissatisfaction and concern about the practicality of it. According to Berhanu et al. (2006) the ATVET program is suffered from many interacted problems. The most notable of all the problems, among others, include the inability of ATVET colleges to attract motivated and capable candidates; shortage of demonstration facilities; and misappropriate selection criteria. Therefore, it is crucial to study these problems by collecting empirical evidences. Based on reviewed literatures and the research method data collected about the curriculum, the teaching-

learning process, the practicum that is being implemented currently, in all ATVET colleges, the level of awareness of the trainees about their environment, and the physical facilities of the selected colleges.

Chapter Three

Research Methods

The primary objective of this research is to assess the status of environmental issues in the courses of agricultural TVET colleges. Mixed research methodology was employed to achieve this research objective. In order to get an objective state of environmental issues in the courses and generalize the finding, quantitative survey was applied. To achieve this, structured questionnaires was developed. To triangulate the quantitative data, qualitative data collection techniques such as open-ended questionnaires, unstructured observation of the research sites and classrooms, and interviews with teachers was conducted in the three purposely selected ATVET colleges. According to Creswell (2003) it is possible for the investigator to collect "both forms of data at the same time during the study".

3.1 Data Sources

The ATVET colleges currently run a three-year diploma program in five disciplines: (1) Animal Health Department, (2) Animal Science Department, (3) Agricultural Cooperatives Department, (d) Natural Resources Department, and (e) Plant Science Department (MOARD, 2005). Among these three departments were selected purposely. They are Plant Science, Animal Science and Natural Resources Departments. The reasons for the selection of these departments are: because it would not be manageable to study all the courses given in the colleges. In addition to these the courses given in these three departments directly related to the research purpose. Plant science is related to crop production which involves the utilization of land which is the basic environmental element in Ethiopia. Animal science focuses on the management and utilization of animal feed to

overcome overgrazing. The natural resources department focuses on conservation of natural resources.

From the three departments, three courses were selected. The curriculum guides were selected based on cluster sampling. However, the research included only those courses that are given as major subjects in the given department. That means basic courses like English and Mathematics were not included because they are not directly related to the research objectives.

Students and instructors in the above mentioned departments were served as the main sources of data. A curriculum expert was approached and his input was included in the research. Other secondary documents published by the Ministry of Agriculture and Rural Development were consulted. Last but not least the research sites were also served as a source of data. Moreover classroom observations were conducted by the researcher as research techniques to collect data.

3.2 Sampling Techniques

The targets of this study are agricultural TVET colleges that are found in Ethiopia. In Ethiopia, there are 25 TVET colleges. Among these colleges three are selected purposely. The reasons that the researcher decided to employ purposeful sampling in selecting colleges are:

- The colleges have varying experiences. Therefore, it was important to include the experienced and the new ones; and
- For convenience in terms of time, cost and access to transportation to collect the required data sufficiently;

Next, the instructors in the three departments i.e. Plant Science, Animal Science and Natural Resources of the three colleges taken as they are because they are manageable in size. And total of 53 instructors filled and returned the questionnaire. However since the number of students in

the three colleges are 1990 it was necessary to take samples from this population. From the three colleges and the three departments a total of 334 students were selected by systematic sampling techniques according to their proportion.

3.3 Data Collecting Instruments and Procedures

Curriculum analysis, questionnaire, observation, and interview were used to obtain the necessary information from the samples and informants.

Curriculum Analysis

The researcher was planning to take the curriculum as unit of analysis. In each unit of analysis the researcher wants to investigate environmental issues that are included in the courses to enhance the cognitive aspects of the trainees. Therefore, the general and specific objectives stated in the curriculum, teaching methods and evaluation techniques included in the curriculum guides in selected courses were assessed. As Amare (1998) writes in curriculum analysis an "entire article or books can serve as unit of analysis" (p.4). Thus the curriculum guides of the selected courses were taken as they are. Therefore three curriculum guides were assessed to check whether they address environmental issues in their contents.

Three departments were selected for the research purpose from five departments that are currently given in ATVET colleges. These are Natural Resources, Plant Science and Animal Science. In the Natural Resources department 11 major courses are delivered. Plant Science department has 16 and Animal Science has 13 major courses. It is without including the basic and supportive courses that are equally given to all departments. There are 13 basic and

supportive courses (MOARD, 2005). The research does not include these courses. Only major courses are included in the sampling procedures.

Each course has its own curriculum guide. But there is no student text books developed and published at national level. Each instructor is required to prepare a handout for the course he teaches. Therefore the researcher focuses on the curriculum guides of the selected courses. A course is selected from each department by sampling. Accordingly Forest Management Planning is selected from Natural Resources department; Survey and Leveling from Plant Science; Feeds and Applied Animal Nutrition from Animal Science. Each course has its own course objectives; there are general and specific objectives; and there are also recommended contents, training methods and training materials under each unit.

Questionnaires

Data were collected from instructors about the curriculum and the teaching-learning process in ATVET colleges. The questionnaire administered to the instructors consists of three sections. The questionnaire consists of closed ended questions. In the first section they were asked about the curriculum, the method of delivery of courses, and the physical facilities in their respective college. In the second section they were asked about the practicum that is implemented in the program. In the third section they were asked about the qualities ATVET trainees should have to join the colleges. Similarly, to obtain information on students` knowledge and understanding about their environment, both close and open-ended questions administered. The researcher developed a test to measures the level of trainees' awareness about environmental issues. The test contains 20 items. The questionnaire administered to students was translated to Amharic by a

competent and experienced translator and it was reviewed by a graduate TEFL student. And the researcher found it satisfactory to achieve the desired objectives. The researcher also approached three instructors to examine the appropriateness of the test items. All of them agreed that the test items are related to the courses given in ATVET colleges. The instructors also asked whether the test items can measure the environmental awareness of and skills of the trainees. To get their independent view each instructor gave his own estimate of how much could an average trainee could score the test items out of 20. After they have gone thoroughly through the test items, each instructor gave me his estimate. Then I summed up their estimates and divided it by three and the average found to be 73%.

Observation

To enrich the data that was obtained through curriculum analysis and questionnaires two classroom observations were conducted. This was intended to see how teachers deliver the courses to the trainees. The researcher observed the research site and collect detail information as much as possible to further enrich the study. Demonstration sites and students' practice work were observed. Pictures have been taken to substantiate data (see Appendix V).

Interview

To elicit the needed information from instructors and experts who developed and monitor the delivery of the courses, interviews were conducted. Nine instructors that means three from each college was interviewed. The only curriculum expert in the Ministry of Agricultural and Rural Development of ATVET division was interviewed with semi-structured interview.

3.4 Method of Data Analysis

The data collected through the different instruments were analyzed both quantitatively and qualitatively. The data collected from the trainees using questionnaires are analyzed using percentages and descriptive statistics. To identify the mean achievement scores of the trainees based on their sex independent *t* test was employed. The mean achievement test scores of the trainees among the three colleges and three departments were analyzed using one-way ANOVA. The data obtained from the teachers were analyzed using percentage. All the data except that were collected through open-ended questions from the trainees, the curriculum guides, and interviews with teachers and expert, were computed using version 11.0 SPSS for Windows.

Chapter Four

Presentation and Analysis of Data

The Ministry of Agriculture and Rural Development has embarked on training development agents who would shoulder the responsibility of helping the farmers at local levels so that the condition of peasant would be improved and sustainable development set in motion. The Ministry developed profiles for each department prospective graduates from ATVET colleges: Natural Resources Department, Plant Science Department and Animal Science Department.

The graduates of Natural Resources Department are expected to demonstrate capabilities to conserve, develop, and use of natural resources in sustainable manner. A successful completer from this department will be able to, among others, construct the structural and biological soil conservation measures (such as terraces, check dams, and fanyajuu), conserve and manage wild life; and organize training on the construction of soil and water harvesting devices, ponds, irrigation schemes, nursery establishment and management, tree plantation establishment and management (MOARD, 2005).

Graduates from Plant Science Department are expected to understand basic concepts of plant developments, production technologies and their managements, major pests and their controlling methods, post harvest handlings and processing techniques. A successful completer from this department will be able to, among others, perform in the improvement of crop production, productivity and help farmers to use and save their products; establish appropriate demonstration sites to verify and show crop production technologies to farmers; give modular training for

farmers and school dropouts on crop production and protection; and participate in programs of natural resources development, protection and sustainable use (MOARD, 2005).

The graduates of Animal Science Department would demonstrate capabilities on range management, animal nutrition and hygiene, animal health and breeding, and hide and skins. A successful completer from this department will be able to, among others, identify feed resources, produce improved forage, harvest and store feed resources, process feed, formulate ration and feed different classes of livestock; and integrate animal production to fields of agriculture such as natural resources development and crop production (MOARD, 2005).

To achieve these profiles, the Ministry develops curriculum guides for each course. Hence, the objectives developed in the course materials of the selected courses are presented below.

Curriculum Analysis of the Selected Guides of ATVET Courses

Objective Developed in Curricula Guides

The objectives stated in each curriculum guide were discussed based on the general objectives stated by the Ministry of Agriculture and Rural Development above. According to Rao and Reddy (2005) the best way to judge whether a textbook includes environmental issues is "to examine the objective of the book" (p.216). It is based on this understanding that the objectives stated in the curricula guides are analyzed and presented in Table 2 below.

Table 2: Objectives Developed in the Curricula Guides of the Selected Courses

Curriculum Guide of	Total Objectives Developed	Objectives Related of Environmental Issues			
		Knowledge		Skills	
		No	%	No	%
Forest Management & Planning	23	17	73.9	6	26.1
Feeds & Applied Animal Nutrition	33	14	42.4	1	3.0
Surveying and Leveling	24	1	4.2	1	4.2
Total	80	32	40	8	10

In Table 2, the curriculum guide of Forest Management and Planning included objectives that are related to environmental issues. From all the objectives included in the curriculum guide, 73.9% of them are focusing on inculcating knowledge and 26.1% on skills development. Since the entire course is about forest the objectives would address environmental issues. In similar manner, the curriculum guide of Feeds and Applied Animal Nutrition included objectives that are related to the environment. Only 42.4% of the objectives focused on equipping trainees with knowledge while three percent focuses on skills. However, the curriculum guide of Surveying and Leveling has only two objectives –one related to knowledge and the other to skill.

Teaching Methods

To attain the objectives developed on the curricula guides, the right teaching methods should be employed. The method used in any other types of instruction can be used to teach environmental issues with special adaptation (Rao and Reddy, 2005). The appropriate methods to teach environmental issues are working in small groups, cooperation, project work, problem solving, presentations, and motivation (Kostova and Atasoy, 2008). The teaching methods that are included in the curricula guides are analyzed and presented in Table 3 below.

Table 3: Teaching Methods included in the Curricula Guides of the Selected Courses

Teaching Methods	Forest Management & Planning		Surveying & Leveling		Feeds & Applied Animal Nutrition		Total	
	No	%	No	%	No	%	No	%
Lecture	17	43	16	27.6	30	57.7	63	41.7
Class participation	8	19.0	6	10.3	12	23.1	26	17.2
Experience sharing from expert	2	4.7	---	---	---	---	2	1.3
Illustration	7	16.7	5	8.6	--	---	12	8
Demonstration/display	---	---	17	29.3	9	17.3	26	17.2
Group Discussion	---	---	2	3.4	---	---	2	1.3
Field Visit/Practical	7	16.7	12	20.7	---	---	19	12.3
Total	42	100	58	100	51	100	151	100

Table 3 shows that the curriculum guide of Forest Management and Planning consists of 43%, lecturing, class participation made up of 19% and, illustration and practice has 16.7% each. As the Table also indicates, the curriculum guide Surveying and Leveling comprises 27.6% lecture method. Since the course required using instruments, display consists 29.3% and illustration 8.6%. Practice has 20.7%. The curriculum guide of Feed and Applied Animal Nutrition consists of 57.7% lecturing, while discussion and demonstration make up 23.1% and 17.3% respectively. Practice is not mentioned at all.

Evaluation Techniques

In order to assess whether the objectives developed in the curricula materials are achieved, evaluation play a crucial role. According to Kostova and Atasoy, (2008) the trainees' understanding of environmental issues should be measured in their ability to bring solution to real life problems through developing project, planning of activity, making experiments and observations, participating in grass growing and tree-planting. The evaluation techniques that are included in the curricula guides are analyzed and presented in Table 4 below.

Table 4: Evaluation Techniques included in the Curricula Guides of the Selected Courses

Evaluation Techniques	Forest Management & Planning		Surveying & Leveling		Feeds & Applied Animal Nutrition		Total	
	No	%	No	%	No	%	No	%
Class activity (participation)	1	3.0	17	39.5	18	34.6	36	27.9
Assess group assignment	12	35.3	---	---	19	36.5	31	24.0
Assess Individual field report	5	14.7	---	---			5	3.9
Written exam	3	8.8	---	---	5	9.6	8	6.2
Quiz	13	38.2	---	---	---	---	13	10.1
Give homework	---	---	12	27.9	---	---	12	9.3
Observe the trainees while practicing	---	---	14	32.6	10	19.2	24	18.6
	34	100	43	100	52	100	129	100

Table 4 shows that the trainees' of Natural Resources department would be assessed through class participation which comprises 3% while group and individual assignment make up 35.3% and 14.7% respectively. The rest 47% is assigned for written examinations and quiz. The Table also shows that asking questions in the classroom is very important to know whether the trainees' of Plant Science department grasp the content given in the class. It comprises 39.5%. Homework assessment and observation of trainees during practice make up 27.9% and 32.6% respectively. From the Table it is also possible to observe that the trainees in Animal Science Department would be assessed by asking question during lecturing (34.6%); their participation in group discussion comprises 36.5% and fieldwork assessment makes up 19.2%. Written exam consists of 9.6%. The column under total shows that participation comprises 27.9%, assessment of group assignment 24% and followed by practice 18.6%.

In addition to the curriculum analysis, teachers were also asked about the curriculum of ATVET and the teaching learning process. Their response analyzed and presented in Table 5 below.

Table 5: Teachers' Response about the Curriculum and the actual Teaching-Learning Process

Items	Agreement		Neutral		Disagreement	
	No	%	No	%	#	%
T1	44	83.0	2	3.8	7	13.2
T2	37	69.8	6	11.3	10	18.9
T3	43	81.2	7	13.2	3	5.7
T4	46	86.7	4	7.5	3	5.7
T5	40	75.5	5	9.4	8	15.1
T6	39	73.6	6	11.3	8	15.1
T7	35	66.0	9	17.0	9	17.0
T8	22	41.6	4	7.5	27	51.0
T9	12	22.6	9	17.0	32	60.4
T10	45	85.0	3	5.7	5	9.4
T11	11	20.8	11	20.8	31	58.5
T12	38	71.7	6	11.3	9	17.0

T1=The curriculum designed for ATVET is appropriate.
T2=The curriculum designed for ATVET addresses environmental issues.
T3=The curriculum designed for ATVET helps students to acquire problem-solving capacity.
T4=The curriculum of ATVET is designed having the country's national strategy to alleviate poverty.
T5=The method of delivery of courses is appropriate.
T6=The method of delivery of courses helps to meet the objectives stated in the curriculum.
T7=The method of delivery of courses encourages students to participate effectively.
T8=There are adequate demonstration sites in the college.
T9=The physical facilities in the college are well furnished.
T10=The college has adequate qualified teachers/instructors.
T11=The criteria of selecting trainees to ATVET colleges are appropriate.
T12=The courses given in the college enhance the students' awareness about their environment.

According to Table 5, 83% of the instructors believed that the curriculum designed for ATVET colleges is appropriate. 69.8% of them reported that the curriculum addresses environmental issues. But 18.9% of them did not agree with this statement. 81.2% of the instructors agreed that the curriculum helps trainees to acquire problem-solving capacity. While 13.2% of them had neutral option, 5.7% of the instructors did not agree with this same statement. 86.8% of the instructors believed that the curriculum is designed having the country's national strategy to alleviate poverty. 71.7% of the instructors agreed that the courses given in the college enhance students' awareness on the environment. 11.3% of them had neutral position. But 15.1% of them did not accept this statement.

75.5% of the instructors stated that the method of delivery of courses is appropriate. But 15.1% of the instructors did not agree with this same statement. 73.6% of the instructors believed that the method of delivery of courses helps to meet the objectives stated in the curriculum. However, 11.3% said neutral and 13.2% of them did not agree that the method helps to meet the objective stated in the curriculum. 66% of the instructors agreed that the method of delivery of courses encourages students to participate effectively in the teaching-learning process. But 17% had neutral option and another 17% of them did not agree with this same statement.

41.5% of the instructors agreed that there are adequate demonstration site in their colleges. But 51% of them did not agree with this statement. According to 22.6% of the instructors the there is adequate physical facilities in the colleges. Though 17% of them had neutral position, the remaining 60.4% of the instructors did not agree with this statement. 85% of the instructors believed that the colleges have adequate qualified teachers. 5.7% of them had neutral position. But 9.4% of them did not agree with the statement.

20.8% of the instructors believed that the admission criteria of ATVET trainees are appropriate. 20.8% of them said neutral. But 58.5% of them did not agree with this same statement.

Moreover, teachers were asked about the practicum that is currently implemented in ATVET colleges. Their response was analyzed and presented in Table 6 below.

Table 6: Teachers' Response about Practicum which is implemented in ATVET Colleges:

Items	Agreement		Neutral		Disagreement	
	No	%	No	%	No	%
T21	50	94.3	2	3.8	1	1.9
T21	7	13.2	7	13.2	39	73.6
T23	9	17.0	4	7.5	40	75.4
T24	5	9.4	6	11.3	42	79.2
T25	6	11.3	6	11.3	41	77.4
T26	49	92.4	2	3.8	2	3.8
T27	5	9.4	5	9.4	43	81.1

T21= Practice helps students to get skills that would help them in real life.
T22= The practice is too long and unable trainees to get sufficient theoretical knowledge.
T23= The practice is tedious because it requires to travel to rural areas.
T24= The practice is tedious because it requires to write report.
T25= The practice is not practical because it does not help to assess and follow up students' performance objectively.
T26= Practice helps to enhance students' commitment to work in rural areas.
T27= Practice is not economically feasible for countries like Ethiopia and it should be abandoned

94.3% of the instructors agreed that practice helps students to get skills that would help them in real life. 13.2% of the instructors agreed that the practice is too long and unable trainees to get sufficient theoretical knowledge. 13.2% of them had neutral option. But 73.6% of them did not agree with this same statement. 17% of the instructors agreed that the practice is tedious because it requires traveling to rural areas. While 7.5% of them were neutral, 75.4% of them did not agree with this same statement. 9.4% of the instructors agreed that practice is tedious because it requires writing a report. 11.3% of them were neutral. But 79.1% of them did not agree with this statement. 11.4% of the instructors believed that practice is not practical because it does not help to assess and follow up students' performance objectively. 11.3% were neutral. But 77.4% of them did not agree with this same statement. 92.4% of the instructors agreed that practice helps to enhance students' commitment to work in rural areas. 3.8% of them had neutral option. While

another 3.8% of them did not agree with this statement. 9.5% of the instructors agreed that practice is not economically feasible for countries like Ethiopia and it should be abandoned. 9.4% of them had neutral position. But 81.1% of them did not agree with this same statement.

Besides, teachers were asked about the admission criteria that ATVET candidates should have before they join colleges.

Table 7: Teachers' Response on Qualities that the Trainees should have to join ATVET Colleges

Items	Agreement		Neutral		Disagreement	
	No	%	No	%	No	%
T31	47	88.7	0	0	6	11.3
T32	28	52.8	13	24.5	12	22.6
T33	35	66.0	9	17.0	9	17.0
T34	24	45.3	7	13.2	22	41.5
T35	35	66.0	8	15.1	10	18.9

T31= I believe that the trainees need to have strong bases in the sciences.
T32= I believe that trainees should have sound bases in mathematics.
T33= I believe that, more than anything else, the trainees should have the interest to work in rural areas.
T34= I believe that the trainees educational background is appropriate to the training given in the college.
T35= I believe that the trainees should have rural background.

88.7% of the instructors agreed that the trainees need to have strong bases in the sciences. But 11.4% of them did not agree with this same statement. 52.8% of the instructors believed that the trainees should have sound bases in mathematics. 24.5% of them had neutral option. The rest 22.6% of them did not agree with this statement. 66% of the instructors believed that the trainees should have the interest to work in rural areas. 17% of them were neutral. 17% of them did not accept this same statement. 45.3% of the instructors believed that the trainees' educational background is appropriate to the training given in the college. 13.2% of them were neutral. But 41.5% of them did not agree with this same statement. 66% of the instructors agreed that the

trainees should have rural background. 15.1% of them had neutral option. For 18.9% of them the trainees' background does not matter.

The objective of the curriculum, the teaching learning process and all the facilities are to enhance the capabilities of the trainees in various disciplines. To assess whether the objectives stated in the curriculum and the methods employed to achieve them helped the trainees, questionnaires were developed to the trainees and their response analyzed and presented below. In Table 8, 9 and 10 below the response of the trainees to a *Likert-type scale* questions was presented.

Table 8: Trainees' Responses about Poor Farming Practices in Causing of Environmental Degradation by Departments

Items	Rating	Department			Total	
		Natural Resources	Plant Science	Animal Science		
		No	No	No	No	%
Fine tilling of the soil	Low	24	27	17	68	20.4
	Average	38	36	32	106	31.7
	Severe	72	54	34	160	47.9
Practicing of mono-cropping	Low	27	24	16	67	20.1
	Average	49	34	30	113	33.8
	Severe	58	59	37	154	46.1
Shifting cultivation	Low	64	55	39	158	47.3
	Average	49	44	37	130	38.9
	Severe	21	18	7	46	13.8

According to Table 8, fine tilling of soil has low (20.4%), medium (31.7%) and severe (47.9%) impact on the environment. Practice of monocropping has low (20.1%), medium (33.8%), and severe (461%) impact on the environment. And shifting cultivation has low (47.3%), medium (38.9%), and severe (13.8%) impact on the environment.

Table 9: Trainees' Responses about Physical Characteristics in Causing of Environmental Degradation by Departments

Items	Rating	Department			Total	
		Natural Resources	Plant Science	Animal Science		
		No	No	No	No	%
Heavy seasonal rainfall	Low	36	33	24	93	27.8
	Average	66	49	43	158	47.3
	Severe	32	35	16	83	24.9
Nature/type of soil	Low	28	25	19	72	21.6
	Average	80	54	50	184	55.1
	Severe	26	38	14	78	23.4
Topography/terrain	Low	22	15	12	49	14.7
	Average	71	59	48	178	53.3
	Severe	41	43	23	107	32.0

In Table 9, heavy seasonal rainfall has low (27.8%), medium (47.3%) and severe (24.9%) impact on the environment. The nature or type of soil can be a cause of environmental degradation. 21.6% of the students said it is low, 55.1% of them said it is medium and 23.4% of them said it is severe. Topography or terrain has low (14.7%), medium (53.3%), and severe (32%) impact on the environment

Table 10: Trainees' Responses about Demand for Fuel and Socio-Economic Conditions in Causing of Environmental Degradation by Departments

Items	Rating	Department			Total	
		Natural Resources	Plant Science	Animal Science		
		No	No	No	No	%
Shortage of firewood	Low	26	21	70	21.0	26
	Average	37	35	132	39.5	37
	Severe	54	27	132	39.5	54
Burning of animal waste	Low	71	63	44	178	53.3
	Average	35	30	28	93	27.8
	Severe	28	24	11	63	18.9
Use of crop residue for fuel	Low	42	53	31	126	37.7
	Average	47	32	20	99	29.6
	Severe	45	32	31	108	32.3
Deforestation	Low	19	17	9	45	13.5
	Average	30	15	17	62	18.6
	Severe	85	85	57	227	68.0
Poverty	Low	22	21	12	55	16.5
	Average	39	39	20	98	29.3
	Severe	73	57	51	181	54.2

In Table 10, shortage of firewood has low (21%), medium (39.5%) and severe (39.5%) impact on the environment. The use of crop residues for fuel rather than for soil cover has low (37.7%), medium (29.6%), and severe (32.3%) impact on the environment. According to the trainees burning of animal waste has low (53.3%), medium (27.8%), and severe (18.9%) impact on the environment. Deforestation has low (13.5%), medium (18.6%), and severe (68%) impact on the environment. Poverty has low (16.5%), medium (29.3%), and severe (54.2%) impact on the environment

In addition to the Likert-type scale questions, test which contains 20 multiple-choice items were administered to the trainees. The result was computed to hundreds and the result were analyzed and presented in Table 11 below.

Table 11: Level of Trainees' Awareness about their Environment in Relation to a Standard Set (73%) by their Teachers

Colleges	Departments	Total students who took the test	Students who achieved including & above the standard		Students who achieved below the standard	
			No	%	No	%
Alage	Natural Resources	39	4	10.3	35	89.7
	Plant science	46	2	4.3	44	95.7
	Animal science	26	2	7.7	24	92.3
Assela	Natural Resources	57	3	5.3	54	94.7
	Plant science	38	3	7.9	35	92.1
	Animal science	26	0	0	26	100
Holeta	Natural Resources	38	3	7.9	35	92.1
	Plant science	33	1	3	32	97
	Animal science	31	2	6.5	29	93.5
Total		334	20	6%	314	94%

Table 11 shows that 10.3% of the Natural Resources Department students in Alage College got better score in relation to the standard set (73%) by their teachers. And it is followed by Plant Science Department of Assela College and Natural Resources Department of Holeta College where each has 7.9% students above the standard. But from the total students 94% of them scored below 73%. In order to see whether statistical significance among sex, colleges and departments exist the total achievement test score for each student was computed into hundred and further statistical analysis was made.

The analysis made above does not show the differences between sex, departments and colleges. As a result, descriptive statistics, t-test and One-Way ANOVA were employed.

Table 12: Descriptive Statistics for Achievement Test scores by sex

variable	sex	N	Mean	Standard Deviation
Test score	Male	268	56.60	12.655
	Female	66	49.24	12.747

Table 13: T-test for Independent Samples of Sex

variable	t	df	Mean Difference
Test Score	4.227*	332	7.36

*$p\angle 0.05$

Table 12 indicates that there is a mean achievement score difference between male (M=56.60, SD=12.655) and female (M=49.24, SD=12.747) trainees. As it is shown in Table 13 there is a statistically significant mean achievement score difference between male and female trainees, $t(332)=4.227$, $p\angle 0.05$. This agrees with the finding of Aklilu (2001).

Table 14: Descriptive statistics for Mean scores by colleges

College	N	Mean	Standard Deviation
Alage	111	55.77	12.399
Holeta	102	55.59	13.558
Assela	121	54.21	13.086
Total	334	55.15	12.990

Table 14 shows that Alage has got the highest mean score (55.77), followed by Holeta with mean achievement score (55.59) and Assela is the last with mean achievement score (54.21). To check whether there is statistically significant mean achievement score difference between departments, One-way ANOVA is computed for the colleges in Table 15 below.

Table 15: ANOVA Summary for achievement test by colleges

Source of variation	Sum of Squares	Degree of Freedom	Mean Square	F ratio
Between Groups	167.486	2	83.743	0.495*
Within Groups	56025.029	331	169.260	
Total	56192.515	333		

*p>0.05

The ANOVA summary in Table 15 shows that there is no statistically significant mean achievement score difference among colleges, $F(2,331)=0.495$, $p> 0.05$. Therefore, the observed slight mean difference among colleges in Table 14 might be due to high or low scores of trainees.

Table 16: Descriptive statistics for Mean scores by departments

Department	N	Mean	Standard Deviation
Natural Resources	134	56.27	12.783
Animal science	83	54.52	12.750
Plant science	117	54.32	13.405
Total	334	55.15	12.990

Table 16 shows that Natural Resources Department got the highest mean score (56.27) and followed by Animal Science Department with mean score (54.52) and Plant Science Department with mean scores (54.52). The Natural Resources Department has better environmental knowledge than the other two departments. To check whether there is statistically significant mean achievement score difference between the departments, One-way ANOVA is computed for the departments in Table 17 below.

Table 17: ANOVA Summary for achievement test by departments

Source of variation	Sum of Squares	Degree of Freedom	Mean Square	F ratio
Between Groups	282.165	2	141.082	.835*
Within Groups	55910.350	331	168.913	
Total	56192.515	333		

*P> 0.05

The ANOVA summary in Table 17 indicates that there is no significant statistical mean achievement score difference among the departments, $F(2,331)=0.835$, $p>0.05$. Hence, the mean difference that is observed in Table 16 might be due to high or low scores of the trainees.

In addition to the Likert-type scale questions and the multiple-choice test given to the trainees, open ended questions were given to them to measure their problem-solving capacity and their interest in joining ATVET colleges. Their response were analyzed and presented in Table 18 below.

Table 18: Trainees' Responses to Open-ended Questions to measure their Skills of Identifying and Solving Environmental Problems by Departments

Description	Alage N=111	Assela N=121	Holeta N=102	Total N=334	% of the Total
1. Environmental Problems					
-drought	32	22	13	67	20.0
-soil degradation	36	37	43	116	34.7
-deforestation	47	26	41	114	34.1
-water pollution	11	4	16	31	9.3
2. Causes					
-deforestation	38	31	30	99	30
-shortage of rainfall	15	8	12	35	10.5
-soil erosion	9	12	8	29	8.7
-lack of awareness	18	19	14	51	15.3
-weather change	5	6	6	17	5.1
-high population growth	68	59	56	183	54.8
-expansion of agricultural land		3	4	7	2.1
-shortage of firewood	5	3	3	11	3.3
-unwise use of resources	9	1	10	20	6
-over grazing	6		5	11	3.3
3. Consequences					
-desertification	35	23	18	76	22.6
-depletion of plant species		2	6	8	2.4
-decrease in productivity /farm size	45	39	42	126	37.7
-drought and famine will occur	53	56	41	150	45
-livestock may died/migrate	12	6	2	20	6
-Water/air pollution	15	5	15	35	10.5
4. Solutions to environmental Problems					
-reaforestation/planting tree	43	37	32	112	34
-conservation of natural resources	28	13	25	66	20
-construct dams/terraces	6	7	6	19	5.7
-to create awareness among the people	33	16	20	69	20.7
-alternative energy sources	7		2	9	2.7

According to Table 18, the main of environmental problems in Ethiopia that are identified by the trainees are high population growth (54.8), drought (20%), soil degradation (34.1%) and deforestation (34.7%). Deforestation (30%), shortage of rainfall (10.5%) and lack of awareness (15.3) are the three main causes of environmental degradation in the country that are identified by the trainees. The consequences of environmental degradation are desertification (22.6%), decrease in productivity/farm size (37.7%) and water/air pollution (10.5%). Possible measures

that could be take to alleviate environmental problems are reafforestation/planting trees (34%), to create awareness among the people (20.7%), and conservation of natural resources (20%).

Table 19: Trainees' Response to Open-ended Question to Measure their Level of Commitment and Motivation

Description	Alage N=111	Assela N=121	Holeta N=102	Total N=334	% of the Total
1. Reasons to join ATVET					
-to advise farmers on how to utilize their land/resources appropriately	7	11	17	35	10.5
-to develop my country through modern farming methods	16	43	22	81	24.3
-to improve my life	28	17	7	52	15.6
-to eradicate poverty	1	6	5	12	3.6
-b/c I couldn't continue preparatory	15	5	3	23	6.9
-I had experience/interest in agriculture	22	5	18	45	13.5
2. Candidates plan before they join ATVET					
-to complete grade 12 and join university	48	27	43	118	35.3
-to engage in farming, to become merchant, etc	9	7	2	18	5.4
-to join ATVET	14	10	11	35	10.5
3. Trainees' future Plan					
- I want to continue my education if I get the chance	105	97	86	288	86.2
4. The field trainees want to study in future					
-agriculture related field	87	64	73	224	67.1
-other fields	9	8	11	28	8.4
5. The challenges of ATVET graduates					
-there is no challenge	11	9	3	23	6.9
-lack of adequate facilities/inputs	14	15	14	43	12.9
-to be assigned in different position	1	4	2	7	2.1
-farmers are not willing to accept their advices	8	15	14	37	11.1
-they have to travel long distance	5	5	4	14	4.2
-inability to translate the theory in practice	5	7	3	15	4.5

In Table 19, it is possible to see that 24.3% of the trainees are motivated to join ATVET colleges because they have the desire to develop their country by introducing modern farming techniques. However, 35.3% of them had the plan to go to the preparatory and join university. Only 10.5% of them had the plan to join ATVET. When they were asked whether they have the plan to continue further education 86.2% of them answered in affirmative. And 67.1% of them have the

plan to study agriculture (to have degree or more in their respective fields). Only 8.4% of the trainees want to study fields other than agriculture.

12.9% of the trainees identified shortage of facilities or inputs in areas they would be assigned as challenges that ATVET graduates would face. 11.1% of them have pessimistic attitude in that the farmers will not be willing to accept their advices. According to 6.9% of the trainees, there is no challenge.

Discussion

The major environmental problems in Ethioia are land degradation, deforestation and depletion of biodiversity (Aklilu, 2001 and Muluneh, 2003). According to these same authors the causes of environmental degradation are soil erosion, overgrazing, intensive farming, and use of animal dung and crop residues as fuel (Ibid). The consequences of these environmental degradation include reduce nutrition for poor farmers, localized flooding or erosion, decrease in farm productivity and of genetic resources (Todaro, 2000). There is a strong relationship between environmental degradation and poverty. According to Aklilu (2001) "Fall in crop production is perhaps the most visible consequence of land degradation…The relationship between poverty and land degradation is a two-way: the poor being forced to over-exploit their environment and then getting even poorer as the rate of environmental degradation increases" (Aklilu, 2001; p.35)

Therefore, the central developmental issues in Ethiopia are sustainable land use and food security at national, regional, local and household levels (Medhin, 2002). Since the majority of the population lives in rural areas by making subsistence agriculture as its main stay, the remedial to

environmental degradation and acute poverty should mainly focus on the rural party of the country. Hence agricultural development which gives due attention to appropriate land use management becomes the key national strategy to alleviate poverty (MoFED, 2006). According to this document, to achieve the national plan, the country embarked on producing development agents who will assist the farmers at local level by establishing ATVET Colleges that would train candidates for three years in five disciplines.

According to the World Bank (2007), in order to improve the contribution of agricultural institutions to national development, their visions should be realigned with national development aspirations of a given nation. The research tried to assess whether the main environmental issues such as land degradation, deforestation and depletion of biodiversity are addressed in the courses of ATVET colleges. The finding shows that 50% of the objectives of the selected curricula guides treated environmental issues. The objectives are dedicated to understand the concept of forest and range management, developing forage, preparing hay and silage and understanding the concept of contour. These objectives are directly related to soil and water conservation measures.

The World Bank (2007) states that the curricula for the midlevel training of the ATVET program in Ethiopia display elements of good practice. The majority of the instructors believe that the curriculum designed for ATVET colleges is appropriate; it addresses environmental issues; it helps student to acquire problem-solving capacity; it incorporates the country's national strategy of alleviating poverty.

The course selected from Natural Resources Department is entitled 'Forest Management Planning'. The entire course is about forest which is one of the crucial environmental elements in Ethiopia. The course is designed in such a way that trainees would enable to understand the principles and concepts of forest management. This by itself would give trainees some understanding of what a forest mean. In addition to this the environmental aspects of forest is discussed in its own right in a sub-topic entitled 'environmental consideration'. From Table 2, we can see that 73.9% of the objectives are focusing on inculcating knowledge and 26.1% on skills development.

The second course that is selected from Plant Science Department for the research is Surveying and Leveling. The entire course is almost dedicated to measurement and computation. It is designed to equip trainees on how to use survey instruments and their units construction of scales. From the twenty four objectives only two objectives related to natural resources conservation. The two objectives focused on the concept of contour and on how to construct it. Understanding the concept of contouring and acquiring skills about it is very important in constructing terraces and other similar water and soil conservation measures. For a high altitude and mountainous country like Ethiopia its importance is unquestionable.

According to Daniel (1990) one of the factors that contribute to environmental degradation in Ethiopia is overgrazing. Examination of the objectives included in the curriculum guide of Feeds and Applied Animal Nutrition indicates that the trainees will have two major roles. First they will help to identify and conserve the existing pasture land. This will give time for the pasture land to regenerate. Second they will develop skills on how to develop, prepare and

conserve animal feeds such as forage, hay and silage. This helps to halt free grazing and wastage of animal feeds. Both approaches help to conserve and use natural resource appropriately. In light of this, of all the objectives included in the curriculum guide of Feeds and Applied Animal Nutrition 42.4% of them related to conserving natural resources by equipping trainees with the necessary knowledge of range management and forage development. Three percent of the objectives are dedicated to skills development of the trainees so that they would prepare hay and silage.

The teaching methods in ATVET are expected to be participatory and practice oriented. Trainees should spend 70 percent of their time on "hands-on practical training, which includes a ten-month apprenticeship in the final year" (Belay, 2006: p29). A great number of instructors agreed that the method of delivery of courses is appropriate; it helps to meet the objectives stated in the curriculum; it encourages students to participate effectively in the teaching-learning process. However, examination of the teaching methods enshrined in each curriculum guide indicates that lecture is the dominant teaching method. From 151 teaching methods included in the three curricula guides 41.7% is lecturing. Class participation makes up 17.2%. The same amount is assigned to demonstration. Only 12.3% is given to practice. This is far below the 30% average that trainees should spend in practice during course work.

Be it as it may, the finding indicates that teachers' attitude towards practice was positive. The majority of them believed that it helps students to get skills that would help them in real life; it does not dwarf the trainees theoretical knowledge; it is not tedious though it requires traveling to rural areas and to write report; it is not a hindrance to assess and follow up students' performance

objectively; it helps to enhance students' commitment to work in rural areas; it is economically feasible for countries like Ethiopia and it should not be abandoned. The interview I had with the instructors confirms all the points discussed except the issue of trainees' assessment during practice. An interviewee who had the experience in visiting trainees in their areas testified that the stakeholders' evaluation did not reflect the true performance of the trainees during practicum.

According to Kostova and Atasoy, (2008) environmental issues could be easily assimilated if students are working in small groups, debating, peer learning, cooperation, project work, problem solving, presentations, and motivation. The teachers` role is of facilitating the teaching-learning process so that trainees would think critically and offer creative solutions. From the two classroom observations I had in Alage and Assela student active participation seems dominated by lecturing. Giving chance to students' to air their opinion depends on the teachers' ability and consciousness. What I observed during the two classroom observations was that, teachers were entirely focusing on transferring information to their passive listeners. In one of the college the teacher is writing on the blackboard and the students are copying. Then the teacher tried to give explanation on the topic. He asked the students if they have any thing that they do not understand. He is not provoking the entire class to participate. Instead because there was no question from the students, he was asking them if he could erase the blackboard to write additional note.

The situation was almost similar in another college except the teacher already gave a handout for each student. He tried to give explanation on the topic. Students were listening to him attentively. At time, they were trying to take additional notes on their handouts. But there was no active

participation in the classroom. This might be due to two main reasons. It might be due to the nature of that particular topic which might not be convenient to student participation. Or teachers might be in hurry to finish their course as the researcher understood from Assela instructors. According to them due to the current inflation that occurred throughout the country, students could not able to sustain themselves with the meager pocket money they receive from the college. Therefore they request the administration to shorten the education season.

The finding shows that the evaluation techniques used by the teachers could help trainees to find solutions to real life problems, which is one of the goals in ATVET training in general and environmental education in particular. Active class participations (27.9%), individual and group project (27.9%), and practical works (18.6) and written examination and quiz (19.4%) used to measure the trainees' performance.

The trainees of ATVET have double responsibilities of helping farmers in adopting modern farm techniques and adopting mechanism to utilize the natural resources especially the land in a sustainable manner. They should ensure increasing yields without negatively affecting the environment. Both of them give emphasis to practical aspect of training. This required igniting the trainees' interests to engage in real life situation and involve actively in conserving and protecting the environment. Rao and Reddy (2005) recommend that a separate area should be set aside to establish sites to study about the environment and for agricultural use. They also suggest that it is important to provide an outdoor meeting place so that discussions can take place without returning to the classroom. That means practice requires facilities and demonstration sites. Based on the information obtained from more than half of the instructors there are no adequate facilities

and demonstration sites in ATVET colleges. Of the three colleges, Alage was exceptional. Its huge land allows teachers to prepare demonstration sites in their respective campus. Assela and Holeta due to their limited spaces do not have the opportunity that is enjoyed by Alage. The interview I had with a teacher in Holeta confirmed this truth. Due to shortage of demonstration site, instructors are forced to use the same plot of land twice or trice in a semester. This would deprive trainees to see the results of their practical work/training because it would be dismissed before its growth cycle completes.

According to the World Bank, middle level agricultural trainings are most effective if they select trainees properly. More than half of the instructors believe that the admission criteria of ATVET trainees are not appropriate. Interviewed teachers unanimously agreed that the current students' performance is by far lower than the previous one. According to the information I had from an Expert in the Extension Division, entrance examination is prepared by the office to be administered by the Woreda Agricultural Offices. The expert mentioned that interest to join ATVET is a crucial element in the selection criteria. Perhaps there might be some procedural mistake or error committed at Woreda level in selecting the right kind of candidates. Regarding the trainees prior traits, the majority of the instructors agree that the trainees need to have strong bases in the sciences and mathematics; they should have the interest to work in rural areas; their educational level is appropriate to the training given in the college; they should have rural background.

Human actions such as poor farming practices, the use of animal dung and crop residues as fuel, expansion of cultivation by clearing forest, etc contributed to land degradation. Fine tilling of the

land to cultivate crops such as *Tef* facilitates soil erosion. Huge cattle population leads to shortage of pasture and overgrazing (Muluneh, 2003). The trainees' awareness about the causes of environmental degradation is very low as it is seen from Table 10. The major causes of environmental degradation such as burning of animal waste and crop residue were not selected by the trainees. It is clear that burning of biomass or natural fertilizers, such as manure, "are important on-farm inputs for maintaining crop yield" (Todaro, 2000). However, 68% of the trainees believe that deforestation has severe impact on the environment. The 54.2% of trainees also believe that poverty has severe impact on the environment. Todaro (2000) mentioned that absolute poverty can be a cause for environmental degradation.

The finding indicates that the trainees' performance in problem solving questions was encouraging. In Table 18, 54.8% of the trainees believe that high population growth can cause environmental degradation. 30% of the trainees identified deforestation as the major causes of environmental degradation.

The low level of awareness of the trainees confirmed in the achievement test score where 94% of the total trainees have scored below the standard set (73%) by their teachers as it is shown in Table 11. The finding shows that there is a significant mean difference between males and females in their awareness about natural resources management and conservation measures. Table 12 also indicates that there is a mean difference between the achievement test scores of male (M=56.60, SD=12.655) and female (M=49.24, SD=12.747) trainees. This agrees with the findings of Aklilu (2001) and Damtew (2007) who conducted research in high school students. As it is shown in Table 13 there is a statistically significant mean achievement score difference

between male and female trainees on their level of awareness about the environment, $t(332)=4.227$, $p\angle 0.05$. This differs from Damtew (2007) where he found no statistically significant mean difference between males and females.

The finding shows that there is slight mean difference among colleges (Alage=55.77, Holeta=55.59 and Assela=54.21). But there is no statistically significant mean difference among colleges, $F(2,331)=0.495$, $p>0.05$. In the foregoing discussion it was indicated that Alage is better furnished than Assela and Holeta. And it was expected that they should perform better than others. But it was not the case. This reveals that the trainees are getting similar theoretical knowledge and the implementation of the curriculum in all the colleges was almost identical. The finding also indicates that the mean difference between departments are comparable (Natural Resources=56.27, Animal Science=54.52 and Plant Science=54.32). The better performance by Natural Resources trainees may not be a surprise. It is expected for they are taking more courses that are related to environment than others. However, there is no statistically significant mean difference among departments, $F(2,331)=0.835$, $p>0.05$. This indicates that the mean difference among departments may be due to low or high scores of the trainees.

The finding shows that trainees have better understanding about the consequences of environmental degradation. Trainees identified desertification and decrease in productivity as consequences of environmental degradation. The solutions suggested by the trainees to alleviate environmental problems were reafforestation, tree planting, creating awareness among the people and conservation of the natural resources.

As it is discussed above trainees are selected based on interest to join ATVET though admission examination was developed and supposed to be administered by Woreda Agricultural Offices. The responses' of the trainees indicated that the majority of them joined ATVET colleges because they could not able to go to preparatory to join university. It seems that joining ATVET is the 'occupation of the last resort' (World Bank, 2007). When they were asked whether they have the plan to continue further education 86.2% of them answered in affirmative. And 67.1% of them have the plan to study agriculture. According to the World Bank ATVET would be "least effective when they serve as an alternative pathway to university admission". The researcher does not fully agree with this statement. Of course it is necessary to attract those who are motivated and have the interest to work in rural areas. It is also important to make sure that they would work in their post for sometime until a new batch would substitute them and the expenses incurred by the government compensated with their services. However, it would not be appropriate to totally close the opportunity to continue further education of those capable individuals. Perhaps it might be an appropriate forum where the experiences of the actual practitioner in the field would flow to the academic and research institutions. Moreover, those who have the actual field experiences might be in a better position to acquire firsthand information about the existing reality. Especially they would help to generate practical experience on how to tackle environmental problems.

In general, the findings show that the courses of ATVET colleges are designed to address the country's development plan to reduce poverty and ensure sustainable development. Since sustainable development is related to increasing productivity without damaging the environment, the courses are addressing the main environmental issues especially land degradation as the

curriculum analysis demonstrated. Though the teaching methods that are included in the courses are appropriate to achieve the objectives included in the curriculum, lecturing is the dominant method as the curriculum analysis and the classroom observations showed. This has detrimental effect for ATVET courses to achieve the desired results. Lecturing is not also appropriate to teach environmental skills to the trainees. That means the potential of the course materials to achieve sustainable development can be compromised by the actual teaching-learning process. This greatly reduces the capacity of the country to reduce poverty. The moral, capacity and courage of the trainees to work in rural areas are not satisfactory. First, ATVET is not their plan from the very beginning. Second, most of them want to make it a steppingstone to seek further educational opportunities. The trainees' awareness about the environment is generally very low. Their responses to a *Likert-type scale* questions show that their awareness about the causes of land degradation is very low. Burning of animal waste and crop residues rated low in causing damage to the environment. The achievement scores of the trainees' also showed that they have low knowledge about natural resources and their management. This also seriously inhibits the role of the development agents in involving meaningfully in the country's endeavor to alleviate poverty and ensure sustainable growth. However, the trainees' response to open ended questions was encouraging. They identified deforestation and population growth as major causes of environmental degradation. Some of them also identified desertification and decrease in productivity as consequences of environmental degradation. Reafforestation, tree planting and awareness creation are mentioned as solutions to improve the environment. Generally, males have better knowledge about natural resources management and conservation schemes than females. The mean achievement score of the Natural Resources Department is better than Plant Science and Animal Science Departments. But there is no statistically significant mean

difference between departments. The mean achievement scores of the colleges are equivalent. And there is no statistically significant mean difference between colleges. The finding indicates that there is no appropriate criterion to select candidates to ATVET colleges. The ATVET colleges are not well furnished and equipped to give adequate services to the trainees. This seriously inhibits the capacity of the colleges to translate the curriculum to the fullest. Perhaps, this might be one of the reasons that push instructors to stick to lecturing method.

Chapter Five

Summary, Conclusion and Recommendations

4.1 Summary and Conclusion

The majority of developing countries depend on subsistence agriculture by tilling lands with traditional farming system. The unsustainable exploitation of the life supporting system accelerates to satisfy the increasing demand for foods, fuel and grazing. The unsustainable utilization of natural resources coupled with natural disasters such as drought and famine hinder the capacity of the human occupant to fulfill the basic necessities of life. Countries found in the Third Word regions fall in the trap of poverty. And to change their situation they further exploit the environment. Ethiopia is one of the least developed countries where continuing exploitation of the natural resources and its consequences manifested clearly. In Ethiopia, the majority of the population lives in rural area making subsistence farming its main stay. The life of the people is characterized by recurrent famine and drought. The main reason for this suffering is the poor farming practice that extended for centuries. Scholars predicted that the current demographic and economic growth is likely to continue in the coming decades.

To bring economic growth without damaging the environment is the current development paradigm. To ensure this, education has given a pivotal position in creating the necessary human power that would help the farmer at local level. It was at the dawn of the development era that the establishment of modern agricultural institutions begun in Ethiopia. Today, the government of Ethiopia embarked on producing hosts of development agents by establishing and upgraded 25 Agricultural Technical Vocational Education and Training Colleges. These colleges are

giving a three years training in five disciplines. However, the program was not studied so far since its implementation begun in 2001.

The purpose of the study was to assess the courses of ATVET colleges are included environmental issues such as land degradation, deforestation and depletion of biodiversity. In order to assess the courses, data were gathered through curriculum analysis, questionnaires, interviews and classrooms and sites observations. Three curriculum guides were selected with sampling techniques from the three departments that were included in the research. The research focused only on three colleges. From the three colleges 53 instructors and 334 trainees were participated. The data obtained through the various instruments were analyzed both quantitatively and qualitatively.

The finding shows that the ATVET courses are addressing environmental issues. The curriculum analysis shows that 50% of the objectives of the selected curricula guides treated environmental issues. The objectives are dedicated to inculcate the necessary knowledge and skills of forest and range management, forage development, preparing of hay and silage and understanding the concept of contour and its application. These objectives are directly related to soil and water conservation measures. It is confirmed by the majority of the instructors. According to them ATVET courses are addressing environmental issues and would help in alleviating poverty. That means the courses would help to alleviate poverty without bringing damage on the environment.

The method of delivery of courses which give emphases on practice can also be seen as strength. A great number of instructors believe that it is appropriate. When we scrutinize the methods

included in the curriculum guides, however, it is possible to observe that the traditional lecture method appears dominant. In the guise of discussion, explanation and participation the instructors can easily dominate the class. It is confirmed in the two classroom observations the researcher had.

Though it is understood that practice requires adequate facilities and demonstration sites, it is not evenly distribute among the colleges that are included in the research. Alage has better demonstration sites than Assela and Holeta.

The majority of the instructors believe that the trainees should have strong basis in the sciences and mathematics. However the admission criteria of ATVET trainees are questionable at least in its implementation. This led to the inclusion of candidates who lack the necessary skills and capacity. Trainees' awareness about the causes of environmental degradation is very low. The main causes of environmental degradation such as shortage of firewood, burning of animal waste and crop residue rated low by the majority of the sampled trainees. The low level of awareness of the trainees confirmed in the achievement test score where 94% of the total trainees have scored below the standard set (73%) by their teachers. However, the trainees' problem solving skills and capacity was encouraging. Reaforestation and conservation measures are the possible measures that are identified by a great number of students. Alternative energy source is mentioned by 2.7% percent of the total trainees. Generally, male trainees perform better than female trainees in the achievement test score. The descriptive statistics tell us that mean achievement scores between colleges and departments are almost equivalent. ATVET is not a primary choice of the trainees and it will not be their dream occupation. At least the majority do not want to stick to it forever.

Therefore, it is possible to conclude that the courses given in ATVET colleges address environmental issues. However, the availability of environmental issues in the courses might not be a guarantee to create awareness about the environment unless clearly defined objectives that address the goal of environmental education are included in the curriculum. This was not the case in the selected curriculum guides. It seems that the method of delivery of courses is not implemented as intended. In the first place, the methods included in the curriculum guides are new to the teachers. Instructors knowingly or unknowingly may drift to traditional method of delivery of courses that is lecturing. It was the way they themselves have been experiencing throughout their life. Thus students' active participation fell in the mercy of the instructors. The trainees' awareness about the environment is unsatisfactory. The low level of awareness of the trainees may be due to the poor background of the trainees. In addition to this lack of adequate demonstration site and physical facilities might be mentioned as other causes for the low level of environmental awareness on the part of the trainees.

4.2 Recommendations

Based on the findings the following recommendations are forwarded:

1. Future curriculum revision might include clearly stated objectives, teaching and evaluation techniques that are related to environmental education;
2. The implementation of the teaching methods and the evaluation techniques require to deviate from the traditional spoon-feeding teaching methods. Therefore, due emphasis should be given to familiarize teachers with teaching methods that are conducive to teach environmental issues;
3. Interest is a crucial element in any serious endeavor. It is legitimate to see interest to admit trainees in ATVET colleges. But it is equally important to see whether the candidates have the potential to effectively engage in the teaching learning processes;
4. Moreover those who work on ATVET should find ways to attract and retain capable individuals by opening attractive faculties and raising the morale of the trainees who join ATVET;
5. ATVET colleges need relatively larger area to accommodate demonstration sites and physical facilities in order that they fulfill what is expected of them. Assela and Holeta need such space;
6. This research mainly focused on the appropriateness of the ATVET training in relation to the trainees' background. And the researcher recommends if its relevance to the farmers' circumstances would be studied thoroughly.

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Appendix I: Research Questionnaires

Addis Ababa University
School of Graduate Studies
Institute of Educational Research

Research Questionnaires

Research Topic:

The Status of Environmental Issues in Selected Agricultural TVET Courses towards Poverty Alleviation and Sustainable Development

The Purpose of the Research:

The researcher believes that the recurrent drought and famine that the country faced might be due to the unwise use of natural resources that the majority of the rural population depends. The study will reveal important and applicable recommendations that will help to improve the implementation of the teaching-learning process in the agricultural institutions.

It is the researcher's earnest hope that you will answer the following questions honestly and dedicate sufficient time on each question. Your response is confidential. You don't need to write your name.

Thank You!

Part I
Questions to be administered to Experts and Instructors

1. The curriculum designed for Agricultural Technical and Vocational Education & Training (ATVET) is appropriate
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

2. The curriculum designed for ATVET addresses environmental issues
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

3. The curriculum designed for ATVET helps students to acquire problem-solving capacity
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

4. The curriculum of ATVET is designed having the countries national strategy to alleviate poverty
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

5. The method of delivery of courses is appropriate
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

6. The method of delivery of courses helps to meet the objectives stated in the curriculum
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

7. The method of delivery of courses encourages students to participate effectively in the teaching-learning process
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

8. There are adequate demonstration sites in the college
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

9. The physical facilities in the college are well furnished
   ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

10. The college has adequate qualified teachers/instructors
    ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

11. The criteria of selecting trainees to ATVET colleges is appropriate
    ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

12. The courses given in the college enhance the students' awareness about their environment
    ○Strongly agree ○Agree ○Neutral ○Disagree ○Strongly disagree

13. Put '√' mark under your choice which range from 'strongly agree' to 'strongly disagree' about the practicum which is implemented in the college

No	Descriptions	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
1	Practice helps students to get skills that would help them in real life					
2	The practice is too long and unable trainees to get sufficient theoretical knowledge					
3	The practice is tedious because it requires to travel to rural areas					
4	The practice is tedious because it requires to write report					
5	The practice is not practical because it does not help to assess and follow up students' performance objectively					
6	Practice helps to enhance students' commitment to work in rural areas					
7	Practice is not economically feasible for countries like Ethiopia and it should be abandoned					

14. Put '√' mark under your choice which range from 'strongly agree' to 'strongly disagree' about the qualities that the trainees should have to join ATVET colleges

No	Descriptions	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
1	I believe that the trainees need to have a strong bases in the sciences					
2	I believe that trainees should have sound bases in mathematics					
3	I believe that, more than anything else, the trainees should have the interest to work in rural areas					
4	I believe that the trainees educational background is appropriate to the training given in the college					
5	I believe that the trainees should have rural background					

Part II

This questionnaire is prepared for ATVET Colleges Trainees. Your honest response is very crucial for the success of the research. Your response is confidential. Yon do not need to write your name. Thank you!

1. **Personal Information**

   Tick '√' the relevant box:

1. Sex □ Male □ Female
2. Department □ Animal Husbandry
   □ Natural Resources Management
   □ Crop Production
3. Year □ 1st □ 2nd □ 3rd
4. From which agroclimatic zone do you come from?
   □ Dega □ Woynadaga □ Kola
5. If you were in practice, in which agroclimatic zone was it?
   □ Dega □ Woynadaga □ Kola

2. **Rate the following from 'low' to 'sever' on causing environmental degradation in Ethiopia by putting '√' mark on the space provided under your choice**

#	Description	Low	Average	Sever
1	Shortage of firewood			
2	fine tilling of soil			
3	Heavy seasonal rainfall			
4	nature/type of soil			
5	burning of animal waste			
6	Topography/terrain			
7	practicing of mono-cropping			
8	Deforestation			
9	Poverty			
10	Shifting cultivation			
11	use of crop residue for fuel rather than for soil cover			

3. **Answer the following questions by circling your choice.**

1. What is the most serious environmental issue in Ethiopia
   A. Water pollution B. Soil erosion C. Air Pollution D. all

2. Which type of soil erosion **<u>is not</u>** the most serious one in Ethiopia?
   A. gully erosion B. sheet erosion C. landslide D. Rill erosion

3. Which soil conservation measure is appropriate in all landuse types
   A. Revegetation B. Controlled Grazing C. Alley Cropping D. Microbasin

4. Which soil conservation measure is suitable on forest land
   A. Hillside planting B. Fanya juu C. Cut and Carry D. Graded Bund

5. Which soil conservation measure can be applied on grassland
   A. Hillside planting B. Cut and Carry C. Fanya juu D. all

6. Which of the following **does not** help to improve soil fertility?
   A. Crop rotation B. fallowing C. shifting cultivation D. applying cow dung

7. Which one of the following is an agroforestry system by growing food crops?
   A. tree planting B. grass strip C. alley cropping D. fallowing

8. When does *Grass strip* soil conservation measure could be applied?
   A. if the soil is clay B. if the soil has good infiltration
   C. if the soil is sand or silt texture D. B & C

9. Trees that improve soil fertility through nitrogen fixation are known as _____
   A. legumes B. timber C. non-timber D. None of the above

10. What could you advice to increase agricultural production and farmers' household income?
    A. to use fertilizers and improved seeds
    B. to focus on soil and water conservation
    C. raising farm animals such as chickens and beekeeping
    D. all

11. Which of the following is a soil and water conservation strategy?
    A. construction of terraces B. reduced burning
    C. increase use of manure and compost D. all

12. What benefit can be obtained by planting trees?
    A. it can be a source of income for poor farmers B. it helps to reduce soil erosion
    C. it helps to conserve biotic diversity D. it helps to get beeswax and honey
    E. all

13. Which of the following is a crucial factor to produce vegetables?
    A. Combiner & harvester B. access to market C. capital D. None of the above

14. Which strategy is environmentally suitable to overcome shortage of firewood?
    A. construct a biogas plant B. use coal energy C. use charcoal D. all

15. Which of the following energy source that is environmentally friendly one?
    A. Wind energy B. oil and gas C. Solar energy D. A & C

16. Which one of the following **is not** a soil conservation measure?
    A. Fanya juu B. Terrace C. Tree Planting D. None of the above

17. What due you call developing an area into a forest?
    A. silviculture B. apiculture C. pruning D. None of the above

18. What resources do you use to make/construct a trace?
    A. soil B. stones C. water D. A & B

19. What do you call an animal feed that is prepared by fermenting grass/field crops/ in a pit together?
    A. roughages B. silage C. hay D. all

20. Which one of the following **does not** belong to organic fertilizers?
    A. manure B. compost C. smuts D. all

4. **Fill in the black space after you read each question carefully.**

1. In your view what are the major environmental problems in Ethiopia?
   _____

2. What are the causes of these environmental problems?
   _____

3. What are the measures that could be taken to alleviate these environmental problems?
   _____
   _____

4. What are the consequences of environmental degradation?
   _____
   _____

5. **Fill in the black space after you read each question carefully.**

1. What motivated you to join ATVET colleges?
   _____

2. What was your plan before you joined this college?
   _____

3. Do you have the plan to continue further education? _____

4. If your answer to question number 3 is 'Yes', what do you want to study if you get the chance?
   _____

5. What are the challenges, if any, that TVET graduates currently face?
   _____
   _____

Appendix II: Table that show students' achievement test (A.S.) scores

ID: Student Identity
Sex: Male 1
Female 2
Year: 1st Year = 1
2nd Year = 2
College: Alage = 1
Assela = 2
Holeta = 3
Department: Natural Resources =1
Plant Science = 2
Animal Science = 3

ID	Sex	Year	College	Dept.	A.S.
S1	1	2	1	3	40
S2	1	2	1	3	70
S3	1	2	1	3	60
S4	1	2	1	3	50
S5	1	2	1	3	50
S6	1	2	1	3	55
S7	1	2	1	3	65
S8	1	2	1	3	45
S9	1	2	1	3	75
S10	1	2	1	3	35
S11	1	2	1	3	55
S12	1	2	1	3	50
S13	1	2	1	3	55
S14	1	2	1	3	65
S15	1	2	1	3	55
S16	1	2	1	3	75
S17	1	2	1	3	35
S18	1	2	1	3	40
S19	1	2	1	3	70
S20	1	2	1	3	50
S21	1	2	1	3	60
S22	1	2	1	3	55
S23	1	2	1	3	40
S24	1	2	1	3	50
S25	1	2	1	3	60
S26	1	2	1	3	55
S27	2	2	1	2	60
S28	1	2	1	2	70
S29	1	2	1	2	75
S30	1	2	1	2	70
S31	1	2	1	2	60

S32	1	2	1	2	55
S33	2	2	1	2	50
S34	1	2	1	2	70
S35	1	2	1	2	65
S36	1	2	1	2	60
S37	2	2	1	2	55
S38	1	2	1	2	70
S39	2	2	1	2	40
S40	1	2	1	2	55
S41	2	2	1	2	25
S42	1	2	1	2	55
S43	1	2	1	2	70
S44	1	2	1	2	75
S45	1	2	1	2	70
S46	1	2	1	2	45
S47	1	2	1	2	65
S48	1	2	1	2	65
S49	1	2	1	2	50
S50	1	1	1	2	70
S51	1	1	1	2	55
S52	1	1	1	2	60
S53	1	1	1	2	45
S54	1	1	1	2	35
S55	1	1	1	2	35
S56	1	1	1	2	50
S57	1	1	1	2	60
S58	1	1	1	2	40
S59	1	1	1	2	45
S60	1	1	1	2	65
S61	1	1	1	2	50
S62	2	1	1	2	50
S63	1	1	1	2	50
S64	2	1	1	2	35
S65	1	1	1	2	60
S66	1	1	1	2	35
S67	1	1	1	2	50
S68	1	1	1	2	55
S69	1	1	1	2	40
S70	1	1	1	2	55
S71	1	1	1	2	70
S72	1	1	1	2	50
S73	1	2	1	1	55
S74	1	2	1	1	55
S75	1	2	1	1	65
S76	1	2	1	1	50
S77	1	2	1	1	45

S78	2	2	1	1	40
S79	2	2	1	1	55
S80	1	2	1	1	90
S81	2	2	1	1	50
S82	1	2	1	1	60
S83	1	2	1	1	50
S84	2	2	1	1	65
S85	1	2	1	1	75
S86	1	2	1	1	65
S87	1	2	1	1	45
S88	2	2	1	1	30
S89	1	2	1	1	70
S90	1	2	1	1	75
S91	1	2	1	1	55
S92	2	2	1	1	50
S93	2	2	1	1	50
S94	1	2	1	1	80
S95	1	2	1	1	70
S96	1	2	1	1	65
S97	1	2	1	1	55
S98	1	2	1	1	65
S99	1	2	1	1	65
S100	2	2	1	1	55
S101	2	2	1	1	80
S102	2	1	1	1	50
S103	1	1	1	1	40
S104	2	1	1	1	30
S105	2	1	1	1	45
S106	1	1	1	1	45
S107	2	1	1	1	70
S108	1	1	1	1	60
S109	2	1	1	1	60
S110	1	1	1	1	50
S111	1	1	1	1	60
S112	1	2	2	1	70
S113	1	2	2	1	45
S114	1	2	2	1	55
S115	1	2	2	1	35
S116	1	2	2	1	45
S117	1	2	2	1	75
S118	1	2	2	1	60
S119	1	2	2	1	65
S120	1	2	2	1	50
S121	2	2	2	1	40
S122	1	2	2	1	60
S123	1	2	2	1	70

S124	1	2	2	1	65
S125	2	2	2	1	50
S126	1	2	2	1	40
S127	1	2	2	1	80
S128	1	2	2	1	55
2129	1	2	2	1	50
S130	2	2	2	1	45
S131	2	2	2	1	50
S132	2	2	2	1	65
S133	1	2	2	1	70
S134	2	2	2	1	40
S135	2	2	2	1	40
S136	1	2	2	1	35
S137	1	2	2	1	40
S138	1	2	2	1	35
S139	1	2	2	1	60
S140	1	2	2	1	60
S141	1	2	2	1	50
S142	1	2	2	1	60
S143	1	2	2	1	65
S144	1	2	2	1	50
S145	1	2	2	1	65
S146	1	2	2	1	50
S147	1	2	2	1	60
S148	1	2	2	1	45
S149	1	2	2	1	65
S150	1	2	2	1	60
S151	1	2	2	1	40
S152	1	2	2	3	65
S153	1	2	2	3	65
S154	1	2	2	3	50
S155	1	2	2	3	65
S156	1	2	2	3	70
S157	1	2	2	3	55
S158	1	2	2	3	60
S159	1	2	2	3	35
S160	1	2	2	3	70
S161	2	2	2	3	50
S162	1	2	2	3	65
S163	1	2	2	3	40
S164	1	2	2	3	60
S165	1	2	2	3	50
S166	2	2	2	3	40
S167	1	2	2	3	55
S168	1	2	2	3	25
S169	1	1	2	3	70

S170	2	1	2	3	55
S171	2	1	2	3	55
S172	1	1	2	3	60
S173	2	1	2	3	70
S174	1	1	2	3	50
S175	1	1	2	3	60
S176	1	1	2	3	65
S177	2	1	2	3	70
S178	1	1	2	1	65
S179	1	1	2	1	50
S180	1	1	2	1	50
S181	1	1	2	1	65
S182	1	1	2	1	50
S183	1	1	2	1	50
S184	1	1	2	1	55
S185	1	1	2	1	60
S186	1	1	2	1	60
S187	1	1	2	1	50
S188	1	1	2	1	70
S189	1	1	2	1	50
S190	1	1	2	1	45
S191	1	1	2	1	75
S192	2	1	2	1	25
S193	2	1	2	1	45
S194	1	1	2	1	35
S195	1	2	2	2	60
S196	1	2	2	2	55
S197	1	2	2	2	50
S198	1	2	2	2	65
S199	1	2	2	2	75
S200	1	2	2	2	80
S201	1	2	2	2	60
S202	1	2	2	2	65
S203	1	2	2	2	55
S204	1	2	2	2	60
S205	1	2	2	2	80
S206	1	2	2	2	70
S207	1	2	2	2	30
S208	1	2	2	2	10
S209	1	2	2	2	25
S210	2	2	2	2	60
S211	1	2	2	2	45
S212	1	1	2	2	40
S213	2	1	2	2	70
S214	1	1	2	2	45
S215	1	1	2	2	65

S216	1	1	2	2	35
S217	1	1	2	2	45
S218	1	1	2	2	45
S219	2	1	2	2	55
S220	1	1	2	2	50
S221	2	1	2	2	70
S222	1	1	2	2	60
S223	2	1	2	2	50
S224	1	1	2	2	35
S225	1	1	2	2	70
S226	1	1	2	2	45
S227	1	1	2	2	65
S228	1	1	2	2	30
S229	1	1	2	2	50
S230	2	1	2	2	55
S231	1	1	2	2	50
S232	2	1	2	2	50
S233	2	1	3	3	50
S234	2	1	3	3	45
S235	1	1	3	3	65
S236	1	1	3	3	55
S237	1	1	3	3	40
S238	1	1	3	3	50
S239	2	1	3	3	35
S240	1	1	3	3	55
S241	1	1	3	3	25
S242	1	2	3	3	50
S243	1	2	3	3	70
S244	1	2	3	3	60
S245	1	2	3	3	55
S246	2	2	3	3	40
S247	1	2	3	3	60
S248	1	2	3	3	30
S249	2	2	3	3	65
S250	2	2	3	3	70
S251	1	2	3	3	80
S252	1	2	3	3	50
S253	2	2	3	3	45
S254	1	2	3	3	60
S255	1	2	3	3	60
S256	1	2	3	3	60
S257	1	2	3	3	75
S258	1	2	3	3	35
S259	1	2	3	3	65
S260	1	2	3	3	40
S261	1	2	3	3	20

S262	1	2	3	3	60
S263	1	2	3	3	65
S264	1	2	3	2	65
S265	1	2	3	2	70
S266	1	2	3	2	60
S267	1	2	3	2	50
S228	1	2	3	2	55
S269	2	2	3	2	35
S270	2	2	3	2	50
S271	1	2	3	2	65
S272	1	2	3	2	65
S273	1	2	3	2	50
S274	1	2	3	2	55
S275	1	2	3	2	65
S276	2	2	3	2	30
S277	1	2	3	2	55
S278	1	2	3	2	75
S279	1	2	3	2	50
S280	2	2	3	2	40
S281	1	2	3	2	70
S282	1	2	3	2	45
S283	1	2	3	2	50
S284	2	2	3	2	20
S285	1	2	3	2	50
S286	2	2	3	2	50
S287	1	2	3	2	65
S288	1	2	3	2	60
S289	1	2	3	2	60
S290	2	2	3	2	40
S291	2	2	3	2	45
S292	1	2	3	2	45
S293	1	2	3	2	70
S294	1	2	3	2	65
S295	1	2	3	2	55
S296	1	2	3	2	70
S297	1	2	3	1	70
S298	1	2	3	1	50
S299	1	2	3	1	60
S300	1	2	3	1	65
S301	1	2	3	1	45
S302	1	2	3	1	60
S303	2	2	3	1	50
S304	2	2	3	1	60
S305	2	2	3	1	65
S306	1	2	3	1	75
S307	1	2	3	1	70

S308	1	2	3	1	60
S309	1	2	3	1	70
S310	1	2	3	1	70
S311	1	2	3	1	70
S312	1	2	3	1	60
S313	1	2	3	1	90
S314	1	2	3	1	45
S315	1	2	3	1	45
S316	1	2	3	1	65
S317	1	2	3	1	70
S318	1	2	3	1	60
S319	1	2	3	1	50
S320	1	2	3	1	75
S321	2	2	3	1	50
S322	2	2	3	1	50
S323	1	2	3	1	50
S324	1	2	3	1	65
S325	1	1	3	1	75
S326	1	1	3	1	50
S327	1	1	3	1	70
S328	2	1	3	1	55
S329	2	1	3	1	25
S330	2	1	3	1	40
S331	1	1	3	1	35
S332	1	1	3	1	45
S333	1	1	3	1	70
S334	1	1	3	1	60

Appendix III: Courses offered in Natural Resources, Plant Science and Animal Science Departments

A. Courses given in Natural Resources Department

1. Alternative Energy Source
2. Water Harvesting Technology I
3. Water Harvesting Technology II
4. Water Harvesting Technology III
5. Small Scale Irrigation
6. Ecology
7. Farm Forestry
8. Forest Management Planning
9. Introduction to non-timber forest products
10. Land use planning
11. Nursery Establishment and Management

B. Courses given in Plant Science Department

1. Principles of Plant Physiology
2. Principles of Plant Anatomy and Morphology
3. Introduction to Soils
4. Field Crops Production
5. Vegetable Crops Production
6. Surveying and Leveling
7. Farm Machinery and Implements
8. Root and Tuber Crop Production
9. Soil and Water Conservation
10. Soil, Water and Plant Nutrition
11. Crop Production Technology
12. Fruits Production Technology

C. Courses given in Animal Science Department

1. Anatomy and physiology of Farm Animals I
2. Principles of Animal Nutrition
3. Poultry Production
4. Livestock farm structure
5. Sheep and Goat Production
6. Camel Production
7. Animal Health
8. Dairy Farming
9. Beekeeping
10. Fish Farming
11. Feeds and Applied Animal Nutrition
12. Hides and Skins Processing
13. Beef Cattle Production

Source: MOARD, 2005

Appendix IV: Agricultural Technical Vocational Education and Training Colleges in the Ethiopia

No	Name of ATVET Colleges	Name of the Region where the college is located
1	Alage ATVET Colleges	Federal
2	Agarfa ATVET Colleges	Federal
3	Ardaita ATVET Colleges	Federal
4	Bekoji ATVET Colleges	Federal
5	Assela ATVET Colleges	Oromia
6	Bako ATVET Colleges	Oromia
7	Chiro ATVET Colleges	Oromia
8	Holeta ATVET Colleges	Oromia
9	Kombolcha ATVET Colleges	Oromia
10	Nedjo ATVET Colleges	Oromia
11	Bure ATVET Colleges	Amhara
12	Kombolcha ATVET Colleges	Amhara
13	Mersa ATVET Colleges	Amhara
14	Metolemariam ATVET Colleges	Amhara
15	Wereta ATVET Colleges	Amhara
16	Maychew ATVET Colleges	Tigray
17	Shire ATVET Colleges	Tigray
18	Wukro ATVET Colleges	Tigray
19	Dilla ATVET Colleges	SNNPR
20	Mizan ATVET Colleges	SNNPR
21	Wolaita ATVET Colleges	SNNPR
22	Assosa ATVET Colleges	Benshangul
23	Gambella ATVET Colleges	Gambella
24	Gewane ATVET Colleges	Afar
25	Gode ATVET Colleges	Somalia

Source: MOARD, 2005.

Appendix V: Pictures Taken by the researcher during field visits

Picture 1. Fish production pond Alage

Picture 2: Solar Cooker in Alage

Picture 3a: Biogas Plant demonstration site in Alage

Picture 3b: Biogas Plant demonstration site in Alage

Picture 5a: Roof Top Water Storage in Alage

Picture 5b: Roof Top Water Storage in Alage

Picture 6: Trainees while practicing skin preserving techniques in Assela.

Picture 7: Traditional beehive in Assela

Picture 8a: Trainees while they are in practice in Nursery demonstration site in Assela

Picture 8b: Nursery Bed in Assela.

Picture 9a: Demonstration site of small scale irrigation tanker in Assela

Picture 9b: Demonstration site of small scale drip-irrigation field in Assela

Declaration

I, the undersigned, declare that the thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Jemal Ibrahim

_____

June 2008

This thesis has been submitted for examination with my approval as a university advisor.

Girma Lemma (Mr.)

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Date