# CHAPTER ONE

# AGRICULTURAL PERFORMANCE ASSESSMENT IN SCHOOLS IN BOTSWANA

## 1.1 INTRODUCTION

It is important that an education system should strive to provide quality education to the students. Quality of education is not what the students are told by their teachers to do but what they do to create knowledge of their own. To evaluate if students have learnt something, they have to be assessed. Assessment seems to be the most difficult and unpleasant part of the teaching profession. It is not every teacher who can assess and provide quality information needed for making sound policies to enhance learning.

This chapter introduces the study of enhancing quality of Agriculture performance assessment in schools in Botswana. Section 1.2 gives background to the study situating it within the framework of policy reforms. Section 1.3 discusses the problem and rationale leading to the conduct of this study. Section 1.4 outlines definition of terms as they are used in this study. Section 1.5 outlines the research approach, followed by Section 1.6 which gives the aim and research questions for the study. Section 1.7 describes the significance of the study and finally Section 1.8 gives a brief outline of each chapter.

## 1.2 BACKGROUND TO THE STUDY

The United Nations and Educational Scientific and Cultural Organisation [UNESCO] (2004) declared that the quality of education was declining universally, despite having advocated universal basic education for all school-age going children during the early 1990s. Since then a number of countries committed themselves and have made significant progress in providing education for all (UNESCO, 2004), with Botswana achieving much in terms of access to education, with “Apparent Intake Ratio (AIR) for both six and seven

year olds being more than 100%[1], which indicates a high degree of access to primary education" (MO&SD, 2003, p.15), taking into consideration that 42.4 million school-aged children in Africa were out of school by 2002 (UNESCO, 2002). However, emphasis on enrolment without provision of sufficient resources to match the large class sizes has resulted in decline in the quality of education.

Recently, emphasis has been directed to quality of education, as evidenced by ratifications of many international conventions, such as The Rights of the Child (United Nations, 2001a), The Dakar Framework for Action (UNESCO, 2000), and the Millennium Development Goals (UN, 2000). Though quality seems to be an elusive concept (Doty 1996), in assessment it is considered to be "the provision of the information of highest validity and optimum reliability suited to a particular purpose and context" (Harlen, 1994, p. 13).

According to Grisay and Mählck (1991) (cited in Kellaghan & Geaney, 2003), quality in education begins with the development of the relevant curriculum, and improvement of teacher preparation and the methods of assessing pupils (p.13). To evaluate if quality education has taken place, assessment of the curriculum is instituted, hence quality of the educational system is measured by student achievement (Kellagan & Greaney, 2003), not by the physical and human resources provided (Pittman, 2003).

The quality of what is going on in the classroom is of greater importance than the number of children who participate in the education process. The notion of merely filling spaces called 'schools' with children called 'learners', does not address even the quantitative objectives (UNESCO, 2004). UNESCO therefore defined education as being concerned with processes and outcomes that are defined qualitatively. However, this type of education has been elusive, as evidenced by the number of countries lagging behind or declining in achieving quality, including developed ones, (Greaney & Kellagan, 2001; UNESCO, 2004; Walker, 2006).

In order to address the question of quality in education effectively, firstly it has to be realized that education concerns itself not only with cognitive development, but also with

[1] Some pupils enrolled at below or over the official school admission age of six

accumulation of particular values, attitudes, and skills. Good quality education should fulfil the acquisition of all these. Secondly, quality instruction has to be accompanied by appropriate quality assessment strategies (Stiggins, 1997), thus assessment is inseparable from the teaching and learning process. The teacher is needed for mentoring, coaching and assessing students while actively engaged in the activities that result in them acquiring knowledge and skills. Stiggins identified five specific standards that quality assessment has to satisfy, one of which alludes to the appropriate assessment format to be used (Stiggins, 1997, p. 167):

> A sound assessment examines students' achievement through the use of a method that is capable of reflecting valued targets. We have different kinds of achievement to assess, and as such have to use different kinds of assessment methods to reflect them – select response, essays, performance assessment, structured responses, direct personal communication with students.

The implication here is that quality learning should be learner-centred and formatively assessed. Research has revealed that cooperative learning, which is a learner-centred approach, encourages students' interaction and development of investigative skills (Greenwood & Gaunt, 1994). Since assessment is essentially finding out the worth of what students do, it is logical that they should be assessed as they work either alone or in groups.

The Government of Botswana has since committed itself to providing accessible quality education to all (Government of Botswana, 1994; Ministry of Education & Skills Development [MoE&SD], 2000); Ministry of Finance and Development Planning [MFDP], 1991, 1997, 2003) to mould the child to fit in the participation of future social and economic activities of the country. This was evidenced by two commissions, instituted in 1977 and 1993, which both recommended Continuous Assessment (CA) to be part of a student's final grade. Unfortunately, during the late 1970's, manpower supply was in serious shortage, hence the implementation of the recommendations were not followed as initially intended. For example, the concentration after the first recommendation was on expanding access to primary education so as to acquire strong

foundation in education. Quality was then, though imperative, inadvertently subjected to secondary treatment, given prevalent financial and human resource constraints (Government of Botswana, 1993).

The Government learned from the first National Commission on Education that just providing equitable access to education was a necessary but not sufficient goal. The second commission, which culminated in The Revised National Policy on Education (RNPE) of 1994, clearly indicated government intentions to improve the quality of education as well as assessment through:

- making the curriculum more practical and pre-vocational
- making the learning process more realistic and resembling the world of work
- moving away from a teaching process where the teacher is the provider of knowledge to a learning process that involves students' participation
- introducing continuous assessment at all levels to reduce pressure on pupils and present a more comprehensive assessment of the individual child's capabilities
- monitoring the quality of the education system
- reducing class sizes at primary level, ultimately to 30 pupils, and raising that of senior secondary to 35
- moving from Norm-Referenced Testing to Criterion-Referenced Testing
- reducing the number of unqualified teachers and upgrading the minimum qualification of primary teachers to diploma level (Government of Botswana, 1994).

To emphasise the commitment to quality education provision, the Government of Botswana established the National Council on Education (NCE) to oversee the implementation of the RNPE recommendations. However, though the RNPE advocated provision of quality education and assessment, a major setback was the absence of quality assessment policy for implementing across the education spectrum, including performance assessment, as discussed in the subsequent section.

The policy would provide direction to common conceptualisation of quality in the context of performance assessment, and what constitutes quality assurance processes that make the performance assessment valid and reliable.

## 1.3 THE PROBLEM STATEMENT AND RATIONALE

The quality of an education system needs to be continuously monitored through mechanisms built into the system. The introduction of (CA) was partly intended to monitor the quality of education and partly to reduce pressure associated with one-off terminal examination, culminating in a more comprehensive assessment of the individual child's capabilities. CA is presently limited to those subjects that are practical in nature, and undertaken in the form of performance tasks.

In Agriculture, performance assessment comprise four practical tests (MoE&SD, 2001), which are implemented over the first five terms of the senior secondary programme. However, it is not clear how these practical tests are to be derived, since there is no policy on CA, hence the variation in the conceptualisation of performance assessment tasks. The researcher, during time as an Agriculture Officer, noticed that schools were engaged in tasks with completely different demands and scope. For example, some were deriving the tasks from the same topic, such as *Vegetable Production*, while others treated skills (see Table 6.1) as performance tasks, and yet others regarded an enterprise[2] as a practical test. In addition to the four practical tests conducted, students also do a project in their final year. The project and the practical tests constitute CA in Agriculture.

Practical tests are assessed and scored by the classroom teacher only, while the project is scored by the classroom teacher and then externally moderated. Moderation is carried out at the end of the course and interrogates marks of the final product. The moderator's mark carries more weight than the teacher's (details of the assessment of performance tasks and the project are discussed in Section 2.9). The moderator is brought in to

[2] This is a standalone entity which contributes to the gross income of a farm. For example, vegetable production, poultry production, or grain crop production

improve the reliability of performance assessment, but this tends to lower the validity of the assessment process because the moderator has little knowledge of who actually did the work and how the work was done (processes) (Tindal & Haladyna, 2002), and scores the work based solely on the assessment criteria. Performance Assessment is weighed least (20%) of the three papers in Agriculture (See Sections 2.8 and 2.9), despite school-based assessment (SBA) being considered one of the contemporary educational reforms (Airasian & Russell, 2008; Haynes, 2000; McMillan, 2004; Popham, 2005; Stiggins, 1997; van der Merwe, 2000).

Despite the effort to moderate the marks, the conduct of performance assessment is characterized by numerous problems (Baku, 2008; Grimma & Ventura, 2000; Lennox, 2000; Portal, 2000; Ravoice & Pongi, 2000; van den Merwe, 2000; Yadidi & Banda, 2008). During routine spot-checks by the Researcher to verify the conduct of performance assessment, it was discovered that no traceable or retrievable records were kept by schools to justify the marks awarded. Although only a few schools could be visited countrywide due to the shortage of manpower, through triangulation means of information gathering, such as standardisation meetings for the marking of the project, and training workshops, the problem was found to be widespread.

Workshops organized to train teachers in proper conduct of performance assessment did not yield any positive results, with subsequent visits to schools revealing no significant improvements. Inflated marks continued to be submitted to the examining body for summative purposes. It was then suspected that the following were the main causes of improper conduct of performance assessment leading to inauthentic marks:

- lack of standardised tasks for proper performance assessment implementation
- Inadequate training to handle performance assessment
- Lack of resources
- Lack of motivation due to low weighting (20%) of performance assessment
- Large class sizes leading to high workload
- Inadequate supervision and monitoring

- Lack of commitment by school administration (Chong, 2009; Finn et al., 2003; Jones, 2006; Keightley & Coleman, 2002; Mamary, 2007; Maxwell, 2004; Tindal & Haladyna, 2002; Torrance, 1995).

A number of authors have widely documented how performance marks can be validated. These include having a quality assessment policy in place; having a pool of well trained teachers to assess performance tasks; approval of the schools to conduct assessment; internal and external monitoring; development of assessment criteria; involvement of parents and students in assessment; using multiple assessors; reassessment, and collaborative development of standard tasks and assessment materials, (Broadfoot, 1994; Freeman. 1993; Greenwood & Gaunt, 1994; Harlen, 1994; Harry & Schroeder, 2000; McMillan, 2000; Salvia & Ysseldyke, 1998; Stiggins 1997; Tindal & Haladyna, 2002).

The researcher, as an officer working in an assessment environment, could only influence quality assessment through developing standardised tasks and assessment materials in collaboration with teachers. These will be used by the classroom teachers who are strategically positioned to implement performance assessment in a system entrenched with quality assurance.

## 1.4 DEFINITION OF TERMS

It is necessary here to clarify key terms used in this study:

*Performance assessment* is an all-embracing term used to include products and processes such as portfolios, projects, and experiments (Johnson, Penny & Gordon, 2009; McMillan, 2004). In the context of this study, it means assessment of practicals conducted during the course of the study to enhance learning, using clearly defined criteria (Nitko & Brookhart, 2007). These practicals may range from short activities that take only a few minutes to projects culminating in polished products, in which case a process or product or both are evaluated.

*Portfolio* is one type of performance assessment which is used to demonstrate the student's attainment of learning in practicals (McMillan, 2004; Nitko & Brookhart, 2007; Popham, 2005), such as keeping records of daily transactions during the conduct of practicals. The teacher can then evaluate consciously selected students' records using clearly defined criteria.

*Authentic assessment* determines the degree to which the performance task approximates realism (McMillan, 2004). Assessment of most agricultural activities has the highest authenticity. They involve direct examination of students' ability to use knowledge to perform a task similar to that encountered in the 'real world', for example, preparing a plot or spraying crops with chemicals.

*Product assessment* is made of a completed piece of work performed by students, such as a 'pruned tree' or 'levelled plot'. The product is the end-result of performance or process, and there are situations in Agriculture when assessment of the product is the desirable goal (Gronlund, 2003).

*Process assessment* is made of activities during the performance of a task, and includes assessment of skills and dispositions (Nitko & Brookhart, 2007). In most cases, product and process assessments are carried out to complement each other, or in situations where one cannot be assessed without the other.

*Formative assessment* is the continuous assessment of learning with the main objective of diagnosing students' weaknesses and strengths to institute corrective action. In this study the term is used interchangeably with *assessment for learning* (Airasian & Russell, 2008).

*Quality*, in this study, means conducting performance assessment fitting the intended purpose and context, or conforming to standards (Richard, 1993) of validity and reliability (Harlen, 1994) to promote learning (Greenwood & Gaunt 1994).

*Quality Assurance* is a systematic approach of ensuring quality products and services through entrenching quality in the system, and may involve training teachers on how to conduct performance assessment, use of standard tasks and clear scoring criteria, provision of enough resources, multiple assessment, and accrediting schools to offer

performance assessment (Doherty, 1994; Walklin, 1992). Quality assurance embraces the concept of *Statistical Process Control* (SPC).

*Process control* is a way of ensuring quality by concentrating on the process of production, and by looking at the system as a whole rather than in fragmented parts (Doty, 1996; Richards, 1993), so as to find the process faults (Doty, 1996) and eliminate them (Goetsch & Davis, 1997) before they could affect the end result. Looking holistically at the factors in the teaching-learning process that directly affect quality of assessment, such as methods, equipment or tools, monitoring and supervision, and teachers' skills to assess, infrastructure, administration, educational materials, cohort of learners, policies and documentation, is a process control which employs the strategy of *Six Sigma* to achieve its goals.

*Six Sigma* is a process that dramatically improves efficiency by designing and monitoring everyday activities in ways that minimize waste and resources, and achieves better, faster, and less expensive products (Henderson, 2006; Wild & Ramaswamy, 2008). It focuses on eliminating those factors that might lower the validity and reliability of performance assessment, at the earliest possible occurrence. For example, if inadequacy in training is identified as a contributory factor to low validity and reliability of performance assessment, it should be addressed at the earliest possible opportunity.

## 1.5 THE RESEARCH APPROACH

To understand and explore the characteristics and quality processes needed in the performance assessment of Agriculture in senior secondary schools, the study employed a design research design. Educational design research is "a systematic study of designing, developing and evaluating educational interventions such as programs, teaching-learning strategies, and materials, products and systems" (Plomp 2008, p. 2). The study was conducted in two phases, the first being to conduct a baseline survey to establish the needs and context of the problem, which entailed describing quality assessment practices

and processes that were ongoing, as well as points of views and attitudes that were held by stakeholders in performance assessment (Cohen, Manion & Morrison, 2000).

Based on the findings of the baseline survey, prototypes of quality tasks and assessment materials were then iteratively designed and developed for implementation in the second phase of the study. The prototypes were developed by practitioners at various stages of the design process, adopting a cyclic approach of design, evaluation and revision (Barab & Squire, 2004; Kelly, 2004; Plomp 2008; Van den Akker, Branch, Gustafson, Nieveen & Plomp, 1999). The final prototype was tried in schools and its success was measured by its practicality (utility) in real contexts (Gravemeijer, 2006). The research approach is discussed in detail in Chapter 4.

## 1.6 THE AIM AND RESEARCH QUESTIONS

Botswana has set itself a goal to achieve Universal Basic Education by the year 2016 (Vision 2016). There is significant progress in achieving that as indicated in Section 1.2 that the Apparent Intake Ratio (AIR) for both six- and seven-year olds is more than 100% (MoE&SD, 2003, p. 15). The government has long committed to providing accessible quality education to all (Government of Botswana, 1994; MFDP, 1991; MFDP, 1997; MFDP, 2003). The commissions on education of 1977 and 1993 both recommended the introduction of CA to be an integral component of certification (Government of Botswana, 1977). Continuous Assessment in Agriculture has been implemented for sometime as a response to the recommendations by Commissions on Education of 1977 and 1993. To date, there is no evidence suggesting towards its success with anecdotal evidence indicating problems of validity and reliability of marks.

The aim of the study therefore was to understand and explore the characteristics and quality processes needed in the performance assessment of Agriculture Form Four students to ensure valid and reliable examinations in Botswana. To fully address this aim, the status quo of performance assessment processes in schools was determined through a baseline survey. Subsequently, iterative design, development and evaluation of

prototypes of standard tasks and assessment materials were carried out. Against the above background, the main research questions and sub-questions guiding this study are:

1. *How valid and reliable are the performance assessment processes in Botswana schools?*

The validity and reliability of the marks produced by teachers at school level are a function of the processes and procedures followed both at school-level and system-level. To ascertain this, one has first to understand those processes and procedures in place. This was achieved through a baseline survey directed by the following three sub-questions:

a) *How is performance assessment currently conducted in Botswana schools?*

   It is important first to understand how the system of performance assessment works, to improve its processes. To fully understand and appreciate the concerns and limitations imposed by the current practice, one needs to consult with the practitioners and stakeholders.

b) *How does the current practice in schools compare with the policy and procedures for performance assessment?*

   Any undertaking in education or any sphere of life should be guided by carefully well thought through policies and procedures. One should therefore examine those policies and procedures to be fully convinced that the assessment practices are conducted properly.

c) *How does Botswana's experience compares with the international practice?*

   Due to globalisation, Botswana is compelled to evaluate its education system based on international best practice to provide high standards of education. There is an inevitable paradigm shift from exporting raw materials to human resources, hence Botswana should not be left behind.

2. *How can quality assurance processes be developed in order to produce valid and reliable marks for BGCSE Agriculture performance assessment?*

For the system to produce valid and reliable marks for certification, quality assurance processes and procedures have to be in place. Some of these are system-based and some are school-based. Among the former is the development of standard tasks and assessment materials to guide teachers in their assessment. For these materials to be relevant and useful, they have to involve stakeholders during development. This research question was addressed by an intervention guided by the following sub-questions:

d) *How can quality assurance processes for performance assessment be developed to ensure valid and reliable marks?*

   The production of valid and reliable marks is dependent upon embedding quality assurance processes into the system, particularly entrenching it into the doer. For any intervention to be acceptable to the users, they should be part of the developing team. Practitioners should be able to recognise and develop standard tasks and assessment materials for use to improve the acquisition of knowledge and skills by the students.

e) *What are the characteristics of an effective quality assurance system for ensuring valid and reliable performance assessment nationally?*

   The iterative development of assessment materials incorporating formative evaluation should ultimately result in characteristics that are peculiar to the situation at hand, which might differ from the standard one. Education should be based on the students' acculturation, as well as their prior knowledge.

## 1.7 SIGNIFICANCE OF THE STUDY

As argued in Section 1.3, there is anecdotal evidence of problems pertaining to the conduct of performance assessment in Agriculture in Botswana schools due to lack of quality assurance processes. In the context of Botswana, performance assessment constitutes CA which the RNPE recommended in 1994 to be incorporated in the certification at senior secondary school level. However, the recommendation was made taking cognisance of the fact that teachers were not well trained to handle CA, hence

priority was given training teachers thoroughly on the conduct of CA before embarking on it. Currently there is no baseline data for teacher level of proficiency to conduct performance assessment in Agriculture, this study is the first empirical study to establish that and design an intervention to ascertain quality assurance measures.

The establishment of quality assurance measures for Agriculture would serve as the basis for developing policy on CA in general as the problems of performance assessment cut across subjects. Currently, there is no policy guiding the conduct of CA increasing the chances of having invalid and unreliable performance assessment marks. The developed policy would furthermore outline other important aspects of performance assessment such as design of curriculum for training institutions particularly their "Assessment Courses" content. There is little done with regards to performance assessment in Botswana and Africa in general.

## 1.8 OUTLINE OF CHAPTERS

This section is intended to give a synopsis of the chapters that follow.

**Chapter One** has introduced the study, including the problem statement, research approaches and questions and clarification of key terms used. **Chapter Two** presents an overview of Botswana's Education System, in particular the curriculum reforms and how they have affected assessment in general, and Agriculture in particular. The literature is reviewed in **Chapter Three,** revealing a call amongst researchers for performance assessment; guidelines for developing performance assessment; what constitutes quality assessment; development of performance assessment tasks; and associated scoring criteria. It goes on to examine the validity and reliability of performance assessment and presents the study's conceptual framework. **Chapter Four** presents the adopted research design and explores the approach followed by this design and why it was preferred. **Chapter Five** is a discussion of the findings of the baseline study and their implications for intervention development. The iterative development of the first two prototypes is discussed in **Chapter Six**. **Chapter Seven** discusses the development and evaluation of

the last two prototypes. Lastly, **Chapter Eight** draws conclusions and makes recommendations emanating from the study.

# CHAPTR TWO

# THE CONTEXT OF BOTSWANA

## 2.1 INTRODUCTION

This chapter presents the context of Botswana, situating the research in terms of its demography outlined in Section 2.2 and landscape and climate discussed in Section 2.3. The economy of the country is discussed in Section 2.4. These have a bearing on the education system of the country. Focus is then placed on the education system of the country in Section 2.5, based on its structure, management, and curriculum reform for pre-primary education, primary education, junior secondary education, and senior secondary education. Section 2.6 examines the examination of senior secondary curriculum, while Section 2.7 confines itself to teaching of agriculture in senior secondary schools. Assessment in Agriculture is delineated in Section 2.8 and Section 2.9 zeroes on the assessment of practicals. Section 2.10 takes a look at the training of Agriculture teachers. The conclusion of the chapter forms Section 2.10.

## 2.2 DEMOGRAPHY

The population of Botswana has grown significantly from 650,000 in 1973 (Loken, 1973) to approximately 1,756,700 in 2001 (May, 2006; Ministry of Finance and Development Planning (MFDP), 2001 & 2005). During the 2001 population census, the population growth rate was 2.33%, indicating a lower growth rate from 3.5% between 1981 and 1991 (Republic of Botswana, 2009, p. 16). The preliminary results from the 2006 Demographic Survey show a further reduction in growth rate since the 2001 Population and Housing Census, with about 35% of the population being below the age of 15 and 5% above 65 (Ministry of Trade and Industry [MTI], 2008). Life expectancy at birth is estimated to be 39, representing a decline from 55.6 estimated in 2001 (May, 2006; Republic of Botswana, 2009). In 1991, prior to the HIV and AIDS pandemic, life expectancy had increased to 65.3 years (MTI, 2008).

Botswana is a multiethnic and multilingual country, with approximately 23 different ethnic groups speaking approximately 38 different languages (Tlou & Campbell, 1984). The national language is Setswana, while the official languages are Setswana and English, with the latter being the main medium used in government and business offices. The country covers approximately 581,730 square kilometres, with an average population density of three persons per square kilometre (May, 2006; MFDP, 2003). Traditionally a pastoral society with the majority of people living in rural areas, there has been a migration to urban centres by people in search of employment and better lives.

## 2.3 LANDSCAPE AND CLIMATE

Botswana is a landlocked country, as shown in Figure 2.1, sharing borders with Namibia, South Africa, Zimbabwe and Zambia (MFDP, 2003). The Tropic of Capricorn crosses the central part of the country around Mahalapye, signifying the southern latitude over which the sun may be directly overhead, and thus provide a 'tropical' and 'sub-tropical' climate to the country. The country has a dry, semi-arid climate with temperatures ranging from as low as – $5^0$C at night to as high as $43^0$C during the day. Most of the country is covered by the Kalahari Desert, occupying almost two-thirds of the country. This is home to the indigenous Basarwa (Khoi-San) people. Plain fertile land is found in the eastern part, where most people live. The northern part of the country is a good tourist attraction because of its natural flora and fauna. The Okavango Delta – one of the seven natural wonders of the World is located in this part of the country.


*Figure 2.1: Map of Botswana (Source: May, 2006)*

The country experiences erratic rainfall with the mean annual rainfall averaging 450 mm, exceeded by moisture loss through evapo-transpiration, with droughts being common.

## 2.4 ECONOMY

Botswana attained independence in 1966 after over 80 years of being a British protectorate (Tlou & Campbell, 1984), and one of the poorest countries in the world. However, in 1972 national income exceeded expenditure for the first time, following the sale of minerals from the newly exploited mines in Selibe-Phikwe, and almost half export earnings from the cattle industry (Loken, 1973). This made it one of the few countries in Africa to have a balanced budget (Loken, 1973), and it is now classified as an upper-middle income country, with most of the population dependent on agriculture for their livelihood (MFDP, 2009). In 1967, a year after independence, one of the world's richest diamond pipes was discovered at Orapa, and in 1982 another one at Jwaneng.

Botswana is home to a variety of minerals, such as copper, nickel, salt, soda ash, coal, gold, and potash (MTI, 2007). Exploration of these and other minerals is ongoing and has recently led to the discovery of large deposits of coal, which is expected to help satisfy the energy needs of the region for the next decade. The rich deposits of minerals have contributed significantly to the growth of the country's economy, and consequently the education sector (May, 2006; MTI, 2007). For example, according to the MFDP (2006), the MoE&SD received 27% of the 2006/2007 recurrent budget and 9% of the development budget.

Botswana's per capita income was Pula (P) 33,000[3] in 2006 (MTI, 2007). Between 1965/1966 and 2005/2006, real Gross Domestic Product (GDP) growth averaged 9% and total Government expenditure had grown to P22.4 billion by 2006/07, and was mainly locally financed (MTI, 2008, p. 14). Financing of the government budgets from foreign grants declined from 51% to less than 2% over the same period (MTI, 2008, p. 16). This

[3]£1 is equivalent to P10.00

facilitated the building of foreign exchange reserves, which amounted to around $12 billion as of the end of November 2008 (MFDP, 2009).

A report by MFDP (2009) suggests that tourism is another important natural resource which is rapidly growing and has recently surpassed minerals in terms of income generation. The country's political stability coupled with its transparent transactions according to Transparency International, earned it the status of the least corrupt country in Africa and 37$^{th}$ in the World. This has contributed significantly to the growth of this sector. The World Bank *Ease of Doing Business* Report also ranked the country 48$^{th}$ of the 175 countries in terms of relative ease to conduct business. These conditions resulted in a number of industries opening businesses in the country putting high demand on trained labour force. This triggered the government to concentrate on the education system to meet their demands.

## 2.5 BOTSWANA'S EDUCATION SYSTEM

The growth of the economy pushed the demand for skilled labour force. Expatriate labour force was expensive to sustain and the government had the social responsibility to train its own people. With more financial resources from the mining sector and agriculture, there was need to expand the formal education sector. The discussion now focuses on the education system, mainly the structure, management and curricular reform, to understand the place of performance assessment.

### *2.5.1 Structure of the Education System*

Formal education begins with Pre-Primary for children aged 4-5 years. Primary education is for children from 6 to 12 years while secondary education is for children aged 13 – 17. Anybody could enrol for tertiary institutions, through various routes which award degrees up to doctorates, as represented in Figure 2.2.

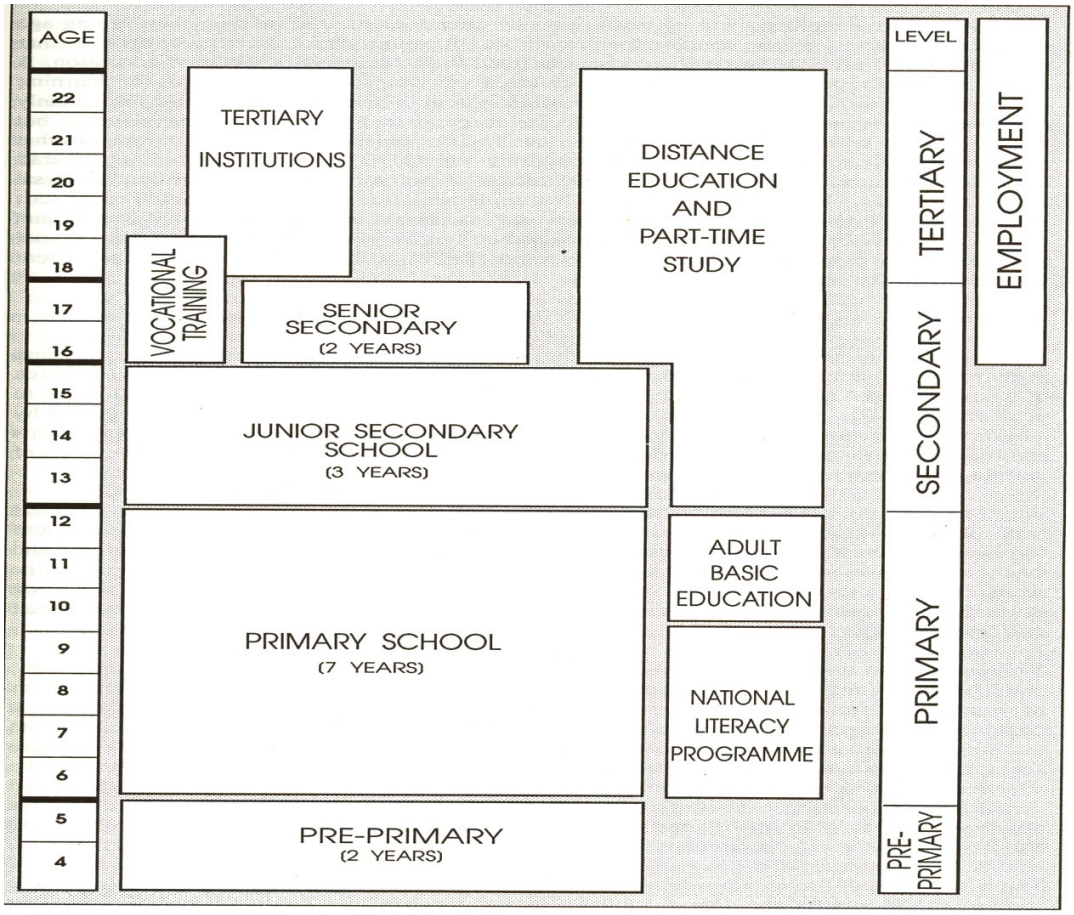


*Figure 2.2: The structure of Botswana's education and training system (Source: Republic of Botswana, 1993. p. viii)*

The first two years are dedicated to Pre-Primary education, but this has not yet been fully formalised or made operational (See subsection 2.5.3). Primary education runs for seven years, interspersed with examinations at Standard Four and Standard Seven[4]. Running parallel to formal primary schooling is the National Literacy Programme and Adult Basic Education, targeting those individuals who, by circumstances beyond their control, could not be enrolled in the formal education system.

[4] This is equivalent to grade seven

Junior secondary education is a three-year programme, followed by two years of senior secondary schooling and two-to-four[5] years of tertiary schooling (Republic of Botswana, 1993). The structure of the formal education system can be described as 2-7-3-2-(2-4), thus the first 12 years (excluding pre-primary) constitute basic education, in accordance with the World Conference on Education For All in Jomtein (UNICEF, 1990). In addition, the Distance Education run by Botswana College of Distance and Open Learning, University of Botswana and Teacher Training Colleges, offers opportunities to individuals who wish to pursue studies whilst working.

### *2.5.2 Management of the Education Sector*

Education and Training is mainly the responsibility of the Ministry of Education and Skills Development (MoE&SD), with some ministries such as Ministry of Labour and Home Affairs (MLHA) also offering post-secondary training, and Local Government jointly oversees the running of Pre-Primary education. However, plans are at an advanced stage to wholly relocate this important sector of the education system to the MoE&SD for better coordination, in line with recommendations 9 and 11 of the Revised National Policy on Education of 1994 (Republic of Botswana, 1994).

### *2.5.3 Education and Curricular Reform*

Reforms have been taking place across all levels of the education system. Accelerated reforms took place particularly at the primary level. There were very little reforms in both the pre-primary and senior secondary levels. Emphasis is now on those two levels.

*Pre-Primary Education*

Nearly 10% of children aged between two and five receive Pre-Primary education (MoE&SD, 2009, p. 15). According to MoE&SD (2006, p. 22), only 1,638 children out of a total of 50,868 (3.22%) of Standard One learners had access to Pre-schooling. Currently, there is no common curriculum to link teaching with formal education, and

[5] The qualification is dependent upon the institution and programme followed. Normally certificate courses take up to two years, Diploma from two-three years while degree courses are normally four years for pre-service students and two-three years for in-service students

activities vary from one school to the other (MFDP, 1991). The quality of teaching at Pre-Primary is questionable, due to the inadequate training institutions for this level. The only training institution serves the whole country, with an output of only 30 teachers per year. As a result, the number of untrained teachers is high. For example, there were 48.5% in 2005 which increased to 49.6% in 2006 (MoE&SD, 2009, p. 8).

Although progress towards formalising pre-primary education is being made, as evidenced by the establishment of the Pre-Primary Education Unit in the Ministry of education and Skills Development, and the formulation of the relevant policy in 2001 (MoE&SD, 2001), curriculum development is still at a draft stage and substantial Teacher Training has not yet started. No student-teachers have yet enrolled in Colleges of Education for the two-year training programme for pre-primary education.

*Primary Education*

There were only 250 primary schools at the time of independence in 1966 (MTI, 2008), compared to the latest figure of 782 countrywide (MoE&SD, 2009). During the same period, enrolment rose from 72,000 to 333,417 (MoE&SD, 2009). School fees were abolished in 1980 to facilitate increased access to school by all children, leading to an exponential increase in enrolment, and for the first time including girls, who are now equalling boys in number (Government of Botswana, 2006). It is expected that the quality of teaching has improved since the percentage of untrained teachers dropped from 39% in 1978, to 16% in 1991, to 5.5% in 2009 (MoE&SD, 2009, p. 23).

The proportion of children at school-going age who are not enrolled in schools has fallen, from 17% in 1991 to 3% in 2003 (MTI, 2007, p. 18), with the drop-out rate being only 1.2% in 2006 (MoE&SD, 2009, p. 22). The repetition rate was also low, at 0.2% in 2006 (MoE&SD, 2009, p. 21). This rate, although still undesirable, constitutes an impressive record on the part of government, given that less than two-thirds of children in Sub-Saharan Africa are enrolled in primary schools (United Nations, 2005). Botswana's transition rate from primary to junior school level has been increasing steadily, from 92.6% in 1998 to 97.7% in 2006 (MoE&SD, 2009, p. 21).

In terms of teacher quality, a diploma qualification has been introduced in Teacher Training Colleges to replace certificate qualification and strategies to upgrade in-service teachers to diploma level has been put in place, mainly through distance education. Currently, about 97.1% of primary school teachers have at least a diploma qualification (MoE&SD, 2009. p. 23). The national Pupil-Teacher Ratio is currently 25:1 (MoE&SD, 2009, p. 20), indicating a favourable environment to facilitate pragmatic and constructivist approaches to the teaching-learning process.

The newly developed curriculum has introduced new subjects such as Creative and Performing Arts (CAPA), Guidance and Counselling, and Agriculture, (MoE&SD, 2002, 2005, & 2007). CAPA is made up of different practical subjects such as Design and Technology, Home Economics, Music, Physical Education, Art and Craft, and Business Studies, and was introducing at this level with the aim of developing the manipulative skills in pupils at a young age.

*Junior Secondary School Education*

On gaining independence in 1966, there were only nine unified secondary schools in Botswana. By 2008, government had constructed 206 junior secondary schools. In 2006, the transition rate from primary to junior secondary school was 97.7% (MoE&SD, 2009, p. 21), a high figure which resulted in shortage of teachers culminating in 6.6% of expatriate teachers and 1.8% of untrained teachers finding their way in the teaching force (MoE&SD, 2009, p. 28). This triggered massive teacher training initiatives resulting in an oversupply of teachers in all subject areas (Bennel & Molwane, 2008).

The challenge to provide basic education for all resulted in an emphasis on quantity at the expense of quality, (as discussed in Section 1.2), led to the second Education Commission redirecting the philosophy of the education system to providing "… a foundation that enables individuals to cultivate manipulative ability, positive work attitudes..." for its recipients to fit in the world of work (Republic of Botswana, 1993, p. 19). A number of practical subjects were thus introduced into the curriculum, to align with the aim of basic education, in particular. Two such aims which are of relevance here were:

(i) to include a number of practical subjects that can help learners to develop an understanding and appreciation of technology, manipulative skills and familiarity with tools, equipment and materials

(ii) to vocationalise the academic subjects.

The present junior secondary curriculum comprises core and optional subjects (MoE&SD, 2002c). The core subjects are studied by all students, who then choose one from each group of Vocational, CAPA and General Studies (MoE&SD, 2002b). Agriculture falls in the core subject grouping, and its assessment is through paper-and-pencil tests as well as a practical work.

*Senior Secondary School Education*

There are 28 Government senior secondary schools and a few private schools offering either BGCSE or IGCSE in the country (MoE&SD, 2009). These cannot absorb all students from 206 government junior schools and many more private schools. As such, the current transition rate stands at 67%, but it was expected to have increased to 70% by 2010 when four more new senior secondary schools come into operation (MFDP, 2009. p. 22; MTI, 2008, p. 150).

Assessment at this level of education was localised in 1996, following recommendations by both the First National Commission on Education (Republic of Botswana, 1977) and Second National Commission on Education (MoE&SD, 2002b; Republic of Botswana, 1993). The recommendations of these commissions have resulted in the development of a relevant curriculum to meet the socio-economic needs of the country.

Senior secondary education follows a two-year programme, progressing from the Basic Education Programme. The curriculum is extensive, and offers an opportunity for learners of different abilities to develop their talents. Core subjects are taken by all students, with optional ones from which they choose subjects aligned to their career aspirations. Table 2.1 shows the subject groupings. Subjects are grouped into Core and Optional. Optional group is further divided into Sciences; Creative, Technical and vocational; and Enrichment (2002b). Terminal examinations, which are subject-based,

are written at the end of the programme, and the results are used for selection and placement purposes in training institutions and employment. Only a few candidates progress to tertiary institutions, although this has been steadily increasing.

Table 2.1: *BGCSE curriculum subject groupings*

| CORE GROUP | OPTIONAL GROUPS | | | |
|---|---|---|---|---|
| **Core** | **Humanities and Social Sciences** | **Sciences** | **Creative, Technical and Vocational** | **Enrichment** |
| English | History | Single Science | Design and Technology | Third Language |
| Setswana | Geography | Double Science | Agriculture | Physical Education |
| Mathematics | Social Studies | Chemistry | Art | Music |
| | Developmental Studies | Physics | Food and Nutrition | Religious Education |
| | | Biology | Computer Studies | Moral Education |
| | Literature in English | Human and Social | Fashion and Fabrics | |
| | | | Business Studies | |
| | | | Home Management | |

## 2.6 EXAMINATION OF SENIOR SECONDARY CURRICULUM

Before localising examinations in 1996, Botswana students sat for Cambridge Overseas School Certificate (COSC) O-level examinations set and marked by Cambridge International Examinations (CIE), the then University of Cambridge Local Examinations Syndicate (UCLES). The first National Commission on Education (Republic of Botswana, 1977) identified a number of constraints associated with continued dependence on COSC, and these were reiterated by the second Commission on Education:

- Limited ability in influencing curriculum development in line with the aspirations of the nation, in terms of on-going socio-economic development
- The requirement to pass English as a basis for determining the pass levels
- Offering of group subject examinations which aggregate a number of subjects in order to gain a certificate with English determining the grade (Republic of Botswana, 1993, p. 188-189).

Consequently, the notion of establishing an Examinations Council to run the examinations was revisited, with a view to strongly recommend its enactment with immediate effect. This was realised in the National Development Plan 7, 1991-1997 (MFDP, 1991). This was viewed as an opportunity for localising curriculum development to cater for a wider ability group and for emphasizing practical and business subjects. It would also promote continuity and linkages between junior and senior secondary curricula, and allow for the review of modes of assessment so as to relate to the world of work. In 2000, the first groups of subjects were written and marked locally. Currently, almost all the subjects are set and marked locally, with the exception of Religious Education.

## 2.7 TEACHING AGRICULTURE IN SENIOR SECONDARY SCHOOLS

BGCSE Agriculture is classified under *Creative, Technical and Vocational* group (see Table 2.1, above). The *Oxford Advance Learners' Dictionary* (Hornsby, 2000) defines *creative* as "Involving the use of skill and the imagination to produce something new or a work of art". It defines *technical* as "connected with the practical use of machinery, methods, etc in science and industry", and *vocational* as "Connected with the skill, knowledge, etc that you need to have in order to do a particular job". Using these definitions, one may argue that the placement of Agriculture in this group was appropriate, since instruction is largely practical and, consequently, the mode or format of assessment is predominantly performance. A mismatch between instructional strategy and format of assessment can result in wrong data being generated, with serious consequences for those being assessed (Stiggins, 2002). Statute

Agriculture is classified as a 'Full Classes' subject according to the MoE&SD Circular[6] of 1st February 2005. Full classes are those that take the minimum number of learners as 30, as stipulated in the Revised National Policy on Education. Other *Creative, Technical and Vocational* (See Table 2.1)are classified as 'Non-Full Classes' with a maximum of 20 students. Contrary to Subject groupings by CD&E (see subsection 2.5.3), Agriculture is the only subject that has been classified by the Circular as a non-practical subject among the *Creative, Technical and Vocational Group*. It is allocated four periods of 40 minutes per six-day timetable for learning and teaching of theory, conducting practicals and assessment (MoE&SD, 2002b). Teachers are required to have a minimum of five classes (24 periods) and a maximum of six classes (29 periods). Such high workloads given that it involves conduct of performance assessment are likely to impact negatively on achieving the aims of BGCSE Agriculture (MoE&SD, 2000a, p. 2), which are to acquire and develop:

1. an appreciation of agriculture as an applied science.

[6] These are directives that are issued by the Ministry Officials as the need arises to modify or direct educational transactions.

2. interest and awareness of existing problems and opportunities in Agriculture in the context of rural development.

3. exposure to out-of-school farming activities, such as agricultural fairs, field trips and the job-shadowing exercise in preparation for the world of work.

4. skills to demonstrate the value of agriculture to the family, community and the national world economies.

5. initiative, problem-solving abilities and scientific methods so as to encourage a spirit of resourcefulness and self-reliance.

6. desirable behavioural pattern and frame of mind in interacting with the environment in a manner that is protective, preserving and nurturing.

7. business and entrepreneurial skills necessary to develop and manage an agricultural project.

8. skills that are relevant to agriculture, including objectivity, precision, initiative, experimentation and research.

9. knowledge and understanding about the efficient use of available government assistance programmes aimed at agricultural development in Botswana.

10. knowledge and understanding of the recent technological development in agriculture.

The aims of BGCSE Agriculture, thus, suggest a paradigm shift from learner-centred approaches to pragmatic and constructivism approaches for effective instruction.

## 2.8 ASSESSMENT IN AGRICULTURE

The examinations conducted by the Botswana Examinations Council are geared towards meeting the overall objective of national education, as pronounced by RNPE, which is “to

assume more effective control of the examination mechanism in order to ensure that the broad objective of the curriculum are realized" (Republic of Botswana 1994.p.5). There are three main assessment objectives for agriculture enshrined in both the Teaching Syllabus (MoE&SD, 2000a) and Assessment Syllabus (MoE&SD, 2000b, p. 4). These are:

1. Knowledge with understanding
2. Handling information, Application and Problem Solving
3. Practical and Investigative Skill

Details of each assessment objective are given in Boxes 1, 2 and 3 (below).

Assessment objective 1 contributes 30% to the examination and mainly constitutes *Knowledge with Understanding*. It is important that students have a basic understanding of the subject matter that will form the fundamental basis for further comprehension of high-order content. Assessment objective 2 assesses the *Comprehension and Critical thinking* and this contributes 40% to the overall mark. Assessment objective 3 assesses the *Practical and Investigative Skills* of the students and constitutes 30% of the overall mark (MoE&SD, 2001, p. 4). Combinations and permutations of the three assessment objectives result in the three papers as shown in Table 2.2 (below), namely; multiple choice (Paper 1), short answer questions and essays (Paper 2), and practicals (Paper 3).

Box 1: Objective 1 - Knowledge with understanding and problem solving

The candidates should be able to use oral, written, symbolic, graphic, tabular, diagrammatical and numerical presentations to:

1. Locate, select, organize and present information from a variety of sources.
2. Translate information from one source to another.
3. Use information to identify patterns, report trends, draw inferences, make predications and propose hypothesis.
4. Present reasoned explanations from phenomenon, pattern and relationships.
5. Solve problems of a quantitative and qualitative nature.

Box 2: Objective 2 - Handling information, application

The candidates should be able to demonstrate:

1. Correct use of terms, symbols, quantities and units of measurement.
2. Correct reference to facts, concepts, laws and principles.
3. Safe Agricultural practices that prepare students for a productive life.

Box 3: Objective 3 - Practical and investigative skills

**Practical Skills and techniques**

The candidates should be able to:

1. Understand and follow instructions.
2. Choose and use suitable techniques, equipment and materials safely and correctly.
3. Record observations, measurements and estimates.

**Practical Investigations**

The candidates should be able to:

1. Identify problem and plan an investigation.
2. Organize and carry out an investigation.
3. Interpret and evaluate observations and experimental data.
4. Draw conclusions and make recommendations.

(*Source: Ministry of Education and Skills Development, Agriculture Assessment syllabus 2001, p. 3-4.)*

Table 2.2: *Examination format for BGCSE Agriculture*

| Paper | Nature of the paper | Objective | Duration | Raw mark | Weight |
|---|---|---|---|---|---|
| Paper 1 | Multiple choice | 1 & 2 | 45 min | 40 | 40% |
| Paper 2 | Short answer questions and essays | 1&2 | 2 hr 15 min | 100 | 40% |
| Paper 3 | Practical | 2&3 | 5 terms* | 155 | 20% |

* 1 term is roughly 66 days ±1, assessment starts already in previous year.

(*Source: Ministry of Education and Skills Development, Agriculture Assessment syllabus 2001, p. 6.)*

The weighting of Paper 1 and Paper 2 is 40% each, whilst that of Paper 3 is only 20% (MoE&SD, 2001, p. 6). The weightings of the papers do not correspond to their demands as evidenced by the time spent. Primarily, a student who performs well in Paper 1 stands a better chance of obtaining a better grade than one who has high marks in Paper 3, yet Paper 3 is allocated more time than any other paper. The pros and cons of multiple choice questions are fully documented by Airasian (2005); Gronlund (2003); Kellagan and Greaney (2001); Nitko and Brookhart (2007) and shall not be discussed here. Grade descriptors presented in Appendix 2.1 attest to the importance of practical skills acquisition. If the practical skills are so important to the learner they should be reflected in the weighting of marks.

## 2.9 ASSESSMENT OF PRACTICALS IN AGRICULTURE

The BGCSE Agriculture practical assessment is divided into two parts. The first part comprises a number of practical tests assessed by the classroom teacher and his/her mark is final. The assessment is guided by marking criteria (See Appendix 2.2), and this part accounts for 51.6% (80 out of 155) of the total mark (MoE&SD, 2001, p. 26). The other part is the project work, which involves problem investigation to design a practical

solution to a real agricultural problem and produce a report on the findings. This accounts for the remaining 49.4% (75 out of 155) (MoE&SD, 2001, p. 27). The total of the two are then scaled down to 20% of the final mark (see Section 2.6) (MoE&SD, 2001, p. 6).

The main aim of the practical tasks assessment is mainly to assess the processes and procedures leading to the outcome, product or artefact. Since the processes have transitory evidence they can only be assessed by the classroom teacher, hence any attempt to moderate the teacher marks will be extremely difficult and distort the outcome. When conducting the practicals a portfolio is kept by the students, detailing the development of the investigation. Examples of tasks for practical work are presented in Appendix 2.2, while the criteria for assessing practical tests are briefly delineated in Table 2.2, (a full guide is presented in Appendix 2.3).

*Table 2.3: Brief description of criteria for assessing practical tests*

| **Criteria** | **Description of criteria** |
|---|---|
| Responsibility | the ability to resume responsibility for the task in hand, and to work from given instructions without detailed supervision and help |
| Initiative | the ability to cope with problems arising on connection with the task, to see what needs to be done and take corrective action. |
| Technique | the ability to take practical tasks in a methodical, systematic way and to handle tools skilfully and to good effect. |
| Perseverance | the ability to see a task through to a successful conclusion with determination and sustained effort. |
| Quality | the ability to attend to detail so that the work done is well finished and well presented. |

The objective of the project is to equip candidates with research and investigative skills. It provides students with the opportunity to develop a hypothesis, plan an investigation around the hypothesis, carry out the investigation, analyze and interpret data collected during the investigation, make observations, write a report, draw conclusions and make recommendations.

The time spent on the project depends on its nature. Some take a few weeks, such as surveys, while others last for some months, such as field experiments. The practical processes of carrying out the investigation are not assessed, even though the project is supervised by the teacher. The student then writes a report, which is first scored by the classroom teacher and then externally moderated by a visiting moderator who then reconciles the marks with the teacher. Detailed marking criteria for scoring the project is shown in Appendix 2.4.

Moderators have a final say, despite the model they follow which aims for reconciliation rather than the exertion of external power. Moderators exert power because they are involved with a product-product continuum, with comparability of pupils central to their concern (Radnor & Shaw, 1995). Judging by the examples of practical tasks suggested, and the corresponding marking guide, there is no doubt that the intention is to impart students with life skills and foster critical thinking among students. The determination of whether the practical tasks are carried out and assessed as enshrined in the syllabus is a main aim of this investigation.

## 2.10 TEACHER TRAINING

Teachers for Agriculture are trained at either the College of Education or the College of Agriculture. The former runs a three-year programme for Agriculture teachers destined to teach at junior secondary school level and culminating in a Diploma qualification. The latter trains teachers for degree level and these teachers are meant to teach at senior secondary schools. The course is four years for pre-service students, and three years for diploma holders. A diploma qualification holder can also teach in senior schools and vice-versa. Analysis of the content of "Assessment/Measurement Course" for both colleges revealed that assessment of practicals was not treated in great detail.

One of the recommendations by the Second Commission on Education was the inclusion of continuous assessment marks in the certification of the candidates. This implied that adequate training of teachers to handle continuous assessment should be undertaken. A

consultancy engaged by the examining body to advise on the role and modalities of incorporating Continuous Assessment recommended that the Examining Body should assist the MoE&SD to develop a standard Assessment Course to be taught in Education Colleges and at the University (Nitko, 1998). However, nothing concrete has to date been done to implement such a course.

## 2.11 CONCLUSION

The structure of the formal education is two years for pre-primary, seven years for primary, three years for junior secondary, two years for senior secondary and two-four years of tertiary education. The least developed level is the pre-primary, i.e., the foundation of education, with about 51% of teachers being trained. The current transition rate from junior to senior schools stands at 67%, and Agriculture has the highest number of students among the optional subjects. Agriculture is classified as a Creative, Technical and Vocational subject, and is the only subject in that group which takes the minimum number of learners of 30, while other subjects in the same group take a maximum number of 20.

Agriculture is assessed by three papers. The one that takes the longest time contributes the least (20%) to the final grade, apparently due to the difficulties of ascertaining its validity and reliability. The assessment in this paper is based on two components, namely the practical tests and the project. Assessment of the practicals is ill-structured, while that of the project is well structured. The next chapter discusses how reliability and validity of performance assessment can be improved.