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TOPICS IN DAGBANLI PHONOLOGY: A CROSS-DIALECTAL STUDY

BY

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DECLARATION

I do hereby declare that with the exception of references that have been duly cited, **Topics in Dagbanli Phonology: A Cross-Dialectal Study** is the result of my own research and that it has not been presented either in whole or in part for another degree elsewhere.

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DEDICATION

To

my wife: Mariama

my sons: Inusah & Sadiq

my late sister: Muniratu (Kande)

ABSTRACT

The thesis is a cross-dialectal investigation of various topics in Dagbanli Phonology. It is set up to contribute to the understanding of segmental phonology which concerns individual segments of speech and their patterns. It responds to basic empirical questions about suprasegmental phonology which realm is linked utterances. A cross-dialectal study of segmental phonology as well as suprasegmental properties of the dialects is discussed and assessed for the purpose of Dagbanli phonology. The prime objectives are to describe variations in Dagbanli dialects, to provide analysis of the topics in Dagbanli phonology across dialects and to advance sound correspondence and sound alternation across Dagbanli dialects. Ethnographic Approach is employed to solicit the primary data from bucolic Dagbanli speech communities. Descriptive Method is engaged for the analysis of both primary and secondary data available while Theories of Data and Free-Standing Theories are applied where necessary. Gbanjonsili 'Gbanjon dialect', Zundusili 'Zundua dialect' and Jimansili 'Jiman dialect' are discovered as the sub-dialects of the major dialects of Dagbanli; the suffix [-sili] in this context refers to a dialect. The sub-dialects have the velar fricatives [x, ɣ] confined to specific segmental contexts with a particular inventory stricture. It reveals that the voiced coronal stop /d/ in the standard dialect manifests as voiceless coronal stop [t] in Zundusili, voiceless coronal affricate /ʧ/ in Gbanjonsili and voiceless dorsal stop [k] in Jimansili through fortition process of devoicing. The thesis confirms coalesce of non-coronal labial /m/ and coronal fricative /s/ to produce dorsal fricative [x] in intervocalic in Gbanjonsili (e.g., /m+s/→[x]; /wóm-sí/→ [wóxɨ́] 'tame'). The thesis describes assimilation and non-assimilatory processes such as lenition and fortition

as the phonological units that account for dialectal differentiation in Dagbanli. Both lenition and fortition operate on segmental level and are not caused by neighbouring segments; while Lenition concerns phonological weakening (e.g., /s/→[h], /má:**s**ílí/ → [má:hílí] 'cool weather'), fortition employs phonological strengthening (e.g., /d/→[t], /díní/ →[tíní] 'knee'). Four different models are attested in the description of segmental differences and similarities across dialects; these models, Relisational, Selectional, Systemic and Distributional, highlight the segmental properties as well as phonological processes affecting the surface realisation of the segments. The alternation of [a~ɔ], [ɔ~a], [a~o] and [i~u] are described in Dagbanli as selectional (random) but not distributional (rule-governed). The thesis suggests that the chief source of segmental variations in Dagbanli is in vowel quality. The thesis describes the basic patterns of harmony systems across Dagbanli dialects with focus on triggers and targets. It argues that backness harmony in Dagbanli and its dialects is progressive where harmonic features spread from root-to-suffix. It shows that mora-counting play significant role in the description of Dagbanli phonology and falling tone is a feature in Dagbanli. The thesis concludes that Dagbanli counts CV.V and CVN as heavy while CV as light convincingly showing moraic consistency. Also, tone is observed as the diagnosis for mora-counting in Dagbanli Phonology.

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LIST OF ABBREVIATION

σ	Syllable
μ	Mora
ω	Prosodic Word
F	Feet
[ATR]	Advanced Tongue Root
Ø	Zero Morpheme
+	Final Vowel
]	Stem Boundary
#	Word Boundary
C	Consonant
Eng.	English
Anim.	Animate
Emph	Emphatic
Imper.	Imperative
Imperf.	Imperfective
Inanim.	Inanimate
N	Noun
V	Verb
Nom.	Nominaliser
Perf.	Perfective
pl.	Plural
sg.	Singular
Def	Definite

AD	Across Dialects
WD	Western Dialect
ED	Eastern Dialect
SD	Southern Dialect
Tomo	Tomosili
Naya	Nayahili
Nan	Nanunli
Zun	Zundusili
Gban	Gbanjonsili
Jim	Jimansili
PA	Place Assimilation
HNA	Harmonic Nasal Assimilation
H	High
L	Low
F	Falling
TBU	Tone Bearing Unit
TOD	Theories of Data
FST	Free-Standing Theories
DM	Descriptive Method
→	Realised as
cf.	compare
.	Syllable Break

CHAPTER ONE

GRNERAL INTRODUCTION

1.1 Introduction

The thesis is a cross-dialectal investigation of various topics in Dagbanli Phonology. Dagbanli cuddles differences in vocabulary, grammar and pronunciation that provide details which result in dialectal variations of the language. The thesis is set up (i) to contribute to the understanding of segmental phonology and (ii) to respond to basic empirical questions about suprasegmental phonology which realm is linked utterances. This thesis explores a cross-dialectal investigation of topics in Dagbanli sound system developed over the past years. Cross-dialectal investigation of various issues in Dagbanli Phonology is significant for the people of variant dialects. Previous studies of Dagbanli phonology discussed Dagbanli grammar and phonology, however, a detailed study of dialectal variation in the language is uncommon.

In providing a detailed account of the topics in Dagbanli phonology, topics to be covered include: segmental phonology and suprasegmental phonology. It explores the assimilatory processes of the segments as part of the segmental studies. Notice that Dagbanli has sub-dialects in which the velar fricatives [x, ɣ] are confined to specific segmental contexts with a particular inventory stricture. It reveals that the dorsal stop /g/ and the coronal fricative /s/ coalesce into the velar fricative [x] in one of the sub-dialects and this is attested through phonological processes such as place assimilation followed by velar stop /g/ deletion. Segmental differences are discussed across the dialects highlighting the differences and similarities between

the dialects. It also looks at phonological processes responsible for the surface realisations of the segmental differences in the three major dialects of Dagbanli namely: Tomosili, Nayahili and Nanunli. It investigates certain features and changes that take place in the various sub-dialects.

The second aim is to investigate prosodic and suprasegmental differences that characterise the three different dialects. In doing so, I focus on syllable and tone differences between the three dialects. It further investigates intonation across Dagbanli dialects. To make the distinction between sounds and orthographic forms in Dagbanli, the symbol, < >, is used for the purpose of representation.

1.2 Dagbanli and its Speakers

Dagbanli, a Mabia language, is spoken in Ghana in the Northern Region and some parts of the country. The language comprises Tomosili, Nayahili and Nanunli as its main dialects (Inusah 2016a, 2019; Hudu 2016, 2018). In this study, I will use Tomo for Tomosili dialect, Naya for Nayahili dialect and Nan for Nanunli dialect for the purpose of analysis. Tomo is a local name for Tomosili dialect while Naya is a local name for Yendi where Nayahili is mainly spoken. For Nan, it is a clip form of Nanunli.

Oral tradition reveals that the history of Dagbanli speakers is traced to *Tohazie* 'red hunter'. He is believed to might have been born in a place called *Gomba* (Zamfara) in the heart of the early Songhai kingdom to the west of Bornu. The scares left by ethnic bodily marks of the *Zamfara* people, who are said to have remained behind and to have been conquered, are similar to that of the present Dagbamba; the Dagbamba recognize these folks as their kin. *Tohazie's* father was

called *Tiyawumya* 'we have heard' and he hailed from Egypt and belonged to the royal family. He was said to have travelled westwards from the North-East of Lake Chad to the South of the Niger bend. *Tohazie* who was the surviving son of his father and a great hunter with so much hunting skills arrived in the Mali Empire in the middle of a drought and led the villagers to kill a wild beast (bull) which invaded their only river and source of drinking water. He married a Malian princess called *Paɣ'wubga* 'woman vulture*'* who gave birth to a son called *Kpaɣ'nimbo* 'what can diseases do'. *Kpaɣ'nimbu* also travelled westwards from the Mali Empire to Biun, in Fadan 'N' Grumah where he established a kingdom and married two women - *Sihisabiga* and *Suhuyini* 'one heart'. While *Suhuyini* gave birth to *Gbewaa, Sihisabiga* gave birth to *Malgimsim, Nyelgili,* and *Namzisheli.*

Gbewaa migrated to Pusiga in the Upper East region of Ghana and established the first *Dagbaŋ* Kingdom where he ruled until his death. *Naa Gbewaa* was believed to have nine children but only five sons - *Zirili, Kufogu, Sitobu, Tohagu* and *ŋmantambo* as well as a daughter, *Yentuaɣiri* are mentioned in this thesis. *Kufogu* who was murdered by *Zirili* out of jealousy was the heart of *Naa Gbewaa*. It was based on *Kufogu's* death that *Naa-Gbewaa* had himself swallowed by the earth according to the oral traditions of the *Mole Dagbanli* speakers who were known as *Dagbamba* in Pusiga. *Naa Zirili,* the first son, then took over from *Naa Gbewaa.* The death of *Naa Zirili,* the elder son of *Naa Gbewaa,* started the dispute among his three surviving brothers-*Tohagu, Sitobu* and *ŋmantambo*. The misunderstanding led to the split among the three brothers. ***Tohagu*** moved to *Mamprugu* and established the *Mamprugu* Kingdom while ***Sitobu*** moved to *Dagbaŋ* and established the current *Dagbaŋ* Kingdom and ***ŋmantambo*** also moved to *Nanuŋ*

and established the *Nanuŋ* Kingdom (Inusah 2016a). The family relationship is presented in the diagram below:

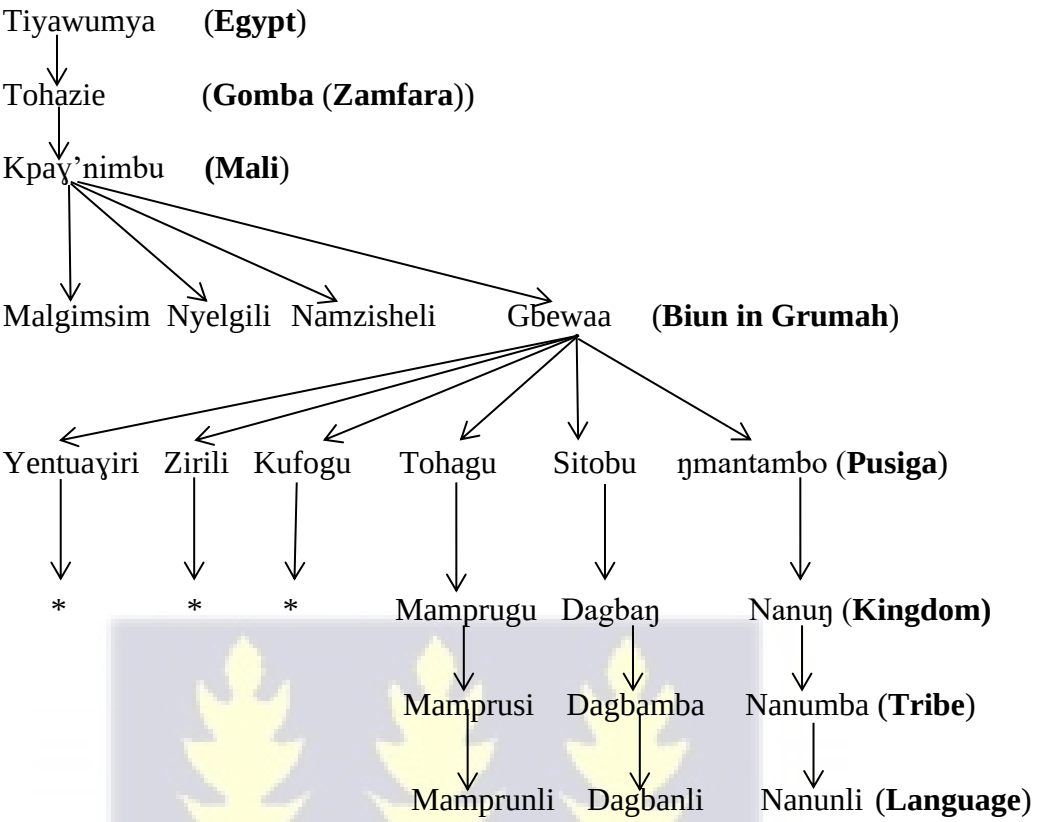


Figure 1.1: The Lineage of Dagbanli Speakers (cf. Inusah 2016a)

Figure (1.1) presents the family lineage which gave birth to the Dagbanli speakers who were called Dagbamba in the early days. The name Dagbamba was once used in Fada N' Grumah 'name of a town' and it was believed to have been originally the Grumah name for the people living to the south of their territories, which the ancestors of the Mamprusi, Dagbamba and Nanumba took after they had conquered the people of Grumah. Figure (1.2) is the Northern Regional map of Ghana indicating the location and places where Dagbanli is spoken frequently in Ghana.

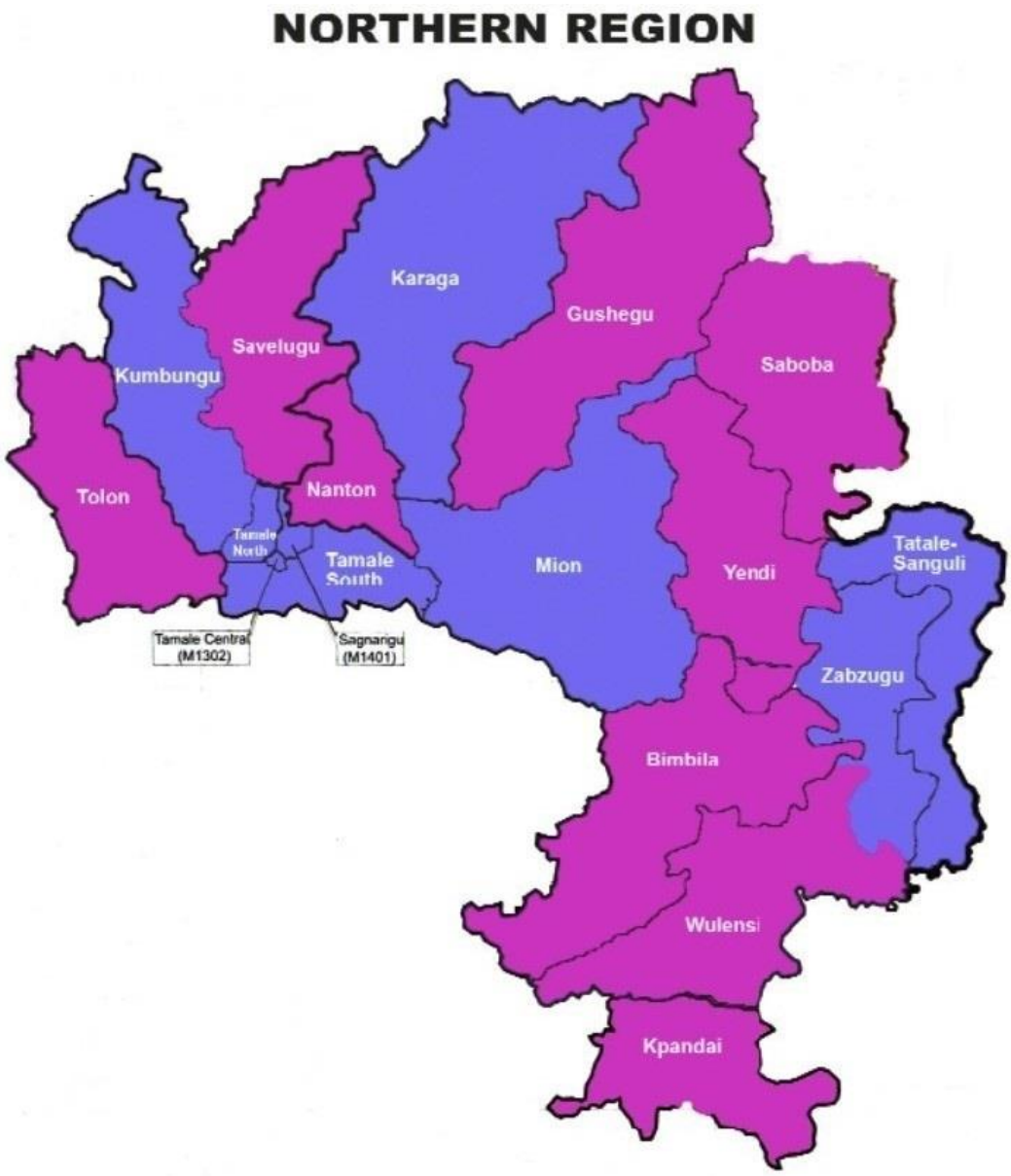


Figure 1.2: Northern Regional map
Source: www.Ethnologue.com.

Dagbanli which is currently spoken in the Northern Region is popularly known as Dagomba [daŋ-gomba] 'Dagbanli language'. The name [daŋ-gomba] is deduced from two lexical items [daŋ] 'clan or family' and [gomba] 'name of a place' through morphological process of compounding where the free morpheme [daŋ] is added to

the root [gomba] to create the new lexeme [daŋ-gomba]. The name [daŋ-gomba] was, however, changed to [dagbamba] in Biun with time due to pronunciation differences. Phonologically, there is evidence of coalesce of the stem coda nasal /ŋ/ in *daŋ* and stem onset /g/ to labial-velar [gb] in intervocalic in the new word [dagbamba].

The people who speak Dagbanli are referred to as Dagbamba-pl and Dagbana-sg. Again, the singular form [dagban-a] is realised from [dagbam-ba] through sound substitution where the labial nasal /m/ in [dagbam-ba] in stem final becomes coronal nasal /n/ after the suffix labial stop /b/ is deleted to permit /n/ to occur with the unrounded suffix vowel /a/. This process generates the singular form [dagbana]. Alternative pronunciation may include:

(1.1) a *dagbamb
b. *dagbanba
c. *dabana
d. dagbana

Examples (1.1 a--c) are ungrammatical because in (1.1a) the labial sequence [mb] do not end a word in the language; in (1.1b) the alveolar nasal /n/ does not occur with the labial stop /b/ as it violates nasal place assimilation, so [*nb] is not accepted while in /1.1c/ the native speaker prefers the labial-velar /gb/ to labial stop [b], which is common in the speech of non-native speakers. The labial-velar /gb/ is preferred because it is grammatical in the language. Also, Dagbanli 'name of the language' which is commonly used is coined from Dagbanli by deleting the suffix lateral /l/ to aid easy pronunciation by both native speakers and non-native speakers though both

realisations are accepted. The word might also have the following possible pronunciations:

(1.2) a. *dagbali
b. *dagban
c. dagbani
d. *dabani

(1.2c) is preferred in the language while (1.2a-b) are ungrammatical and will also post difficulty in pronunciation. Some non-native speakers are likely to pronounce it as *[dabani] since the labial-velar /gb/ may not occur in their languages. This provides evidence of phonological processes yet to be discussed in this thesis in the language.

1.3 Dialects of Dagbanli

A Dialect is one of the subordinate forms or varieties of a language arising from local peculiarities of vocabulary, pronunciation and idiom (Hawkins1992:226). Dialect differences thus include, in addition to pronunciation variants, differences of grammar such as the examples below:

(1.3) a. Jimansili: gbɨb-lí ɲàm → kób-lɨ nàm 'hold-it calm'
b. Jimansili: kàmíná kà tí ʧâŋ → dóŋ-nà kà tí wɛ́ 'come and we go'
c. Zundusili: ń gɔ́n-jà → dè:já 'you welcome'

In the example above, the forms on the right in (1.3a) and (1.3b) in Jimansili and (1.3c) in Zundusili are derived from the standard dialect Tomosili which is spoken in Tamale, the Northern Regional capital. Dialects which are varieties of speech

within a language are widely accepted as the basic units of phonological representation. They also include differences of vocabulary such as the examples below:

(1.4) Vocabulary difference in Dagbanli sub-dialects

Gbanjonsili	**Jimansili**	**Zundusili**	**Gloss**
kʊ̀lɨ	tàpárɨ̀ŋá	ɲàŋà	'hoe'
gɔ́n-jà	gɔ́n-jà	dɛ̀:já	'response'
kàmíná	dʊ́ŋ-nà	kàmíná	'come'
ʧâŋ	wɛ́	ʧâŋ	'walk'
kɔ́bá	kánlɨ́	tá:já	'lorry tyre'
dʊ̀nɔ́lɨ̀	dʊ̀ndɔ́lɨ̀	zàŋgárɨ́	'door'
ɲìná	ŋàbɾà	ɲìná	'teeth'

As seen above, words such as ŋàbɾá 'teeth' in Jimansili for instance, is used only locally with no exact equivalent in Gbanjonsili and Zundusili. Dialects often involve differences of grammar and vocabulary but the differences may involve phonology, which is why 'accent' alone cannot account for all phonological differences.

Previous studies of Dagbanli phonology (Inusah 2016a. 2019, 2020; Hudu 2010, 2014a, 2016, 2018; Hudu & Nindow 2020) reveal that Tomosili (Western Dialect), Nayahili (Eastern Dialect) and Nanunli (Southern Dialect) are the three dialects of Dagbanli. In addition to the major dialects, the thesis identified three sub-dialects in Dagbanli which are refer to in this thesis as Gbanjonsili, Zundusili and Jimansili. For the purpose of analysis in this thesis, Gbanjonsili will be referred to as Gban, Zundusili will be Zun and Jimansili will be Jim. Gban, Zun and Jim are the clipped forms of Gbanjonsili, Zundusili and Jimansili. The unique feature of the sub-dialects is the coronal /d/ which manifest as [t] (Zundusili), [ʧ] (Gbanjonsili) before front vowels and [k] (Jimansili) before the back vowel /u/.

1.3.1 Gbanjonsili Dialect

Gbanjonsili is a sub-dialect of Tomosili; its linguistic forms are closely the same as Tomo except few (e.g wàl[ɨ]sɨ → wàl[ɨ]xɨ 'labour') which bring about the dialectal difference. The speakers of the dialect are mostly found in Tolon the district capital (cf. Figure 1.2), Gbanjon, Gbambaya, Tali, Wayamba, Zoonaayili, Chrifoyili, and other surrounding villages including Katin-daa in the Tonlon district. The speakers are also found in Kumbuŋgu the district capital, Zuɣu, Zuɣu Yipelga and other villages in the Kumbuŋgu district. All the major villages I visited during the field work were miles away from the district capitals and most of the people I interacted with were monolingual speakers who only speak Dagbanli.

Gbanjon is nineteen miles (19) away from the district capital, Tolon and almost all the people are monolingual speakers of the dialect, this informed the decision to name the dialect after the village, hence, Gbanjonsili and it has more speakers as well. The dialect is linguistically linked to Tampulima and Kparisi who are Gonja-Dagbanli speakers found in Fu, Kpalvi, Lingbinsi, Daboya, Mankarigu and others.

1.3.2 Zundusili Dialect

Zundusili is spoken around Kariga (cf. Figure 1.2) the district capital and mostly in Zundua, Kɔkpelga, Tunde, Nakpalga, Bahili, Yila, Suhuni, Nyoŋ and other villages in the Kariga district. The people around the area call themselves *Dagban sabila* 'black Dagombas'. Also, it is spoken in Gushegu the district capital, Yishelan yili, Zantili, Nawuhugu, Katani, Yishie, Pumo, Pulo, Naaluwa, Bogu,

Nalogu, Tuntuzee, Tamaligu and other villages in the Gushegu district. Zundua is a small community close to the Mamprunli speaking area and almost all the people are monolingual speakers of the dialect, this informed the decision to name the dialect after the village. The dialect is named Zundusili due to the fact that 95% of the speakers in Zundua are monolingual speakers and it has more speakers as well.

1.3.3 Jimansili Dialect

Jimansili is spoken around Wulensi (cf. Figure 1.2) mainly in Jimam, Jɔli, Tampɔha, Nakpa, Bakpaba, Joanayili, Dokpam, Chamba, Gbingbalga, Darayili, and other villages. It is a sub-dialect of Nanunli because its linguistic forms are close to Nan except few forms (e.g., kòlɨ́ → tàpáɾɪ̀ŋá 'hoe') which show dialectal variation. Jimam is a village close to the Nawuri speakers and almost all the people are monolingual speakers of the dialect, this informed the decision to name the dialect after the village. The dialect is named Jimansili due to the fact that almost all the speakers are monolingual speakers and it has high number of speakers as well.

1.4 Problem Statement

I observed that there are two options to pursue a detailed linguistic study in any human language: (i) descriptive work on a broad topic and (ii) a theoretical work on a narrow topic. Earlier studies chose the first option and did a descriptive work on aspects of Dagbanli grammar with special emphasis on phonology and morphology while another study chose the second option and did a theoretical work on Dagbanli Tongue-root Harmony: a formal account with ultrasound investigation. The

descriptive work was not restricted to phonology alone so little work was done on the description of a cross-dialectal study of segmental and suprasegmental phonology. For this reason, I have decided to close the gap to contribute to the budding field of broad-based study of segmental and non-segmental phonology, which has become integral part of language education, by working on the first option and do a descriptive work on topics in Dagbanli phonology, which include the two major components in phonology: segmental phonology and suprasegmental phonology. A detailed study of segmental and non-segmental phonology across the dialects in Dagbanli is infrequent. The thesis intends not only to contribute to the budding field of broad-based study on dialectal variation in general; it is also aimed at using the findings to contribute to the literature on topics in Dagbanli phonology.

Ghana's pursuit of quality education has led to changes in its language policies in education. These changes have been aimed at enhancing the language skills through education. I have observed that for the past years, the interest in language in education has grown considerably among scholars such as linguists, psychologists and economists. The problems of language in education are invariably related to issues of language policy and implementation within the educational system. The phonetic explanation for phonological processes has become integral part of language education. As a new perspective of language, it seems to promise a better understanding of certain phonological processes that received a rather difficult treatment from existing works. The discussions in the chapters of this thesis look at the various phonological phenomena in Dagbanli from a new viewpoint of phonology education.

1.5 Research Questions

Dakubu (1988:10) states, "there are instances where the speech forms, which could be regarded as dialects of one language on purely linguistic criteria, are more conveniently treated as separate languages because that is how the speakers feel about them." The issue is not about what the speakers think but could be based on linguistic evidence. The thesis seeks to provide answers for the following questions:

1. What language varieties constitute the sub-dialects of Dagbanli?
2. Which phonological processes underlie the observed phonological differentiation between the dialects of Dagbanli?
3. How are the linguistic models in this thesis accounts for observed difference between Dagbanli dialects?

1.6 Objectives

Dialects may differ from each other at more than one phonological level. There may be segmental differences which involve the pronunciation of single phonemes or there may be prosodic differences which involves pitch, loudness and length. Both kinds raise problems of measurement and description but since relatively few descriptions of segmental and non-segment differences across dialects of Dagbanli are available, the main objective of this thesis is to focus on both segmental and non-segmental variations.

The principal objectives of the thesis are to describe the dialectal variation of the dialects of Dagbanli and to provide analysis of the description of various issues in Dagbanli phonology across dialects as well as to advance sound

correspondence and sound alternation across Dagbanli dialects. The specific objectives intend to reveal phonological units that are common to the dialects as well as those that distinguish them from one another. It will also determine the phonological units believed to contribute towards the explanation of dialectal differentiation in Dagbanli phonology.

1.7 Methodology

The data for this thesis were largely primary elicited personally from the towns and villages in the Northern Region: Tamale for *Tomosili* 'Western Dialect', Yendi for *Nayahili* 'Eastern Dialect' of Dagbanli and the villages around Bimbila for Nanunli 'Southern Dialect' and secondary. Nine (9) field assistants were selected, three (3) from each area. They were trained to keep records of the natural language to prepare a wordlist by using the Summer Institute of Linguistics (SIL) Africa Area Word List 2 (SILCAWL 2) compiled by Douglas Boona. Oral interview was employed as the main instrument for the data collection. Data was also gathered from children aged three (3) in Dagbanli, the children were made up of three (3) males and three (3) females in ordinary and natural conversations at separate times. The purpose for selecting three-year old children was based on Storkel's (2001) idea that a child at the age of three already has developed a large stock of vocabulary so he/she possessed a strong effect of phonotactic frequency on the production of the vocabulary.

The thesis explored the ethnographic method of collecting data following Gumperz (1982) work on Belfast in which one presents himself to a participant as a

friend of a friend. The Ethnographic approach was employed as the main instrument as consultants and the parents of the six children for the interview were pre-informed. Outcome of the oral interview was recorded with an audio tape and later transcribed.

Botha (2011) notes that ethnography is a method that studies peoples' style of living "by way of life, beliefs, language, formal and informal relationships and ideologies as well as many other dimensions of a particular culture or speech community." The knowledge of ethnography on language is associated with the works of Hymes (1972). As observed by Botha (2011:52), "ethnography in linguistics should, at its base, be a method which aims to study the way in which a linguistic code is understood from the point of view of the society that uses that code." The ethnographic approach according to Botha (2011) …..

> ….should be considered when the purpose of the research is to capture the dynamics underlying speakers' interactional behaviours, as opposed to stratifying these interactional behaviours as fixed social categories. The ethnography approach is conducted in a specific speech community, and an indexing scheme is generated as the research progresses. To a large extent there are no predetermined categories that direct the area of investigation (2011:52).

The secondary data were collected from the existing works on Dagbanli phonology (Hudu 2010, 2014a, 2016, 2018; Hudu & Nindow 2020; Inusah 2016a; Olawsky 1999). Two Dagbanli -English dictionaries: Mahama (2003) and Blench (2004) mainly for alternative English glosses of Dagbanli words were also consulted. Some

elderly native speakers were consulted to elicit their judgement on the meaning or pronunciation of words and phrases.

1.8 The Thesis Overview

The thesis is structured into six chapters: the first chapter looks at the general introduction by giving the brief history of Dagbanli speakers; chapter two reviews the literature on approaches to the description of segments and non-segments and some phonological process as a means of doing descriptive work.

Chapter three discusses segmental phonemes and differences across Dagbanli dialects. It highlights the differences and similarities between the dialects and their segmental properties (vowels and consonants). It investigates certain features and changes that take place in various sub-dialects as well as show the similarities and differences between the dialects.

Chapter four looks at sound correspondences in Dagbanli dialects and examines the description of the phonological processes affecting the surface realisations of the segments.

Chapter five discusses the prosodic features which are non-segmental features that describe both isolated units and when segments occur in larger units such as syllable. The issue of stress and tone in Dagbanli phonology is discussed and questions whether stress really exist in the phonology of the language. Chapter six summarises and suggests areas for future research, provides recommendations and then conclusion.

CHAPTER TWO

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

The primary aim of this chapter is to provide concise review of current research in a broad range of areas in phonology. This review is structured into four sections and each section will review the past studies of Dagbanli phonology: Section 2.2 focuses on the conceptual issues. Section 2.3 reviews literature concerning segmental phenomena focusing on sub-segmental structure such as features and feature operations. Section 2.4 looks at the non-segmental phenomena focusing on syllable structure, tone and intonation. Section 2.5 reviews the external interfaces that deal with variation that fit easily into segmental and non-segmental phenomena.

2.2 Conceptual Issues

Prince (2007:34) assesses that "common sense is often a poor guide to methodology noting that a theory is the totality of its consequences and also determines what counts as a sound argument within its premises." In order to pursue linguistics study, there is the need to consider the following:

(i) "Theories of Data (TODs), which produce analyses when set to work on collections of facts"

(ii) "Free-Standing Theories (FSTs), which are sufficiently endowed with structure that many predictions and properties can be determined from examination of the theory alone."

(iii) "Descriptive Method" (DM), which data description is the main analytical approach as the determinant of the anatomy of the concept."

The distinction between FSTs and TODs are based on the empiricist rationalist. The empiricist is based on FST in which procedures and methods for the acquisition of knowledge can be simple as to admit detailed analysis while the rationalist is based on SPE-type phonology which has a TOD character, and investigation of its fundamental properties has shown its general finite-state character (Johnson 1972). Optimality Theory (Prince & Smolensky 2004) falls into FST class, both in the large and in domain-specific instantiations of constraint sets (Prince 2007). The rationalist is based on SPE-type phonology (Chomsky & Halle 1968).

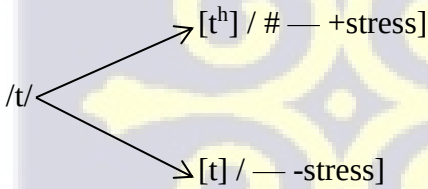
Optimality Theory is a general model of how grammars are structured (i.e., both phonology and morphology including syntax if it is considered a separate component) and its focus is constraint interaction in Generative Grammar (Prince and Smolensky 2004). In OT, "there are two general types of constraint: Markedness and Faithfulness. Markedness constraints evaluate the structure of the output form while Faithfulness constraints evaluate its relationship to other forms" (de Lacy 2007:9). McCarthy (2007) states that the two motivations for OT are that either the processes are blocked by output constraints or processes are triggered by output constraints.

Phonological explanation in OT derives from constraint interaction as the interaction of faithfulness and markedness determines whether input segments survive intact in the output. In OT analysis, "the Generator (Gen) takes its input directly from the lexicon and creates a possibly infinite set of candidate output forms. The Evaluator (Eva) determines the 'winner' by referring to the constraints

listed in Con (the universal constraint repository) and their language-specific ranking." "Constraints are universal; the only variation across languages is (a) the constraints' ranking, and (b) the content of the lexicon. The winner is sent to the relevant interpretive component" (de Lacy 2007:10).

"The Sound Pattern of English developed by Chomsky and Halle in 1968 is the basis for generative phonology in which phonological representations are sequences of segments that are made up of distinctive features which describe aspects of articulation and perception from a universally fixed set, and have the binary values [±]" (Kenstowicz 1994:3). Bloomfield describes a segment as "a class of segments in complementary distribution." This implies that in English, "the aspirated [t^h] of [thai] and the unaspirated [t] of [stai] are allophones of the phoneme /t/. The allophones are not derived from the phoneme by phonological processes but rather stand in a correspondence relation". The two sounds are in complementary distribution because [t^h] has the feature of word [+initial, -medial] while [t] is [-initial, +medial]. This phonotactic distribution for each level of the elements is represented as:

(2.1)



The rule above shows that for each level (phonemic and phonetic) phonotactics state the distribution of the elements composing that [t^h] occurs at the onset of a stressed syllable while [t] occurs elsewhere. However, in an environment where two phonemes are not allophones (invariance) of the same phoneme, neutralization

occurs as in the correct phonemicization of the English words (e.g. writer [raitər] → [rairər] and rider [raidər] →[rairər]). The example provided shows that contrast between the phonemes /t/ and /d/ which has been neutralized by [ɾ] and in context; [ɾ] belongs to [t] intervocalically

"Generative phonology posits two levels of phonological representation; these include an underlying representation that is the most basic form of a word before any phonological rules have been applied to it. The underlying representations show what a native speaker knows about the abstract underlying phonology of the language. The second level is a phonetic representation which is the form of a word that is spoken and heard" Kenstowicz (2004:3). "Ordered phonological rules govern how underlying representation is transformed into the actual pronunciation or the surface form". The generative model of language put emphasis on what the native speaker intuitively knows about a language (Hawkins 1992; Anderson 1985; Kenstowicz & Kisseberth 1979). This is illustrated in English below:

(2.2) Phonological Representation: 'come' [kʌm]

Phonetic representation: [k^hʌm]

'Come' in English is the underlying representation of the native speaker's competence of the basic forms of the word that are transformed to the actual pronunciation in the phonetic representation. The choice for symbol for the initial consonants of the phonological representation may be /k/ that can be phonetically represented as /k^h/ formulating the rule:

(2.3) /k/ → [k^h] / # — +stress].

Phonological rules map underlying representations onto Phonetic/surface phonological representations. They delete, insert, or change segments, or change the features of segments. Phonological rules are commonly used in generative phonology as a notation to capture sound-related operations and computations. They may use phonetic notation or distinctive features or both. Goldsmith (1995) defines phonological rules as mappings between two different levels of sound representation of the abstract or underlying level and the surface level while Hayes (2009) describes them as generalizations about the different ways a sound can be pronounced in different environments.

Phonological rules can be roughly divided into four types:

- ✓ **Assimilation**: When sound changes one of its features to be more similar to an adjacent sound. This is the kind of rule that occurs in the English plural rule forms; -s becomes voiced or voiceless depending on whether or not the preceding consonant is voiced.
- ✓ **Dissimilation**: When sound changes one of its features to become less similar to an adjacent sound, usually to make the two sounds more distinguishable. This type of rule is often seen among people speaking a language that is not their native language were the sound contrasts may be difficult.
- ✓ **Insertion**: When an extra sound is added between two others. This also occurs in the English plural rule: when the plural morpheme-s is added to

bus, ‘bus-s ‘would be unpronounceable, so a short vowel [ə] is inserted between the two [s].

- ✓ **Deletion**: When a sound, such as a stressless syllable or a weak consonant, is not pronounced; for example, most American English speakers do not pronounce the [d] in “handbag”.

Prince (2007) notes that in the absence or failure of FSTs and TOD, it is necessary for the linguists to recede to the ‘Descriptive Method’ (DM) in which data description is the primary analytical methodology for determining the content of a theory. This is virtually inevitable and the interest of this thesis because DM is essential for finding the structure of a theory’s predictions possible. Analytical Method is essential for determining the systematic content of theory since it is particularly valuable for delimiting the negative space of prohibitions into which the Descriptive Method does not venture.

All the analysis in this thesis will be based on DM except the descriptive cases that would require some level of theoretical explanation in which FST or TOD would be applied. The reason for the choice of DM is to encourage phonology education by getting people outside the field of phonology to read and understand phonology with basic theoretical evidence when necessary. Hyman (2004:25) argues that “there is irreducible value in describing complex phenomena using the ordinary tools of general linguistics and description analysis should ideally be rigorous, comprehensive, rich, insightful and interesting.” (Hyman 2004:25).

2.3 Segmental Phenomena

Lipsiki (1994) observes that the grammar and pronunciation of a language maybe noticed at levels of segmental and suprasegmental traits influenced by integration and homogeneity deficiency of speakers. Segments are psychological entities comprising features (smaller units) which play crucial phonological roles (Honeybone 2009, Hall 2007). Clements and Hume (1996) observe that the rubrics of phonological representation are features. The segments can, therefore, "be analysed or broken down into a small number of components or features, these being the minimal elements ('atom') from which the phonemes ('molecules') are build up" (Hawkins 1992).

Previous accounts of segmental features in Dagbanli include Hudu (2014a, 2014c, 2016a, and 2018). Hudu (2014b) provides "a formal analysis of Dagbanli vowel phonology" illustrating Dagbanli vowel features that include height while Hudu (2016) makes a phonetic inquiry into Dagbanli vowel neutralizations.

A further study is done on "asymmetries in the phonological behaviour of Dagbanli place features" (Hudu 2018) revealing that consonants in Dagbanli can be classified as labial, coronal, dorsal and labial-dorsal which are the major distinctive place features. He observes that the patterns of fortition and lenition affect three of the distinctive place features: labials, coronals and dorsals and that the process of lenition that affects the place specification of consonants targets dorsals. It either replaces it with another place feature (as in debuccalisation) or eliminates it from surface form (as in deletion).

The Previous accounts of segmental features of Dagbanli concentrated on place features, height and ATR though the other features are also mentioned but

none offered phonological evidence to explain their relationships. Dobrosvolsky (1997:7) notes, “errors in speech production provide one kind of evidence for the existence of segments while slips of tongue such as *melcome wat* for *welcome mat* show segments shifting and reversing position within and across words.”

Issues of what happens to sounds in isolation and when they are connected into larger units has received some level of response as well as documentation in Dagbanli phonology (Dakubu 1997; Olawsky 1999; Hudu 2010, 2013, 2014b, 2016, 2018; Inusah 2016a, 2019). Some observable phonological processes that happen to sounds in larger units include assimilation, harmony, tone and syllable structure.

Olawsky (1999) observes that Dagbanli sound system contains twenty (20) consonant phonemes which include affricates, double articulated sounds and six (6) vowel phonemes and indicates that the post-alveolar continuant [r] and the glottal fricative [h] are found as allophones of the alveolar stop /d/ and the alveolar fricative /s/. Blench (2006) mentions that Dagbanli has twenty-seven (27) consonants and six (6) vowels and argues that the velar fricative [ɣ] is simply a positional allophone of the velar stop /g/ between vowels. Hudu (2010) observes that Dagbanli has as many as thirty-two consonant sounds considering Tomosili and Nayahili and supports the idea that /g/ appears as [ɣ] which also appears as <ɣ> in the orthography of Dagbanli . Inusah (2016a) confirms this considering the major dialects-Nayahili, Tomsili and Nanunli.

The number of sounds in Dagbanli is one of the phonological issues that needs to be addressed since the sounds are identified based on the three major dialects. The number of sounds in Dagbanli and the issues of whether the velar fricative [ɣ] and the post-alveolar continuant [r] are Dagbanli sounds still remain

unresolved. I believe this is another issue this cross-dialectal study may provide a phonological response to.

Hudu (2010, 2016, 2018) describes the velar fricative [x] as unique to a rural sub-dialect of the Western Dialect, which I described in this thesis as Gbanjonsili (Gban). He explains that /g/ coalesces with /s/ (e.g. tɔ́g-sɨ́ 'speak') and appears as [x] (e.g. tɔ́xɨ́ 'speak') in the sub-dialect. This is another issue to be investigated and find out if the velar [x] could also be segment in Dagbanli without been realized as a surface variant of other sounds in different dialects.

Hudu (2010) examines a formal account of Dagbanli [ATR] harmony system by contributing to the understanding of the patterns of [ATR] harmony and provides response to the "empirical questions about the relations between tongue-root phonological features and the articulatory gestures involved in the production of vowels with those features". Hudu (2018) states that Dagbanli has twenty-two (22) phonemic consonants and ten (10) vowel phonemes. The language has phonemic vowel length as well as many surface forms of vowels and consonants. These are shown in Table (2.1) and example (2.4) along with surface variants, shown in brackets.

Tabke 1: **Consonant inventory in Dagbanli (cf. Hudu 2018**)

Labial	Labio-dental	Alveolar	Palato-alveolar	Palatal	Labial-velar	Velar	Glottal
P b		t d[ɾ]			kp[tp] gb[db]	k g	[ʔ]
m		n		ɲ	ŋm[nm]	ŋ	
			ʧ ʤ				[h]
	f b	s z	[ʃ] [ʒ]			[x]	
		l		j	w[ʊ]		

(2.4): **Vowel inventory in Dagbanli (cf. Hudu 2018)**

Vowel (long)			**Vowels (long)**	
i	ɨ	[u] ʊ	i:	u:
[e]		[o] ɔ	e:	o:
	[ʌ]			
	a			a:

The labial-coronal [tp, db, nm] are respective variants of the labial-dorsal / kp, gb, ŋm/ in the Eastern and Western Dialects, surfacing before front vowels (Hudu 2018; Hudu et al. 2009; Inusah 2020). The glottal stop is a variant of /k, g/ after vowels, while [h] is a variant of /s/ between two vowels in the Western Dialect. For typical speakers of the Eastern Dialect, postvocalic /k, g/ and intervocalic /s/ are all realised as a glottal stop. The alveolar fricatives /s, z/ also surface as [ʃ, ʒ] before front vowels. Similarly, /d/ surfaces as a tap [ɾ] in intervocalic position (Hudu 2018:205).

Phonological analysis is used to determine the distributional difference of phoneme segments of language. Fromkin et al. (2014:261) states, “to do a phonological analysis, the words to be analyzed must be transcribed in great phonetic detail because we do not know in advance which phonetic features are distinctive and which are not”. Notice that changing a segment for a different sound in words to see if it makes variation is a good way of realizing segments of a language. One of the aims of this thesis is to do phonological analysis across Dagbanli dialects. For instance, consider the following data in Nayahili:

(2.5)	dàʔ-ó	'wood-sg'
	dàɾí	'wood-pl'
	sɔ́ɾɨ̂	'broom-pl'
	kpíkpáɾí	'catfish-pl'
	gòndɔ́ʔɔ́	'name of a village'
	nɨ́m-dí	'meat'
	nám-da	'footwear'
	tɨ́b-sím	'heavy'
	tɔ́ʔ-sí	'speak'
	dɔ́ʔ-sí	'deliver-N'
	kpál-tí	'dawadawa spice'

A close look at the data in (2.5) shows minimal pairs involving [t] in [tɔ́ʔ-sí] and [d] in [dɔ́ʔ-sí] making them phonemes but the flap [ɾ] might not be a phoneme for it seems predictable somehow in the data. This clearly shows that the flap [ɾ] is in complementary distribution with both [t] and [d]. One may suggest here that based on these data, [ɾ] occurs in word-medial. This basic phonological analysis would be used to describe segmental differences within the dialects.

2.4 Non-Segmental Phenomena

Segments are grouped together to form syllables and words in which certain features may be superimposed on each segment. These features are often referred to as suprasegmental. Dobrovolsky (1997) explains that sounds are identified with some level of inherent suprasegmental traits which form part of their makeup regardless their constriction in the oral cavity. The traits include: pitch, stress or length. Traditionally, the properties of syllable structure, stress, and tone form a special category, that of prosodic or suprasegmental features. Their distribution and phonological behavior characteristically ignore such features that define the inherent quality of a sound (Olawsky 1999). Kenstowicz (1994: 44) states, "[T]he

autonomy of the suprasegmentals is reflected in the fact that orthographic systems register their presence (if at all) through diacritic marks or accents rather than with separate letters."

2.4.1 Tone

Pike (1948) describes "tone as a contrastive feature on a syllable or other tone-bearing unit (TBU)" while Welmers (1959) argues that "tone is not a property of a syllable as expressed by Pike but rather of morphemes. Hyman (2006:229) notes that "accentual languages may have words which have one tone (or several) or no tones and the tone could be associated with a particular syllable or mora."

Yip (2007) explains that tone is noticed in a language "when the pitch of a word can change the meaning of the word but not just its nuances but its core meaning. For instance, in Cantonese, the syllable [jau] can be said with one of six different pitches and has six different meanings":

(2.3). [jau] in Cantonese

High level	'worry'	high rising	'paint'
Mid-level	'thin'	low level	'again'
Low level	'oil'	low rising	'have'

Yip (2007:235) states that "the range of tonal contrasts that a language may have is up to five noting that it is possible to contrast up to four (e.g. Mambila–Connell 2000) and probably five (e.g. Bencnon–Wedekind 1983) different level tones". It is established that "the most widespread systems are two-tone languages such as Haya (Hyman and Byarushengo 1984) or Dagaare (Anttila and Bodomo 1996) and three-tone languages such as Yoruba [Benue-Congo] (Akinlabi 1985, Pulleyblank 1986)."

It is noted that "the five-tone ones are very rare". Since Dagaare is two-tone and belongs to the family of Mabia languages, I presumably believe that it is possible that Dagbanli which also belongs to the same family of languages might be a two-tone language as well. This is another issue that I will investigate in this thesis.

(Yip 2007) notes that. …..

> …."phonetically, a language may have far more differences as a result of processes like downstep, a common process which lowers high tones after an overt or covert low tone so that a /H L H/ string is phonetically more like [H L M]. The inverse, upstep, also exists (IPA [↑]). For some proposals on how to handle downstep and the related process of downdrift, see Clements (1979), Huang (1980), and Truckenbrodt (2005). Nonetheless, such a language only contrasts two tones, H and L. (2007:231).

Zhang (2000) explains that "languages may also have contour tones (rising or falling tones) and a language can have at least two and perhaps three tons of one shape (rising or falling)." Yip (2007) cautions that "when a language is reported to have a contour tone, it is important for one to also ask where this contour is found. He noted that there are three main possibilities":

(2.4) i. "It may be found only on polysyllables, so that each syllable is essentially level, with the first high and the last low, but the word as a whole has a fall."

ii. "The second possibility is that a contour may occur within a single syllable but only if that syllable is heavy (a long vowel or closed syllable), and thus contains two moras, each of which may be assumed to bear a level tone."

iii. "The third possibility is that contours may occur on any syllable, light or heavy, in which case we are dealing with a true contour tone." (Yip 2007:232)

Dagbanli in its orthography does not use diacritics but it is necessary to make use of tone and intonation in the phonological description. Olawsky (1999) explains that Dagbanli marks stress in its phonological description and the stress does not apply to individual sounds, but to larger units, characteristically syllables. In Olawsky (2002), it is stated that "Dagbanli marks stress in addition to tone and claims that Dagbanli stress is correlated with a higher amplitude and longer duration; distinct from tone, which is correlated with a higher pitch." In contrast, Hudu (2007, 2010) disagrees with Olawsky and reveals that "the vowels he claims to be stressed are neither longer in duration nor higher in intensity than vowels that are supposed to be unstressed."

Hudu (2010) hints that previous studies describe Dagbanli as having two contrastive tones: high and low, with low tone as the default but questions if the Eastern Dialect has a contrastive falling tone that falls on unsuffixed CV roots and some suffixes (e.g., *bá* 'ride', *bà-* 'river', and *bâ* 'father'). He observes that in the Western Dialect, syllables that bear falling tones in the Eastern Dialect bear a high tone. The issue of stress and tone in Dagbanli phonology need to be address and one unresolved issue is whether or not the falling tone is the result of a diachronic phonological process and whether stress really exists in the phonology of the language. Other unresolved tonal issues in Dagbanli include tonal melodies and downstep.

2.4.2 Intonation

Intonation is described as "a technical term in phonological descriptions of spoken languages, which refers to patterned variation in voiced source pitch that serves to contrast and to organize words and larger utterances" (Backman and Venditti 2011:484). "the two terms are differentiated by applying them to different aspects of linguistic uses of pitch that typically invoked in differentiating intonation from tone" (Backman and Venditti 2011:484).

Backman and Venditti (2011:486) argues that "tone in this primary sense invokes a system of contrastive pitch patterns that act as minimal word-differentiating elements, comparable to the inventory of vowels or consonants of a language whereas tone qua intonation invokes other functions, such as mirroring the syntactic structure of an utterance or indicating its pragmatic role in the larger discourse context".

In many accounts of the English intonation system such as Halliday (1967), Goldsmith (1978), and Pierrehumbert (1980), "tone" is used to refer to glissandi or linguistically significant positions. Gussenhoven (2007) states that "intonation refers to the structured variation in pitch which is not determined by lexical distinctions."

Hawkins (1992:193) describes "intonation as a name given to the fluctuation of pitch in spoken utterances, which normally refers to the pitch patterns of a larger grammatical unit such as phrase, clause or sentence, though of course a sentence may consist of only a single word, in which case intonation can apply to it." Intonation has three basic properties:

(2.5) i. "It's a language universal. There are no languages which are spoken as a monotone, i.e. without change of pitch."

ii. "Intonational is functional, i.e. it is used in a language for a particular purposes and never merely 'decorative' way of avoiding speech becoming 'monotonous'."

iii. "Within any particular language, intonation is systematic; different speakers use the same patterns for the same purpose, though there may be dialect differences just as segmental phonemes are systematic in the language as whole" (Hawkins 1992:193).

I have observed that pitch is typically used to make linguistic distinctions such as intonation (distinctive pitch levels within a phrase or sentence) and tone (distinctive pitch levels within a word). Notice that intonation is yet to be investigated in Dagbanli but previous studies (Olawsky 1999) have shown that characteristically, tonal distinctions can indicate both lexical information about the meaning of a word and grammatical information about its function.

2.4.3 Phonological Word

Traditionally, 'word' has been recognized as a universal unit by scholars of varied persuasions (Dixon and Aikhenvald, 2002; Aikhenvald, 2007). I discussed phonological word here for the fact that dialects differ in lexicon and word (Wardhaugh 2002). Hence, the understanding of the phonological word would be required in the description of similarities and differences that exist in Dagbanli dialects.

Previous accounts of phonological word in Dagbanli include (Dakubu 1997; Olawsky 2002; Hudu 2010, 2013, 2014; Inusah 2016a, 2019) note that

phonological word is usually composed of smaller prosodic units such as feet, syllables or moras (which in turn are built from combinations of segments). Hudu (2013) notes, "phonological word is a lexical root accompanied by prefixes, suffixes, proclitic and enclitics phonological word using syllable's structure, tone, vowel harmony and other phonological processes." Inusah (2016a) explains that a phonological word comprises of a combination of organized sounds. He further explains that the phonological word is very significant in the study of Dagbanli because it contributes morphologically and phonologically to the variations that exist in the dialects of the language.

A word in Dagbanli is categorized as complex and compound. The simple word comprises a lexical stem, thus, a verb in Dagbanli is mostly short in a CV syllable form without a coda as in (2.6) or CVC syllable root with a coda in a bare structure needs no suffix as (2.7).

(2.6) Verbs

CV	Gloss	CVC	Gloss
ti	'give'	tim	'send'
di	'eat'	dim	'bite'
tu	'insult'	tib	'heal'
du	'climb'	kab	'break'
te	'filter.v'	mal	'take'
zu	'steal'	sab	'write'
to	'pound'	zaŋ	'take'
lu	'fall'	lab	'throw'

Hudu (2014b:6) notes that "simplex verb may be inflected for aspectual markers as in (2.7a-b) or followed by clitics (2.7c-e) and the underlying verb may also take a derivational suffix to produce words of different lexical categories, as in (2.7f-g)."

(2.7) Verbs (cf. Hudu, 2014b:6).

ti	'give'	ti-ja	'give-perf.'
wɔlg[ɨ]	'separate'	wɔlg[ɨ]-ra	'separate-imperf'
mal[ɨ]	'make'	mal-lɨ	'make it'
zaŋ	'take/have'	zaŋ na	'take hither (bring)'
kpaŋs[ɨ]	'encourage'	kpaŋ so	'encourage him/her'
bɔh[ɨ]	'ask'	bɔh-gʊ	'question-sg.'
lu	'fall'	lu-a	'fall-sg.'

Hudu (2014b:7) explains that "nouns and adjectives are simple words that comprises lexical base and a suffix marker bound to each other and unlike the lexical root, there are limited number of nominal/adjectival suffixes which mark singular and plural number, among other functions, and form the basis for the classification of nouns and adjectives in the language."

2.4.4 Syllable

"Phonologists from a wide range of theoretical perspectives agree that the syllable plays an important role as a prosodic constituent based on the fact that there are phonological processes and/or constraints which take the syllable as their domain of application." (Hoberman1988:63). Blevins (1996) notes that tone is phonological property which takes the syllable as its domain. At the phonetic level, stress and tone, like pharyngealization, are typically realized on multisegmented strings. At the phonological level, there are many languages in which placement of predictable stress or tone requires "skipping" C_0VC_0 sequences. Such principles of stress assignment support the existence of syllables in that the candidates for stress

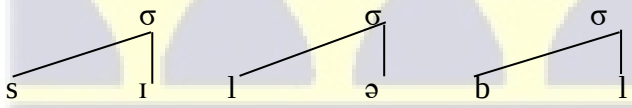
assignment that are skipped over are always complete syllables. Blevins (1996) notes that stress and tone languages fall into two general classes with respect to general assignment algorithms: i. “those in which mappings of stress and tone differ for heavy and light syllables” and ii. “those in which such weight is irrelevant.” In the first case, the mora, or weight unit, might be viewed as the stress/tone-bearing unit while in the second case, it seems necessary to recognize the syllable as the stress/tone-bearing unit.

Blevins (1996) again notes that another phenomenon which argues for the existence of the syllable as a phonological constituent derives from the presence of a contrast between so-called “ballistic” and “controlled” syllables in Otomanguean Amuzgo and Chinantecan languages. In these languages, ballistic syllables have some or all of the following properties: aspiration (voiceless nuclear vs, final voiceless sonorants, and syllable-final aspiration); rapid crescendo to peak intensity, with sudden decrescendo; accentuation of vowel length (long vowels are longer and short vowels are shorter); tonal variants (higher level tones, upglides and downglides); tongue root retraction. Nonballistic syllables are unaspirated, show even rise and falls of intensity, have normal vowel length contrasts, do not show tonal gliding, and have no tongue-root retraction. The group of properties distinguishing ballistic syllables all take domains larger than a single segment.

“Tradition has it that a syllable consists of a vowel, usually preceded by one or more consonants, and sometimes followed by one or more consonants. In the overwhelming majority of spoken languages (though perhaps not all), the syllable plays an important role in analyzing phonological regularities that phonologists have placed at the center of the phonological stage” (Goldsmith 2011:156).

It is difficult to define phonetically what a syllable is. Ladefoged (1993: 243) states that "there is no agreed phonetic definition of a syllable although nearly everybody can identify syllables, almost nobody can define them." Goldsmith (2011) ordinarily defines, "a syllable as the part of a word which is uttered by a single effort or impulse of the voice." Katamba (1989) describes a syllable to be the unit in terms of which phonological systems are organized. The syllable structure processes affect the relative distribution of the consonants (C) and the vowels (V) within a word. Zec (2007:163) observes, "the syllable has a central role in phonological theory as a constituent that represents phonologically significant groupings of segments". The syllable is thus a representational device that encompasses principles of segment sequencing. For instance, the morpheme 'syllable' can be exhaustively parsed into licit substrings of segments, each dominated by a node σ as represented below:

(2.8)



"In sum, once the principles of syllable organization are properly stated, a syllable as an organizing principle for grouping segments into sequences, they subsume most of the generalizations about segment sequencing" (Zec 2007:163).

Zec (2007:163) explains, "under minimal assumptions, the principal subparts of the syllable are the nucleus and the two margins, the onset and the coda. The nucleus contains the most sonorous segment, where sonority is an abstract property of a segment." Basic syllable shapes include CVC, CV, VC and V.

Segments typically occurring in the nucleus are represented as V and those typically in the margins as CV does not necessarily refer to 'vowel'. In some languages, the V slot can also be occupied by a consonant: for example, in (2.9) the final syllable has an [l] in the V slot. The data in the hypothetical language exhibits CVC closed syllable type with obligatory onset and coda but has a system that does not allow complex onsets and codas as illustrated below:

(2.9)

CVC		CVC.V		CVC.CV	
vir	'see'	fir-o	'man'	dus-je	'cities'
baʔ	'sell'	vag-o	'house'	ʤez-je	'markets'
poʔ	'loose'	nim-o	'women'	nim-je	'women'
kal	'write'	pal-o	'school'	ʤug-je	'childern'
ʧus	'play'	bok-o	'bank'	ʧar-e	'farms'
zas	'go'	dus-o	'city'	bok-je	'banks'

It is observed from the data that the language permits both onset and coda consonants. It has a CVC syllable structure and a CV syllable results from a CVC noun stem suffixed with a number marker [–o]. The verb stems in (9) are similar to one another in that they all consist of a single closed syllable. To parse CVC, the constituent model of syllabification naturally suggests that the syllable nucleus forms a constituent with either the onset or the coda as illustrated in the figure below:

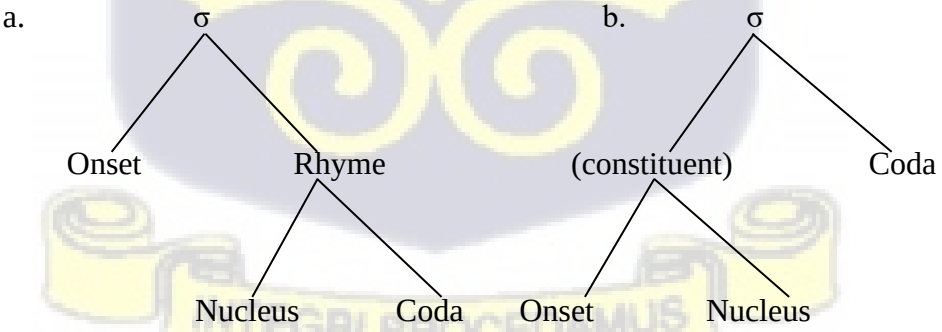


Figure 2.1: The Syllable Structure

The syllable structure in figure (2.1a) is the one most widely defended and used but the structure in figure (2.1b) has been proposed on occasions. “There is a view that what has been treated as a CVC syllable should rather be analyzed as a CV syllable, followed by some kind of defective syllable and such views involve structures more like (b) than like (a)” (Goldsmith 2011).

In the study of phonology, the term “quantity” as noted by Davis (2011) “refers to either segmental duration or syllable weight”. Davis (2011) observes that “with respect to segmental duration, quantity differences among segments are said to be phonemic in languages that contrast long and short form of a vowel of the same quality and in languages that contrast geminate versus non-germinate consonant.” For instance, languages such as Japanese demonstrate both types of contrasts as illustrated below:

(2.10) Japanese quantity contrasts (Tsujimura 2007)

	Short		Long	
a.	[su]	‘vinegar’	[su:]	‘inhale’
b.	[saka]	‘hill’	[saka:]	‘author’

It is attested that both short and long vowels bring about difference in meaning in Dagbanli. “The vowel length in Dagbanli is phonemic and all non-low long vowels are [+ATR] while the low long vowel is [-ATR] (/i:, u:, e:, o:, a:/)” (Hudu 2016; Hudu and Nindow 2020). The data in (2.11) show the contrast between short and long vowels:

(2.11) Contrast between short and long vowels in Dagbanli

màní	‘1.sg emph.’	má:n-í	‘okra-sg’
mí-bû	‘raining.’	mí-bû	‘becoming sour’
fé	‘finger-V’	fè:	‘scarce’
kpɛ́-bô	‘entering’	kpé:-bô	‘boiling’
tòlɨ	‘hot’	tù:lí	‘first’

The vowel [ɨ, ʊ] are the allophonic variants of the vowels /i, u/ as also noted by Hudu (2005, 2010).

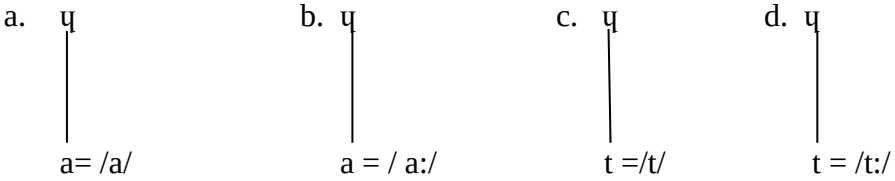
The syllable functions as a natural domain for the application of many phonotactic constraints in Dagbanli. Olawsky (1999) assumes that mora does not play a role in the description of Dagbanli phonology. The mora is a constituent of the syllable intervening between the syllable [σ] and the phoneme string. He cited the following reason to support his assumption: first, mora is not perceived as a natural rhythmic unit of the language by the speakers of Dagbanli- fact which clearly holds for mora-counting languages like Japanese and second, the organization of phonemes in Dagbanli does not depend on moraic structure. His arguments lead to the conclusion not to regard moras as significant prosodic units for Dagbanli phonology.

The issue of whether Dagbanli is a mora-counting language and the conclusion that moras are not significant prosodic units for Dagbanli phonology remain unresolved. I argue in this thesis that mora plays a role in the description of Dagbanli phonology and Dagbanli is a mora-counting language. This is to suggest that Dagbanli is a tone language and according to Davis (2011), in tone languages, tone is realized on mora elements as Zec (2007) notes that "moras have the dual function of serving both as subsyllabic constituents and as units of timing. In the former capacity, they characterize syllable weight, and in the latter, segment length."

Hayes (1989) develops a formal theory of moraic phonology in which the prosodic tier is characterized as moraic. Specifically, in Hayes's theory, a short vowel is underlyingly monomoraic while a long vowel is bimoraic. Davis (2011) posits that with respect to geminate consonants, a germinate consonant differs from

a short consonant in that the geminate is underlyingly moraic while a short consonant is non-moraic. Sample moraic representations are given in (2.12) where (2.12a) shows a short vowel, (2.12b) a long vowel, (2.12c) a short consonant, and (2.12d) a germinate.

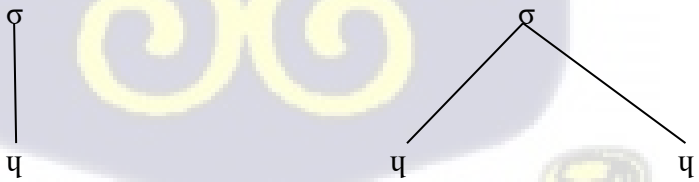
(2.12) Underlying moraic representation (Hayes 1989a)



In Hayes's theory a (non-geminate) coda consonant is not underlyingly moraic. Rather, in some languages a coda consonant acquires moraic status by the rule of Weight-by-Position.

Zeck (2007:165) explains, "syllable weight and the phenomena directly related to it, such as segment length, are directly represented in structural terms by positing a second peak within the syllable. A light syllable includes a single peak, as in (2.13a); and a heavy syllable includes two peaks, as in (2.13b)". The representation in (2.13) is thus consistent with the traditional interpretation of the mora as a measure of syllable weight (Trubetzkoy 1939).

(2.13) a. light b. heavy



The "syllable necessarily includes at least one peak, which stands for the nucleus, and may also include a second peak which marks it as heavy. The two peaks are

represented as moras. One mora in a syllable is designated the 'head' (ɥ) in order to capture the asymmetries between the nuclear and the non-nuclear structural positions" (Zeck 2007:165).

2.5 External Interfaces

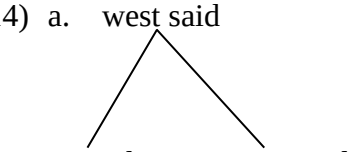
This section focuses on external interfaces that deal with a variety of areas such as variation.

2.5.1 Variation

Language is characterized by having a more or less unitary grammatical, lexical and phonological system. Although members of a speech community may have extremely uniform attitudes to their language, their actual individual language behavior is very variable. The speech of an individual is different in some variable degree from every other speaker. While the individual may accept some forms of the other's speech as being part of their language, these forms may not feature at all in his own usage. The person may even stigmatise some of them in such terms as 'slopy', 'vulgar', 'dialectal', 'nasal' or 'guttural' (Corder 1993). The language of each individual is unique and peculiar to himself. This language is called his idiolect.

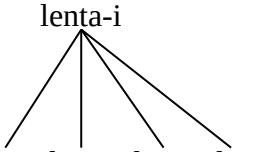
Anttila (2007) explains that the term 'variation' in phonology describes "a situation where one phonological input has more than one output as illustrated in the following examples from American English and South-Eastern Finnish." In both cases, variation results from the optional application of one or more phonological processes.

(2.14) a. west said



'west said'

b. lenta-i



'fly-past'

"Variation is an inherent characteristic of language. Therefore, "it is crucial to consider the impact of variation on language in general. Variation and uniformity are each inherent characteristics of language" (Hasselbring 2006:9) "Variation may occur both within and between dialects, but the focus of this review is on the latter." Joseph 1987:1; Haugen, 1966:59).

Hasselbring (2006:9) notes that "while a high degree of uniformity is necessary within a language to ensure comprehension, variation is present at every linguistic level from the phoneme to discourse." "Variation does not occur equally at each level, for less variation is evident in syntax than in the phonology or lexicon" "Categorization of the level at which variation occurs is not always straightforward. For example, if a grammatical particle is realized by lexeme A in dialect X and lexeme B in dialect Y, some may categorize it as a syntactic difference while others see it as a lexical difference" (Hudson, 1980:46).

Hawkins (1992:226) indicates that "dialects are varieties of speech within a single language and describes it as one of the subordinate forms or varieties of a language arising from local peculiarities of vocabulary, pronunciation and idioms." Corder (1993) classifies dialects into social and linguistic perspectives. The linguistic classification is dialects that have some major parts of their linguistic features in common and also share a common code or norm while the social

classification as dialects of people who are related in kinship group or lived in the same area. The two classifications make such connections as languages that show variability according to geographical and social space.

Hasselbring (2006:14) notes that "a dialect has distinctive characteristics phonologically, lexically, syntactically or semantically, which sets it apart from other dialects of the same language." Wardhaugh (20020) observes that "accent is distinguished from a dialect in that an accent differs only in phonology while dialects differ in syntax or lexicon" as also noted by Stubbs (1980). While the standard dialect can be spoken in a variety of accents, dialects other than the standard are usually each associated with a specific accent (Stubbs 1980). "The term dialect is frequently used inclusively referring to the phonological differences as well as the lexical and syntactic differences (Wardhaugh 2002; Joseph 1987)" Hasselbring (2006:14).

Chambers and Trudgill (1998:58) describe a dialect as "a term which is often applied to forms of language, particularly those spoken in more isolated parts of the world, which have no written form." They further describe a dialect "as some kind of deviation from a norm–as aberrations of a correct or standard form of language."

I disagree with Chambers and Trudgill (1998) that dialects are some kind of deviation from a norm for the fact that dialects are as a result of some changes in the linguistic forms due to contact with other linguistic forms within a geographical location. The instances where the so-called standard forms also losses the originality of some linguistic forms due to the same contact and space and there is no empirical evidence that show that the standard forms are not tampered with.

"[T]he definition of language in relation to dialect becomes more elusive the more firmly one tries to grasp it. Commonly, people think of a language as a collection of mutually intelligible dialects, just as a dialect is a collection of similar idiolects." Fine (2003:91). Based on the fact that most dialects have unique names that identifies them as independent languages due to social space and custom uniqueness, it is indeed difficult to classify them as dialects of another linguistic form that uses the same term as the name of the language that is spoken by different social groups without linguistic evidence. That is the reason Haugen (1966) thinks language and dialect creates ambiguity when one tries to define a dialect.

Hasselbring (2006:20) outlines linguistic shift and its complexity "as the two factors that affect the degree to which dialectal variation at any linguistic level influences cross-dialectal study." The view is that complexity of an emic shift can be low, as in a one-to-one correspondence, or high, as in a two to-one emic correspondence that is due to a split or a merger. For instance, the unapirated /t/ corresponding to the aspirated [t^h] is a small degree of shift while /t/ corresponding to /f/ is larger. The one-to-one correspondences illustrated above are both low on the complexity scale, whereas, if both /h/ and /t/ in one dialect correspond to /t/ in another dialect, this variation would rate high on the complexity scale.

Milliken and Milliken (1996) study of phonological variation reveal that a Phonemic shift rarely impede comprehension unless they result in a phoneme that is similar to or identical to one that already exists in the other dialect. A phoneme in one dialect may shift to become identical to a different phoneme in a second dialect, this, speakers will initially hypothesize that the two phonemes with the same

phonetic realization are the same. A further study of the dialect exposes the individual to the actual correspondence to correct the assumption.

Ambiguity as noted by Haugen (1966) also influences the dialect on the 'many' sides of a one-to-many correspondence. "For example, if /æ/ in dialect Y corresponds to both /ɛ/ and /a/ in dialect X, then speakers of X find the /æ/ in Y to be ambiguous. Each time speakers of X hear /æ/ in Y, they are uncertain whether it corresponds to /ɛ/ or /a/ in their dialect. However, for speakers of Y, the correspondence is not ambiguous, because they learn to interpret both /ɛ/ and /a/ as if they were allophones of /æ/" (Hasselbring 2006:22).

Variations from purely phonemic, morphophonemic or logographic representations can usually be categorized as over- or under differentiation, over- or under representation and irregular correspondences. Over differentiation is "representing a single phoneme, syllable, or morpheme with two or more symbols in a writing system" (SIL International, 2002).

English has over differentiation of all vowels, and some consonants for example, <ph>, <gh> and <f> can each represent the labial-dental fricative /f/. Under differentiation is "the representation of two or more phonemes, syllables, or morphemes with a single symbol" (SIL International, 2002). English also has some under differentiation of both vowels and consonants. The grapheme <th> represents both the dental fricatives /θ/ and /ð/.

At the phonemic level, codification is usually referred to as orthographic development. Pike (1947:213) recommendations on dialectal differences mentions that "dialects which differ too much from the standard may need separate orthographies which should be as similar as possible because once people attain

literacy, they may be able, without further instruction, to read materials in other dialects."

Martinez (2011:23) poses that "when addressing phonological variations of languages, linguists are faced with the challenge of identifying, for the sake of developing a model and describing phonological features, from which standard to depart.". "A discussion of each of the classification systems is beyond the scope of this review but is worth noting that within any classification system there are many variations stemming from the many influences at the core of diversity, including the fluidity of national borders, immigration patterns, etc." (Martinez 2011:24).

Hualde's (2005) notes that "regional classification previously alluded to, identified nine main phonological trait variations: aspiration of word and syllable final /s/, velarization of /n/, neutralization of final /l/ and /r/, deletion of intervocalic /-d-/, contrast between /ʎ/ and / ʝ/, pronunciation of /ʝ/, pronunciation." of trill /r/, pronunciation of /x/, pronunciation of /ʧ/.

Canfield (1981) cited in Martinez (2011) described phonological variations in Central America noting that Honduras, Guatemala, El Salvador and Nicaragua appear to form a "linguistic unit" with respect to phonology and syntax because they share many characteristics. In these three countries the substitution of /s/ → [θ] may appear, as would the substitution of /n/→ [ŋ] in final position. Still, there are differences. For example, substitution of /s/ → [h] in final position only in Nicaragua. And finally, with respect to Guatemala, /s/ is always present in all positions. This is different in Dagbanli as /s/ does not occur in word –medial in one of the dialects. I argue in this thesis that /s/ → [x] in word-medial in one of the sub dialects of Dagbanli and other cases /s/ coalesce with velar stop /g/.

Evidence of dialectal variation in Mabia languages include Akanlig-Pare (2005), Dakubu (2005), Saanchi (2006), Hasselbring (2006), Suleiman (2012) and Dundaa (2013). Hasselbring (2006) describes five dialects of Likpakpaanl - Likoonl, Linafeel, Ligbinl, Lichabol and Limonkpenl. Saanchi (2006) observes that linguistically, Central Dagaare, Northern Dagaare (Dagara) Southern Dagaare (Waali) and Western Dagaare (Bɪrfʊɔr) are all varieties of the same language. Dakubu (2005:2) asserts that "several of the special features of Dagaare spoken around Lawra, which some refer to as Lobi, are apparently derived from Bɪrfʊɔr after a migration from the southwest."

Akanlig-Pare (2005) acknowledges that Buli which is the L1 of the Bulsa people has three dialects namely Northern dialect, Southern dialect and Central dialect. He explains that the Central dialect is distinguished from the Northern dialect and Southern dialects on phonological grounds as also report by Sulemana (2012). This is illustrated below:

(2.15) Buli Dialects (Akanlig-Pare 2005:40)

Northern	Southern	Central	Gloss
ba:ga	ba:k	biak	'dog'
do:gi	do:gi	dʋɛgi	'lie down'
jinla	jinla	dzinla	'today'
ci:ni	ci:ni	tcini	'count'

The Northern and Southern dialects have long monophthongs /a:/ while in the central dialect has diphthongs /ɪə/ as in biak and dʋɛgi. The difference between the Central dialect on one hand and the Northern and Southern dialects on the other is also evident in the use of /dz/ in the former as against the use /j/ in the latter. The similarities in Buli dialects presented by Akanlig-Pare (2005) shows the same

features of labial /b/ and alveolar /d/ stops occurring in the same environment.

Dundaa (2013) classifies Bɪrfʊɔr dialects into four based on language features; these are pɔnaal, Malba, Bachiel and Lenkaal. He identifies some phonological features that distinguish them as a different dialect describing the Bachiel dialect to have /z/ which does not occur in the other dialects. Pɔnaal dialect has a diphthong while the other dialects have long monophthongs. The Malba dialect also exhibits certain linguistic features that the others do not have. While Malba dialect has majority of its speakers in Burkina Faso, Pɔnaal, Bachiel and Lenkaal are spoken in Ghana. He presents the following data to show some dialectical variations at the segmental level in Bɪrfʊɔr.

(2.16) Dialectical variations in Bɪrfʊɔr (Dundaa 2013:12)

Pɔnaal	Bachiel	ŋmalba (Malba)	Lɛnkaal	Gloss
bon	baa	bo	bo	'what'
jin	nin	ɲimi	jɪn	'you'
kpiɛ	kpiɛ	kpɛ:	kpɛɛ	'big'

The data present Bɪrfʊɔr and its dialects showing the dialectal variation among them. /dz/ occurs in word initial in all the dialect except in Bachiel where it becomes /z/ before /a/ showing the feature [- affricate]. This is shows /dz/ does not occur in all the dialects. The major differences noticed are that /b/ maintains its features before round vowelS in all the dialects except Bachiel where it occurs before unrounded vowel.

The notion of dialectal variation in Dagbanli phonology has received little attention from linguists although some linguists Naden (1988), Brukum (2004), Issah (2008), Salifu (2010), Hudu (2005, 2010, 2013, 2014, 16, 18), Gurundow (2014), Inusah (2016a, 2019) and Hudu & Nindow (2020) have concerned

themselves with dialect differences in Dagbanli. They have made reference to the dialects with some linguistic examples without providing detail phonological descriptions. It however, continues to be an area of research where much is not done in the language. It is tested that the major dialects in Dagbanli are Tomosili, Nayihili and Nanunli. Inusah (2016a) presents the following data to illustrate the difference in the dialects:

(2.17) Dagbanli major dialects (Inusah 2016a:100)

Tomosili	**Nayahili**	**Nanunli**	**Gloss**
ʤa:ŋ-gbeʔʊ	da:ŋ-gbe:	da:ŋ-gbe:	'walking stick'
sa:-zʊʔʊ	zʊʔ-sa:	ʤʊhʊ-sa:	'up'
ʧemsi	taʔa	taha	'roofing sheet'
baŋlí	ban-dɔʔʊ	ban-dəhʊ	'lizard'
kɔba	ta:ja	kanlí	'lorry tyre'
kpa:	ku:sa	ku:sa	'nail'

The data show lexical variation between the major dialects of Dagbanli- Tomosili, Nayihili and Nanunli.

2.6 Summary

This chapter reviewed literature on current research in a broad range of areas in phonology. Particular attention was given to literature that described conceptual issues, segmental phenomena, non-segmental phenomena, internal interfaces and external interfaces.

In section 2.2, literature was reviewed on the conceptual issues which discussed theoretical concepts which have enduring importance in phonological theory. It revealed that in order to pursue linguistics study, there was the need to

distinguish heuristically between 'Theories of Data' (TODs), which produce analyses when set to work on collections of facts, and 'Free-Standing Theories'(FSTs) which are sufficiently endowed with structure that many predictions and properties could be determined from examination of the theory alone but it clearly indicated that in the absence or failure of FSTs and TOD, it is necessary for the linguists to recede to 'Descriptive Method' (DM) in which data description is the primary analytical methodology for determining content. This is virtually inevitable and the interest of this thesis because DM is essential since no specific theoretical framework is employed.

In section 2.3, literature was reviewed on segmental phenomena focusing on sub-segmental structure and operations. The review revealed the number of sounds in Dagbanli across-dialects was one of the phonological issues that needed to be addressed. The issues of whether the voiced velar fricative /ɣ/, the post-alveolar continuant [r] and the voiceless velar fricative [x] as Dagbanli sounds are unresolved.

Section 2.4 reviewed the non-segmental phenomena focusing on syllable structure, tone and intonation. The review pointed out the issue of stress and tone in Dagbanli phonology. It questioned whether falling tone in Dagbanli is the result of diachronic phonological process and qualms stress existence in the phonology. It was observed that intonation is yet to be investigated in Dagbanli. Also, the issue of whether Dagbanli is a mora-counting language and the conclusion that moras are not significant prosodic units for Dagbanli phonology remain unresolved.

Section 2.5 reviewed the external interfaces that deal with the area that fit easily into segmental and non-segmental phenomena and this included areas such

as variation. It was clearly noted that variation is an inherent characteristic of language and it was crucial to consider the impact of variation on language in general. Variation and uniformity are inherent characteristics of a language and both may occur within and between dialects, but the focus of this thesis is on the latter.

CHAPTER THREE

SEGMENTAL PHENOMENA IN DAGBANLI

3.1 Introduction

The aim of this chapter is to provide summary of the current status of segmental phonemes in Dagbanli across dialects. I discuss below the evidence for these segments and summarise controversies involving them. Although the emphasis is on the segmental phenomena, the chapter also includes discussion of the relationships involving two or more segments. The chapter discusses segmental phonemes and differences across Dagbanli dialects. It highlights the differences and similarities between the dialects and their segmental properties. It investigates certain features and changes that take place in various sub-dialects as well as show the similarities and differences between the dialects.

The chapter is organised in the following ways: Section 3.1 introduces the chapter while section 3.2 discusses Dagbanli Segments across dialects. In the subsequent sections, I present predictability of the alveolar flap /ɾ/ and the mid vowel /ɛ/ in Dagbanli dialects in section 3.3. Section 3.4 is devoted to the comparison of Dagbanli dialects and Section 3.5 concludes the chapter.

3.2 Dagbanli Segments

Segments are psychological entities that bestow the tie acquisition of language and the its somatic realisation and composing smaller units which play crucial

phonological roles (Honeybone 2009, Hall 2007; Clements and Hume 1996). Hayes (2009) observes that "segments of a language are intrinsically meaningless: their only purpose is to form the building blocks of which larger units are formed". In this section, I discuss the segments of Dagbanli cross dialectally and show sound-letter relationship as evidence of Dagbanli phonology education. The idea of the relationship between Dagbanli sounds and orthography has received little attention from previous studies of Dagbanli phonology.

3.2.1 Consonants

Dagbanli has thirty-three (33) consonant segments (including affricates, double articulated sounds and velar fricatives) as in Table (2) considering all the major dialects (Tomosili, Nayahili and Nanunli) and the sub-dialects (Gbanjonsili, Zundusili and Jimansili) of Dagbanli. These consonant sounds are represented by twenty-seven (27) orthographic symbols including diagraphs <p, b, f, v, d, s, t, l, k, g, ɣ, h, j, m, n, ŋ, r, w, y, z, ʒ, ch, sh, gb, kp, ŋm, ny> as in Table (3). These consonant segments have surface variants illustrated in brackets in the table.

Table 2: Consonants of Dagbanli

	labial	labio-dental	alveolar	palatal	palato-alveolar	velar	labial-velar	glottal
stop	p b		t d[ɾ]			k g	kp[tp] gb[db]	[ʔ]
nasal	m		n	ɲ		ŋ	ŋm[nm]	
fricative		f v	s z		ʃ ʒ	[x] [ɣ]		[h]
affricate					ʧ ʤ			
lateral			l					
approxi-mant				j			w[ʊ]	

Table 3: Orthographic Symbols of Consonants of Dagbanli

	labial	labio-dental	alveolar	palatal	palato-alveolar	velar	labial velar	glottal
stop	p b		t d			k **g**	kp **gb**	
nasal	m		n	**ny**		ŋ	ŋm	
fricative		f v	s z		**sh** ʒ	x ɣ		h
affricate					**ch j**			
lateral			l					
Approxi-mant			**r**	**y**			w	

Table (2) presents all the consonants of Dagbanli across dialects and the surface variants in square brackets [ ]. The segments in the table are classified according to their voicing, place and manner features including some of the surface variants. The sounds [x], [ɣ], [ʔ] and [h] are not phonemic in the language but they only surface as variants of other phonemes in some dialects. The new surface variant that has been added to the table is the voiced velar fricative [ɣ] which appears only in Zundusili dialect as positional variant of the velar stop /g/.

Table (3) shows the orthographic symbols of Dagbanli consonants including diagraphs. The bolded letters do not appear as sounds but orthographic representation of the following consonants:

i. /g/ <ɣ> , <g>
ii. [ɾ] <r>
iii. /j/ <y>
iv. /ɲ/ <ny>
v. /ʃ/ <ch>
vi. /ʤ/ <j>
vii. /gb/ <gb>

This section focusses on the peculiarities of the Dagbanli consonant system. These include the presence of various sounds and their orthographic in complementary

distribution. The Discussion of the consonant segments and their surface variants follows.

3.2.1a Stops

The stops /p, b, t, d, k. g/ are always spelt with the letters <p, b, t, d, k, g> while /kp, gb/ are usually spelt with the digraph <kp, gb> in words as illustrated below:

(3.1). Stops in Dagbanli

/p/	/b/	/t/	/d/	/k/	/g/	/kp/	/gb/
pʊ̀hɨ	bɔ̀hɨ	tɔ́lɨ́	dám	kʊ̀ɾê	gʊ̀hɨ	kpáɾ-â	gbá-lî
<puhi>	<bɔhi>	<tɔli>	<dam>	<kore>	<guhi>	<kpara>	<gbali>
‘greet’	‘ask’	‘mortar’	‘alcohol’	‘desire’	‘wait’	‘farmer’	‘leg’sg’

The following stop segments manifest dialectal variations in Dagbanli dialects: /d/ and /g/. /d/ is a voiced segment but manifest itself as voiceless in the sub-dialects as [t] in Zundusili (Zun), [k] in Jimansili (Jim), and [ʧ] in Gbanjonsili (Gban) in syllable onset. With respect to the /d/ as segment in Dagbanli, four variations are documented. Variation of the /d/ segment is found in Jimansili as [t] in word-initial before /i/ in words such as:

(3.2) /d/→ [t]/____/i/ in word-initial in Zun

/dɨndalʊŋ/	→	[tɨndalʊŋ]	‘crane fly’
/dɨna/	→	[tɨna]	‘that’
/dini/	→	[tini]	‘knee’
/dɨnɔlɨ/	→	[tɨdɔlɨ]	‘door’
/di-ti/	→	[ti-ti]	‘don’t’
/dabɔlɨ/	→	*[tɨbɔlɨ]	‘heap’
/dabɨlɨ/	→	*[tɨbɨlɨ]	‘slave’

/d/ in Jimansili appears in syllable onset as [k] before the high back vowel /u/ as illustrated below:

(3.3) /d/ →[k] /_____/u/ in word-initial in Jim

/dɪndalʊŋ/	→	[kʊndalʊŋ]	'crane fly'
/dɪna/	→	[kʊna]	'that'
/dɪnɪ/	→	[kʊnɪ]	'knee'
/dɪnɔlɪ/	→	[kʊdɔlɪ]	'door'
/di-ku/	→	[ku-ku]	'don't'
/dabɔlɪ/	→	*[kʊbɔlɪ]	'heap'
/dabɪlɪ/	→	*[kʊbɪlɪ]	'slave'

Different allophonic variation of the /d/ segment is realised in Gbanjonsili in word-initial before front vowels, hence becoming palato-alveolar in words as seen below:

(3.4) /d/ →[ʤ] /_____/i/ in Gban

/dɪnɪ/	→	[ʤɪnɪ]	'knee'
/de-e/	→	[ʤe-e]	'antelope'
/dɪndalʊŋ/	→	[ʤɪndalʊŋ]	'crane fly'
/dɪɾ-gʊ/	→	[ʤɪɾ-gʊ]	'spoon'
/dɪl-gʊ/	→	[ʤɪl-gʊ	'headache'
/dabɔlɪ/	→	*[ʤabɔlɪ]	'heap'
/dab-lɪ/	→	*[ʤabɪlɪ]	'slave'

As illustrated in (3.2), (3.3) and (3.4), [t], [k] and [ʤ] may assume a voiced nature of /d/ when they assimilate to the voicing of the vowel that may follow. Most often than not, in rapid speech /d/ appears stable as flap [ɾ] in postvocalic position in mostly loan words across dialects.

(3.5) /d/ as [ɾ] in intervocalic position in Dagbanli loan words

/kwadu/	→	[kɔɾʊ]	'banana'	*(Twi)*
/jɛda/	→	[jɛɾa]	'trustworthy'	*(Hausa)*
/kode/	→	[koɾe]	'covetousness'	*(Hausa)*
/kodoliko/	→	[koɾoliko]	'bridge'	*(Hausa)*
/fada/	→	[faɾa]	'priest'	*(English)*

/d/→[ɾ] is the stop variation shared across dialects. It is shared by Tomo, Naya and Nan as well as their sub-dialects. Regarding the velar stop /g/, it manifests

itself as velar fricative [ɣ] in intervocalic position in Zun, which is the accurate form well-known to the speakers of the dialect.

(3.6) /g/ realised as [ɣ] in intervocalic in Zun

/jág-ó/	→	[jáɣó]	'bead'
/sígí/	→	[síɣí]	'go down'
/zóg-gô/	→	[zóɣô]	'head'
/ʮɔ̃gɨm/	→	[ʮɔ̃ɣɨm]	'be weak'

From the data in (3.6), /g/ is an example of a normal phoneme which is set up as the underlying representation and surfaces as [ɣ] only in Zun dialect like [ʔ] in the rest of the dialects. The glottal stop [ʔ] surfaces as an allophone of the velar stop /g/ in Tomo, Naya and Nan. For the typical speakers of Dagbanli major dialects, postvocalic stop /g/ is realised as glottal stop [ʔ] and the debuccalisation of the /g/ into [ʔ] in postvocalic position limits /g/ to word-initial and post-consonantal positions. This is illustrated below; the tone marking reflects Naya dialect.

(3.7) /g/ realised as [ʔ] in intervocalic in Naya dilaects

a.	/já-gó/	→	[jáʔ-ʊ]	'bead'
b.	/sɨg-ɨ́/	→	[sɨ́ʔɨ´]	'go down'
c.	/zóg-gô/	→	[zóʔ-ô]	'head'
d.	/ʮɔ̃gɨm/	→	[ʮɔ̃ʔɨ́m]	'be weak'
e.	/gʊ̀hɨ̀/	→	*[ʔʊ̀hɨ̀]	'wait'
f.	/gɔ̀ɾɨ′m/	→	*[ʔɔ̀ɾɨ́m]	'journey'
g.	/gáɾ-gɨ̂/	→	*[ʔáɾʔɨ̂]	'interfere'

It is accurate that the postvocalic sound /g/ is realised as a glottal stop [ʔ] in all the dialects in Dagbanli except in Zun dialect in which it surfaces a velar fricative [ɣ].

3.2.1b Fricatives

The fricatives /f, v, s, z, ʃ, ʒ, x, ɣ, h/ are always spelt with the letters <f, v, s, z, ʃ, ʒ, x, ɣ, h> and /ʃ/ is usually spelt with the digraph <sh> in words such as:

(3.8). Fricatives in Dagbanli

/f/	/v/	/s/	/z/	/ʃ/	/ʒ/	/x/	/ɣ/
[fɛ̀bɨ]	[vàlɨ̂]	[sɔ́ʔô]	[zɔ́ŋ]	[ʃĭrí]	[ʒɛ́rɨ́]	[tɔ̀xɨ]	[vɔ́ɣʊ́]
<fɛbi>	<vali>	<sɔɣu>	<zɔŋ>	<shiri>	<ʒeri>	<tɔɣsi>	<vɔɣu>
‘whip’	‘wrestle’	‘broom’	‘bat’	‘honey’	‘soup’	‘speak’	‘leaf’

The fricatives /s/, /z/, and /ɣ/ manifest dialectal variations in Dagbanli. The realisations are all fricatives except for one realisation that is plosives and one is affricate [ʤ]. The alveolar fricative /s/ becomes velar fricative [x] which is the product of mostly two phonological processes; place assimilation followed by velar stop /g/ deletion and the alveolar fricative /s/ in word-medial in Gban. This is presented below:

(3.9) Coalescence of /g/ and /s/ into [x] in intervocalic in Gban

a.	/tɔ̀g-sɨ/	→	[tɔ̀xɨ]	‘speak’
b.	/ɲàg-sɨ́m/	→	[ɲàxɨ́m]	‘delight/sweetness’
c.	/zàgsɨ/	→	[zàxɨ]	‘refuse’
d.	/ɲág-sá/	→	[ɲàxà]	‘to be palatable’
e.	/wág-sɨ́/	→	[wàxɨ́]	‘slacken’

Gban dialect also show evidence of coalescence of labial nasal /m/ and the velar fricative /s/ surfacing as [x] in intervocalic position in some words (e.g. /wʊ́m-sɨ/ → [wʊ́xɨ] ‘raise a person’). In the dialect, /s/ is very rare in intervocalic position in all contexts and it is, therefore, ruled out in that position in other words in the dialect entirely. /s/ surfaces as [ʃ] before front vowels in word-initial in Naya and Nan

dialects in words (e.g. /síá /→ [ʃíá] ‘mockery’). The literature (Hudu 2018) also mentions that /s/ appears as [h] in Tomo (e.g. /písítá/→[píhítá] ‘thirty’). With respect to the /z/, it surfaces as palato-alveolar affricate [ʤ] before vowels in all contexts in Nan and its sub-dialect ruling [z] out of the dialect entirely as presented below:

(3.10) /z/ → [ʤ] /____v in Nan

/zòn-zó-lɨ́/	→	[ʤòn-ʤó-lɨ́]	‘maggot-sg’
/sǎ:zó-ʔó/	→	[sǎ:ʤó-ʔó]	‘up’
/zóʔ-ó/	→	[ʤóʔ-ó]	‘head-sg’
/zɔ́ŋ/	→	[ʤɔ́ŋ]	‘bat’
/zɔ́m/	→	[ʤɔ́m]	‘blind.sg’

/z/ also appears as [ʒ] in Nayahili in words such as:

(10.11) /z/ → [ʒ]/____v in Naya

/zɛ́-ʔʊ′/	→	[ʒɛ́ʔʊ́]	‘storm’
/zɛ́ɾ-gʊɾ/	→	[ʒɛ́ɾ-gʊ́]	‘attacker’
/zìlí/	→	[ʒìlí]	‘load’

[ɣ] as discussed (cf. 3.6) is a variant of /ɡ/ in intervocalic position in Zundusili. Hudu (2010:12) notes that “a closer observation of the lenited variant, including its acoustic features, however shows that [ɣ] place of articulation is much lower in the vocal tract to be a velar and the accurate representation of [ɣ] would be a glottal stop in some contexts (e.g., following a low vowel) and pharyngeal in other contexts (e.g. following a front vowel)”. This is accurate in the major dialects-Tomo, Naya and Nan but in Zun, a sub-dialect of Naya, the lenited variant and its acoustic features shows that [ɣ] place of articulation is in the vocal tract as velar and the accurate representation of [ɣ] in some contexts is accurate in the dialect. In intervocalic position, the speakers of the major dialects tend to realise this sound as a glottal stop [ʔ] except in Zun where it surfaces as [ɣ] in a normal speech.

I suggest that [ɣ] is a segmental variant in Zun dialect which surfaces as a variant of the velar stop /g/ only in intervocalic position. I support this suggestion with the following reasons. First, /ɣ/ is a symbol spelt with the letter <ɣ> in intervocalic position in Dagbanli orthography in all standard written forms representing the sound /g/ in Zun dialect and has been used independently across dialects as presented below:

(3.12) <ɣ> as orthography symbol for /g/ in Dagbanli

/vɔgʊ/	<vɔɣu>	'leaf'
/kɔgʊ/	<kɔɣu>	'antelope'
/baga/	<baɣa>	'soothsayer
/mɔgʊ/	<mɔɣu>	'bush'
/dɔgɨm/	<dɔɣim>	'family member'
/zʊgʊ/	<zuɣu>	'head'
/lɛgʊ/	<lɛɣu>	'kind of hoe'
/ʧʊgʊ/	<chuɣu>	'festival'
/jigi/	<yiɣi>	'fly'
/kpʊgɨ/	<kpuɣi>	'take'
/tagɨ/	<taɣi>	'change'
/lagɨm/	<laɣim>	'gather'
/lʊgɨ-lɨ/	<luɣili>	'side'
/paga/	<paɣa>	'woman'
/sag-sɨ/	<saɣisi>	'advice'
/dɔgʊ/	<dɔɣu>	'stick'
/sagɨ/	<saɣi>	'agree'
/dagɨ/	<daɣi>	'dirt'

A non-native speaker of Dagbanli in a normal writing may substitute <ɣ> for <g> in word medial but there is no evidence of a monolingual native speaker of the language writing <g> in any of the words in (3.12) and many others.

Second, in a phonemic representation, the variant [ɣ] in intervocalic position is realized as velar stop /g/ which surfaces as glottal stop [ʔ] in Tomo (WD), Naya (ED) and Nan (SD). /g/ presumably surfaces as velar fricative [ɣ] in Zun and merges as glottal fricative [h] Jim (SD) before a high front vowel /i/.

(3.13) Phonemic Representation of [ɣ] in Naya

/dɔ́g-ǘ/	[dɔ́ʔ-ǘ]	<dɔɣu>	‘stick’
/vɔ́g-ǘ/	[vɔ́ʔ-ǘ]	<vɔɣu>	‘leaf’
/kɔ́g-ǘ/	[kɔ́ʔ-ǘ]	<kɔɣu>	‘antelope’
/bág-á/	[báʔ-á]	<baga>	‘soothsayer’
/dɔ́g-ǘ/	[dɔ́ʔ-ǘ]	<dɔɣu>	‘bush’
/dɔ́gɨ́m/	[dɔ́ʔɨ́m]	<dɔɣim>	‘family’
/dɔ́gɨ́/	[dɔ́ʔ-ɨ́]	<dɔɣi>	‘deliver’
/zúg-ǘ/	[zúʔ-ǘ]	<zuɣu>	‘head’
/lɛ́g-ǘ/	[lɛ́ʔ-ǘ]	<lɛɣu>	‘kind of hoe’
/ʧǔ́g-ǘ/	[ʧǔ́ʔ-ǘ]	<chuɣu>	‘festival’
/dúg-ǘ/	[dúʔ-ǘ]	<duɣu>	‘pot’

(3.14) Distribution of [ɣ] in Zun

/vɔ́gǘ/	[vɔ́ɣǘ]	<vɔɣu>	‘leaf’
/dɔ́gǘ/	[dɔ́ɣǘ]	<dɔɣʊ>	‘stick’
/kɔ́gǘ/	[kɔ́ɣǘ]	<kɔɣu>	‘antelope’
/bágá/	[báɣá]	<baɣa>	‘soothsayer
/dɔ́gǘ/	[dɔ́ɣǘ]	<mɔɣu>	‘bush’
/dɔ́gɨ́m/	[dɔ́ɣɨ́m]	<dɔɣim>	‘family’
/dɔ́gɨ́/	[dɔ́ɣɨ́]	<dɔɣi>	‘deliver’
/zúgǘ/	[zúɣǘ]	<zuɣu>	‘head’
/lɛ́gǘ/	[lɛ́ɣǘ]	<lɛɣu>	‘kind of hoe’
/ʧǔ́gǘ/	[ʧǔ́ɣǘ]	<chuɣu>	‘festival’
/dúgǘ/	[dúɣǘ]	<dʊgʊ>	‘pot’

The data in (2.13-2.14) provide evidence that the phonemic representation of /g/ in word-medial surfaces as /ɣ/ in Zun dialect.

Third, the velar fricative /ɣ/ is a positional variant of the velar stop /g/ in word-medial since there is no evidence to show that both sounds are not in complementary distribution. In Zun, /g/ phonologically surfaces as [ɣ] in postvocalic as seen in (3.14). In order to support this claim, indigenous words that names towns and villages that have /g/ in intervocalic position is pronounced as [ɣ] in Zun dialect as in the examples below.

(3.15) /ɣ/ in indigenous words in Zun

/zábzógô/	→	[zábzóɣô]	'name of a town'
/gòndɔ́gó/	→	[gòndɔ́ɣó]	'village close to Yendi'
/gòʃɛ̀gó	→	[gòʃɛ̀ɣó]	'name of a town'
/làmàʃɛ̀gó/	→	[làmàʃɛ̀ɣó]	'suburb of Tamale'
/bágá-bágá/	→	[báɣá-báɣá]	'suburb of Tamale'
/ʧɔ́gô/	→	[ʧɔ́ɣô]	'suburb of Tamale'
/ná:bɔ́gô/	→	[ná:bɔ́ɣô/	'suburb of Tamale'

This process is blocked when /g/ occurs in non-postvocalic position in words as seen below"

(3.16) /g/ in non-postvocalic position in Zun

/kòmbòŋ-gô/	*[kòmbòŋ-ɣô]	'name of a town'
/káɾ-gá/	*[káɾɨɣá]	'name of a town'
/kátáɾ-gá/	*[kátáɾɨɣá]	'suburb of Tamale'
/gòɾ-gò/	*[gòɾɨɣò]	'name of a town'
/gbɨ́ngbálɨ́gá	*[gbɨ́ngbálɨ́ɣá]	'name of a town'

Finally, Zun dialect speakers of Dagbanli do not alternatively pronounce the velar fricative [ɣ] and velar stop /g/ in intervocalic position, /g/ only surfaces as [ɣ] in intervocalic position in words as illustrated in (3.15) but blocked in onset position of a syllable as in (3.16). It is very rare to hear [ɣ] in the onset of a syllable being pronounced in any of the dialects but very common between vowels. The alternative pronunciation and description maybe influenced by words in which such sounds occur between vowels. It is also noted that in words which are nouns and verbs, there is no evidence of /g/ becoming /ɣ/ in onset of a syllable and such situation it is realized as /g/ but not [ɣ]. This is illustrated below:

(3.17) [ɣ] as an allophone of /g/ in onset of a syllable

/kʊ́l-gá/	*[kʊl-ɣa]	<kuliga>	'stream'
/gɔ́ɾ-gó/	*[gɔɾ-ɣʊ]	<gorigu>	'sickle'
/ŋmàl-gɨ́/	*[ŋmal-ɣɨ]	<ŋmaligi>	'turn'
/ɲɛ́b-gà/	*[ɲɛb-ɣa]	<nyɛbiga>	'crocordile'
/bàɾ-gɨ́/	*[baɾ-ɣɨ]	<barigi>	'lost'
/bál-gɨ́/	*[bal-ɣɨ]	<baligi>	'slow'
/gɔ́b-gá/	*[gɔb-ɣa]	<gɔbga>	'left'

Based on the reasons provided as evidence to support the behavior of the velar fricative /ɣ/ in Zundusili, it is shown that /g/ occurs before a vowel in an onset of a syllable (#___v) but crucially, [ɣ] never occur in that environment but instead occurs between vowels (v__v), which makes the distribution complementary. Thus, [ɣ] is an allophone of the phoneme /g/ because it has such a highly restricted distribution. The pattern in the data (3.17) suggests that /g/ occur initially before a vowel and after [ɾ] or [l] and in onset position of a final syllable establishing the fact that /g/ and [ɣ] are in complementary distribution where none occurs when any of the others may occur. The environments are shown as follows: /g/ → [ɣ] / v___v in Zundusili. I, therefore suggest that [ɣ] as a variant of /g/ in intervocalic position in Zundusili dialect. Hence, in an onset position, the velar stop /g/ remains the same (e.g. /gɔ́b-gá/ →*[ɣɔ́b-ɣá] 'left') and in intervocalic position the velar stop surfaces as [ɣ] in (e.g. /dɔ́g-ó/ →[dɔ́ɣó] 'stick') in Dagbanli phonology.

3.2.1c Nasals

The nasals /m, n, ŋ, ɲ, ŋm/ are always spelt with the letters <m, n,> while /ɲ, ŋm/ are spelt with the digraphs < ny, ŋm> in words such as:

(3.18) Nasals in Dagbanli

m	n	ŋ	ɲ	ŋm
[mɔ́ʔʊ́]	[nápɔ́ŋ]	[ŋárɪ́m]	[ɲɛ̀vɪ́lɪ́]	[ŋmánɪ̂]
<mɔɣu>	<napɔŋ>	<ŋarim>	<nyɛvili>	<ŋmani>
'grass'	'leg'	'cannon'	'soul'	'calabash'

The nasals /n/, /ɲ/, and /m/ are reported with variations. /n/ is the only nasal that has multiple variations. It may be omitted or present itself as [ɲ], [ŋ], or [m]. It is attested (Hudu 2016) in Dagbanli that labial-velar /ŋm/ appears as [nm] before front vowels

in all dialects except Nanunli. The realization of [ɲ] sound in Jim dialect as [n] before front vowels is a case of variation as seen below:

(3.19) /ɲ/̀ → [n] in Jim

/ɲìn-í/	→	[nìn-í]	'you'
/ɲɛ̀ʔɨ́/	→	[nɛ̀ʔɨ́]	'nose.sg'
/ɲé-ɾá/	→	[né-ɾá]	'one who decates'
/ɲɨ́msà/	→	[nɨ́msà]	'neem tree'
/ɲɨɲáʔ-ó/	→	[nɨɲáʔ-ó]	'finger nail
/ɲɛ̀vɨ́lɨ́/	→	[nɛ̀vɨ́lɨ́]	'soul'

The data in (3.19) present palatalisation of underlying consonants /ŋ/ which accounts for the differences. In this case, three realizations happen in all dialects. /ŋ/ manifest as [ɲ] in Naya and appears as [n] in Nan as in (3.19) especially in onset position in words. Such is the case of /ŋìn-í/ → [ɲìn-í] 'you' in Naya dialect and becomes [n] as in [nìn-í] in Nan dialect. The realisation of [n] from /ɲ/ uniquely describes Jim as a sub-dialect since most speakers of Nan would prefer /ɲ/ (e.g. /ɲìn-í/) to [n] (e.g. [nìn-í]). It is observed that all the underlying palatalized consonants are prominent in Tomo while the surface variants occur in Naya and Nan. The speakers of Tomo can also use the words under Naya but both Tomo and Naya speakers cannot use some of the forms in Nan because /z/ changes to [ʤ] before vowels while /ɲ/ also changes to [n] before front vowels.

3.2.2 Phonological Contrast of Consonants in Dagbanli

Phonological contrast accounts for the variations in the distributions of segments that are contrastive sounds as seen in Table (4) for consonants in Nayahili dialect for the major dialects due to consistence in tone marking.

Table 4: Consonant distribution in Dagbanli (Naya dialect)

Consonant	word-initial	word-medial	word-final
/p/	pâm ‘plait’	tápáʔ-á ‘slap’	
/t/	tàm ‘forget’	pátá ‘hut’	
/k/	kám ‘any’	nàkáhá ‘butcher’	
/kp/ [tp]	kpàm ‘oil’	kpá:kpá ‘coconut’	
/b/	bàm ‘odour’	dɪ́b-gá ‘chewing stick’	làb ‘throw’
/d/	dám ‘alcohol’	tàdáb-tɪ̂ ‘writing ink-pl’	
[ɾ]		ʒéɾɪ́ ‘soup’	dɔ́ɾ-tɪ́ deseas.pl’
/g/	gám ‘a lot’	tè:ŋ-gá ‘beard’	
/gb/ [pb]	gbàm ‘crawl’	dágbáŋ ‘state’	
/m/	màm ‘lover’	tóm-ô ‘messenger-sg’	dám ‘alcohol’
/n/	nàm ‘create’	máná ‘okro’	dɪ̀n ‘which’
/ŋ/	ŋàm ‘struggle’	lóŋ-á ‘drama’	dôŋ ‘enmity’
/ɲ/	ɲàm ‘cool’	káɾɪ́ɲá-ʔó ‘wound’	
/ŋm/ [nm]	ŋmá ‘break	sáŋmáɾɪ́gá ‘star’	
/l/	làm ‘taste’	sálá ‘charcoal’	kɑ́l-ó ‘enamel’
/f/	fɪɾ-lá ‘light’	sá:fé ‘key’	
/v/	váɾɪ́ ‘leaves’	sàlɪ̀n-vɔ́ʔ-ɔ́ ‘ayoyo soup’	
/s/	sám ‘mix’	má:sím ‘cold’	
[x]		ɲáxɪ́m ‘sweetness’	
/z/	záʔɪm ‘fish’	zónzólɪ́ ‘maggot’	
/ʒ/	ʒɪ́m ‘blood’	ká-ʒé: ‘guinea corn’	
/ʃ/	ʃám ‘times’	ʃɪnʃáʔ-ɔ́ ‘bathroom’	
/ʧ/	ʧáŋ ‘go’	ʧɪ́nʧɪ́nɪ́ ‘cloth’	
ʤ/	ʤám ‘play’	dálɪ́ʤá ‘fame’	
/j/	jám ‘sense’	zólí-já ‘family’	
/w/	wɔlígɪ ‘separate’	kàlɪwáná ‘maize’	
[h]		tìhɪ̀m ‘sneeze’	ʃĩh-í ‘touch’
[ʔ]		tápáʔ-á ‘slap’	sɔ́ʔ-ô ‘broom’
[ɣ]		tápáɣ-á ‘slap’ (Zundunsili)	

The examples in Table (4) present the distribution of Dagbanli consonants in Naya in which all the consonants occur in word-medial positions including the surface variants. The nasals [m, ŋ, n] are the ones that are prominent in the word final/coda position of CVC words in all dialects except some few oral consonants /b, l, ɾ, ʔ, h/ which also occur in the coda position of disyllabic words. The segments /b/ and /l/ are the only oral consonants which occurs at word-final but the rest are postvocalic

variants of /d, ɡ, s/. The distribution of the segments /d, z, n/ in word-initial and /z, ɡ, s/ in word-medial show variation in the sub-dialects but are similar in all the major dialects as seen below:

(3.20) distribution of the segments /d, z, n/ in word-initial of the sub-dialects

Segment	**Naya**	**Jim**	**Zun**	**Gban**	**Gloss**
/d/	dɨ́ndàlòŋ	kóndàlòŋ	tɨ́ndàlòŋ	ʧɨ̃ndàlòŋ	‘crane fly’
/z/	zóʔ-ô	ʤóh-ô	zóɣ-ô	zóʔ-ô	‘head’
/n/	ɲè-hɨ̀	nè-hɨ̀	ɲè-hɨ̀	kè-hɨ̀	‘awaken’

(3.21) distribution of the segments / z, ɡ, s/ in word-medial of the sub-dialects

Segment	**Naya**	**Jim**	**Zun**	**Gban**	**Gloss**
/z/	zònzó-lɨ́	ʤòndʒó-lɨ́	zònzó-lɨ́	zònzó-lɨ́	‘maggot’
/g/	ʧɔ́ʔɨm	ʧɔ́hɨm	ʧɔ́ɣɨm	ʧɔ́ʔɨm	‘be weak’
/s/	wál-sɨ́	wál-sɨ́	wál-sɨ́	wálɨ́xɨ́	‘slacken’

It evident that the distributions of /d, z, n/ in word-initial before /i/ and /s, z, ɡ/ in word medial show variation between the major dialects as presented in Naya data (cf. 3.20) and the sub-dialects (cf. 3.21). The rest of the consonants show similarities across dialects in their distribution. In Tomo, /d/ manifest as [ʧ] in Gban, in Naya, /d/ manifest as [t] in Zun and in Nan, /d/ manifest as [k] in Jim. /z/ and /ɲ/ appear as [ʤ] and [n] in Nan and its sub-dialect, thus showing variation between Tomo and Naya against Nan. Between Nan and the sub-dialect Jim, the variation is more pronounced in Jim than Nan, hence, the difference between them. For intervocalic position, /z/, /s/ and /ɡ/ manifest as [ʤ] in Jim, [x] in Gban and [ɣ] in Zun. The distribution of /d, z, n s, ɡ/ in the major dialects are therefore restricted in their sub-dialects.

Phonological contrast illustrates how segments contrast with each other to make difference of meaning in a large pair of units by putting together a set of words

having different meanings and varying by only one sound apiece. A minimal pair is the most effective way to show that two sounds are distinctive as shown in Table (8) for Dagbanli sub-dialects.

Table 5: Minimal Pair test in the sub-dialects (Gban, Jim & Zun)

phonemes	Gban	Jim	Zun
/p/	pání ‘vigina’	pání ‘vigina’	pání ‘vigina’
/t/	‘táni ‘material’	‘táni ‘material’	‘táni ‘material’
/k/	ká-ní ‘not there’	ká-ní ‘not there’	ká-ní ‘not there’
/kp/ [tp]	kpim ‘corpse’	kpim ‘corpse’	kpim ‘corpse’
/b/	bim ‘source’	bim ‘source’	bim ‘sauce’
/d/	ʧim ‘bite’	kɔ́m ‘bite’	tim ‘bite’
/g/	gáni ‘single’	gáni ‘single’	gáni ‘single’
/gb/ [pb]	gbání ‘rashes’	gbání ‘rashes’	gbání ‘rashes’
/m/	máni ‘me’	máni ‘me’	máni ‘me’
/n/	nini ‘eye’	nini ‘eye’	nini ‘eye’
/ŋ/	ŋini ‘you’	nini ‘you’	ɲini ‘you’
/ɲ/	ɲáni ‘giant’	náni ‘giant’	ɲáni ‘giant’
/ŋm/ [nm]	ŋmáni ‘calabash’	ŋmáni ‘calabash’	ŋmáni ‘calabash’
/l/	láni ‘testis’	láni ‘testis’	láni ‘testis’
[ɾ]			
/f/	fim ‘submerge’	fim ‘submerge’	fim ‘submerge’
/v/	vim ‘sweet smell’	vim ‘sweet smell’	vim ‘sweet smell’
/s/	sim ‘appropriate’	sim ‘appropriate’	sim ‘appropriate’
[x]			
[ɣ]			
/z/	zim ‘flour’	zim ‘flour’	zim ‘flour’
/ʒ/	ʒim ‘blood’	ʒim ‘blood’	ʒim ‘blood’
/ʃ/	ʃim ‘miser’	ʃim ‘miser’	ʃim ‘miser’
/ʧ/	‘ʧim ‘fry’	‘ʧim ‘fry’	‘ʧim ‘fry’
/ʤ/	ʤìm ‘groan’	ʤìm ‘groan’	ʤìm ‘groan’
/j/	jim ‘once’	jim ‘once’	jim ‘once’
/w/ [ʊ]	wâní ‘special’	wâní ‘special’	wâní ‘special’
[h]			
[ʔ]			

The test in Table (8) shows that the segments [ɾ, x, ɣ, ʔ, h] do not contrast in Dagbanli and its dialects. None of the segments show evidence of contrast in any of

the sub-dialects like the major dialects. One may suggest here that the consonants in Dagbanli and its sub-dialects behave similar as there are no special cases of contrastive sounds within the sub-dialects, which do not occur in the major dialects. Thus, confirming the fact that [ɾ, x, ɣ, ʔ, h] are not phonemic in Dagbanli phonology but surfaces as a variant of /d, s, g, k/ in Tomo and Naya respectively. This assertion is supported when the questions in (3.22) are given phonological response.

(3.22)

a. "Are there are any minimal pairs in which these sounds contrast?"
b. "Are there any noncontrastive sounds in complementary distribution?"
c. "If noncontrasting phones are found, what are the phonemes and their allophones?"
d. "What are the phonological rules by which the allophones can be derived?"

The tests in Table (8) reveal that all the consonants in Dagbanli are contrastive (e.g. [tám] 'forget' vs [gám] 'large') and are also distinctive except [ɾ, x, ɣ, ʔ, h] which show no evidence of distinctiveness. So, the answer to the first question with regards to [ɾ, x, ɣ, ʔ, h] is No.

In responding to the second question, one can say that the noncontrasting segments [ɾ, x, ɣ, ʔ, h] are in complementary distribution with the contrastive segments /d, s, g, k/ (e.g. [sɨ̀m] 'friend' vs [tɔ̀xɨ̀] 'speak'). One technique of describing sounds that are in complementary distribution is to list each sound with the environment in which it is found, as follows: thus, /s/ as in /sɨm/ word-initial and [x] in [tɔ̀xɨ̀] word-medial are in complementary distribution because their environments are different. In Gbanjonsili dialect, the two sounds occur in different environments: /s/ in syllable onset and [x] only in intervocalic position. The

distribution of /s/ and [x] are different and they complement each other, for [x] is not found in /s/-type environment, nor /s/ in [x]-type. When this happens, the two sounds are analysed to be in complementary distribution or noncontrastive. Therefore, the answer is Yes.

For the third question, which requested for the phoneme pairs that are more basic and whose features would define the phoneme? It is known that two allophones can be derived from one phoneme in which one is selected as the underlying segment form which the allophone makes the rules and the phonemic feature matrix as simple as possible. In Dagbanli, the alveolar fricative /s/ occurs in both word-initial and word-medial in all the dialects except Gbanjonsili in which it surfaces as velar fricative [x] mostly in postvocalic (e.g., /gàlsɨ́/ → [gàlxɨ́] ‘large). Thus, /s/ is selected as the underlying phoneme because it is set up here as the elsewhere allophone (Hayes 2009) and [x] as an allophone.

In response to the last question, one can now state the rule by which the velar fricative [x] is derived from the alveolar fricative in intervocalic position between vowels. Using feature notation, one can state the rule as: /g+s/ → [x] / v___v. These analyses apply to both [ɾ] and [ɣ] where [ɾ] is a variant of /d/ across dialects and [ɣ] is a variant of /g/ in Zundusili in intervocalic position (cf.3.6). The whole processes of responding to the questions (cf. 3.22) are summarised in the table below. It is important to note that this analysis describes the data at hand, and further data may oblige one to re-analyse the situation.

Table 6: The Status of [x, ɣ, ɾ] in Dagbanli

Minimal Pair (sound contrast)	Noncontrastive Sounds (complementary distribution)	Segments and their variants	Phonological Rules by which variants are derived.	Dialect
[x] vs [s] ? ?	[x] vs [g+s] /ɲàgsɨm/ 'sweetness' [ɲàxɨm] 'sweetness'	Phoneme: /s/ Variant: [x]	/g+s/→[x] / v_v	Gban
[ɣ] vs [g] ? ?	[ɣ] vs [b] /vɔ́gó/ 'leaf' [vɔ́ɣó] 'leaf'	Phoneme : /g/ Variant:[ɣ]	/g/ →[ɣ] / v_v	Zun
[ɾ] vs [d] ? ?	[d] vs [ɾ] /kɔ́dó/ 'banana' [kɔ́ɾó] 'banana'	Phoneme: /d/ Variant: [ɾ]	/d/ →[ɾ] / v_v	AD

3.2.3 Vowels

Dagbanli vowel phonology has been fairly well described (Hudu 2016, 2018). The central themes in the previous studies relevant for this thesis are the conclusions on which vowels form part of the inventory of the language, which vowels are contrastive and which are variants of one phoneme? The issues that are attested (Hudu 2010, 2016) to be non-controversial about Dagbanli vowels include: i. vowel length in Dagbanli is phonemic and all non-low long vowels are [+ATR] while the low long vowel is [-ATR]. Both short and long vowels are contrastive and bring about difference in meaning as the data below:

(3.23) Contrast between short vowels and long vowels in Naya (Hudu 2016:60)

pì-já	'bury-perf.'	pì:-já	'choose-perf'
mí-bû	'raining.'	mí:-bû	'becoming sour'
tòlɨ	'hot'	tù:lì	'first'
póńɨ	'door'	pú:ní	'inside'
kpɛ́-bô	'entering'	kpé:-bô	'boiling'
fé	'finger-V'	fè:	'scarce'
dó	'weed-V'	dó:	'lying posture'
gɔ̀ńɨ	'expert'	gò:ní	'fence'
báŋ-á	'bangle-sg.'	bá:ŋ-á	'praise singer-sg.'
màńɨ	'1.sg. emph.'	má:n-í	'okra-sg.'

It is established from the minimal pair test in Table (7) that Dagbanli has nine (9) short vowels /i, ɨ, e, ɛ, a, o, ɔ, u, ʊ/ and five (5) long vowels /i:, a:, o:, e:, u:/ taking all the dialects into consideration. Table below presents the vowels of Dagbanli in all the dialects according to the Class I vowels [+ATR] and the Class II vowels [-ATR] categorization as Table (8). This table contains all the possible fourteen vowels in the dialects with the double articulated long vowels represented as long vowels with the length mark (:).

Table 7: Minimal Pair Test of Vowels in Dagbanli Sub-Dialects

phonemes	Gban	Zun	Jim	Gloss
/i/ [ɨ]	tìm	tɔ̀m	tɔ̀m	'medicine'
/ɛ/ [e]	bʲám té	bɛ́m tɛ́	bém té	'mean' 'filter'
/a/ /u/	tàm tú	tɔ̀m tú	tɔ̀m tú	'forget' 'insult'
/ʊ/	tʊ́m	tʊ́m	tʊ́m	'work'
/o/ /ɔ/	tóm	tóm	tóm	'difficulty'
/i:/ /e:/	bì: bé:	bì: bé:	bì: bé:	'heat' 'shin'
/a:/ /o:/ /u:/	bá: bó: bú:	bá: bó: bú:	bá: bó: bú-á	'dog' 'right' 'goat'

Table (7) shows contrastive vowels in Dagbanli sub-dialects. Other long vowels which are not included in the test are <ɛɛ> and <ɔɔ> which are prominent in Dagbanli idiophones. The contrastive vowels identified in the major dialects are attested here to apply to the sub-dialect of Dagbanli phonologically.

Table 8: Vowel Inventory

Class I			Class II		
i i:		u u:		ɨ	ʊ
e e:		o o:	ɛ		ɔ
				a a:	

The following vowels manifest variations: /i/, /a/, and /o/. /a/ manifest as [ɔ], such as the case in Zundusili where [ɔ] appears before consonants as in the example below.

(3.24) /a/ →[ɔ] in Zun

/bár-gɨ́/	→	[bɔ́r-gɨ́]	'lost'
/lár-gá/	→	[lɔ́r-gá]	'corner'
/lár-gɨ́/	→	[lɔ́r-gɨ́]	'untie'
/dáb-lɨ́m/	→	[dɔ́b-lɨ́m]	'bravery'
/záb-ɾɨ́/	→	[zɔ́b-ɾɨ́]	'hair'
/sáb-lɨ́/	→	[sɔ́b-lɨ́]	'rat'
/wálɨ́/	→	[wɔ́lɨ́]	'bear fruit'
/kálɨ́/	→	[kɔ́lɨ́]	'sweep'
/táɾɨ́/	→	[tɔ́ɾɨ́]	'sweep'
/páʔ-sɨ̀/	→	[tɔ̀ʔ-sɨ̀]	'copy'
/sálɨ̀m/	→	[sɔ̀lɨ̀m]	'narrate'
/páʔ-ɾɨ̀/	→	[pɔ̀ʔ-ɾɨ̀]	'tree buck'

In Tomo, /a/ appears as [ɔ] in some words before the velar stop /ʔ/ as presented below:

(3.25) /a/ → [ɔ] in Tomo

/váʔó/	→	[vɔ́ʔò]	'leaf'
/dáʔó/	→	[dɔ́ʔó]	'stick'
/káʔó/	→	[kɔ̀ʔó]	'antelope'
/bàhɨ̀m/	→	[bɔ̀hɨ̀m]	'learn'
/tàlɨ̀m/	→	[tɔ̀lɨ̀m]	'message'
/wàɾɨ̀/	→	[wɔ̀ɾɨ̀]	'cold'
/wàl-gɨ̀/	→	[wɔ̀l-gɨ̀]	'separate'
/wál-gó/	→	[wɔ̀l-gó]	'sweat'
/wálɨ́/	→	[wɔ́lɨ́]	'bear fruit'

[a] again appears as [o] in Naya and Nan in such words as:

(3.25) /a/ → [o] in Naya

/sàkólô/	→	[sòkólô]	'fufu'
/gáɾó/	→	[góɾó]	'bed'
/pàló/	→	[pòló]	'plot'
/sál-ô/	→	[sólo]	'crowd'
/kạ́ɾó/	→	[kóló]	'enamel ware'
/jạ́nó/	→	[jónó]	'jaw'

With respect to /i/ segment, one variation was documented. It appears as /u/ in Naya and Nan as well their sub-dialects. Consider the realization of [u] in Naya in the data below:

(3.26) /i/ → [u] in Naya dialect

/tɨ́l-gá/	→	[tól-gá]	'pestle'
/zɨ́lɨ́m/	→	[zólɨ́m]	'deep'
/líhí/	→	[jólɨ́]	'watch'
/dɨ́l-gó/	→	[dól-gó]	'headache'
/dɨ́nɨ́/	→	[dónɨ́]	'knee'
/tɨmó/	→	[tómó]	'messenger'
/tɨm/	→	[tóm]	'send'

The manifestation of /i/ as [u] is similar in Nan as well as Zun and Jim. The only difference is that the words with /d/ in onset is realized as [k] in Jim dialect (e.g. /dɨ́l-gó/→[kólgó] 'headache') and [t] in Zun dialect (e.g./dɨ́lgó/→[tɨ́lgó]'headache')

3.2.3.1 Vowel sequence within words

The figure below illustrates Dagbanli vowel sequence which shows the combinations that occur within individual words in all the dialects. It is considered in this analysis as sequence of two vowels as illustrated below:

	i	e	ɛ	a	o	ɔ	u
i	ii		iɛ	ia			
e		ee					
ɛ	iɛ		ɛɛ				
a	ia			aa			
o					oo		
ɔ						ɔɔ	
u				ua	uo		uu
ii							
ee							
oo	ooi						
aa	aai						
uu	uui						

Figure 3.1 Vowel Sequence in Dagbanli

These vowel sequences occur in all the major dialects as illustrated in Naya in the words below:

(3.27) Vowel Sequences in Naya

ii	/bí:/	<bii>	‘heat’
ee	/bé:/	<bee>	‘shin-sg’
aa	/dá:/	<daa>	‘market’
oo	/dó:/	<doo>	‘man’
uu	/dú:/	<duu>	‘room’
ɛɛ	/bɛ́:/	<bɛɛ>	‘idiophone’
ɔɔ	/bɔ́:/	<bɔɔ>	‘idiophone’
ua	/bú-á/	<bua>	‘goat-sg’
iɛ	/pʲɛ́ʔ-ó/	<piɛɣu>	‘sheep-sg’
ia	/tí-á/	<tia>	‘tree-sg’
aai	/ŋmá:[g]í/	<ŋmaai>	‘cut’
uo	/kú-ó/	<ku-o>	‘kill it’
ooi	/zó:[g]í/	<zooi>	‘grow’
uui	/gú:[g]í	<guui>	‘run

All the vowel sequences occur within stem words but in some cases, it is realized in a clause (e.g. [kú-ó] 'kill it'). The double vowel <uu]> manifests variation: /u:/ manifests as [ua] in Jim dialect in some word as illustrated below: Other possible sequence realized are <ooi>, <aai> that occur in all the dialects.

(3.28) Sequence of /u:/ as [ua] in Jim

dú:	→	dú-á	'room'
sù:	→	sù-á	'knife'
tù:	→	tù-á	'baobab tree
pù:	→	pù-á	'pregnant'
gù:	→	gù-á	'protector'
nù:	→	nù-á	'hand'

3.3 Predictability of [ɾ] and /ɛ/ in Dagbanli Dialects

The variants (allophone) of a segment can be seen in terms of predictability. Variants of a segment are predictable in that one can say: in environment A, one finds variant x; in environment B, variant y, etc. Thus, given the sequence- Vl# or – VlC, one can easily predict that the variant [l] occurring here will be [ɬ] and not [l].

The predictability of the flap [ɾ] as a variant across Dagbanli dialects is confirmed in this section noting that it is more prominent in Dagbanli words than loan words. Previous studies of [ɾ] (Bendor-Samuel and Wilson 1969; Olwasky 1999) attest that [d] is weakened to become a flap [ɾ] in intervocalic position in loan words confirming the loan status as illustrated below:

(3.29) /d/ → [ɾ] in loan words in Dagbanli

/kɔ̀dɔ̀/	→	[kɔ̀ɾɔ̀]	'banana-sg'
/jɛ́dà/	→	[jɛ́ɾà]	'trustworthy'
/fádá/	→	[fáɾá]	'father'
/gádó/	→	[gáɾó]	'bed'

In some further cases, the alveolar stop [d] is stable in postvocalic position in loan words (e.g. /bòdò-á/→ *[bòɾò-á] ‘towel-sg). The occurrence of [ɾ] in words in Dagbanli can be confirmed as a variant due to the fact that [ɾ] occurs only in certain largely predictable environments that leads to the conclusion that it should be treated as a variant of /d/ in Dagbanli. This explains the fact that both /d/ and [ɾ] in words do not occur in the same environment and for that matter they are not contrastive here. They are variants because there are differences in the occurrence of their environment as illustrated in the following data:

(3.30) Complementary Distribution of /d/ and [ɾ]

[d]		[ɾ]	
dá-ɾá	‘buy.imperf	bá-ɾá	‘ride.imperf’
dá-á	‘market.sg’	kòɾ-ê	‘desire’
dám	‘alcohol’	dóɾ-ó	‘sick.sg’
dôŋ	‘enemy’	làɾ-gí	‘untie’
dìm	‘bite’	láɾí	‘laugh’
kódɔ̀lkó	‘bridge.sg’	*kóɾɔ̀lkó	‘bridge.sg’

The distributions of /d/ and [ɾ] in the words in (3.30) are different, and they complement each other, for /d/ is not found in [ɾ]-type environments in word-medial, nor [ɾ] in [d]-type in word-initial and elsewhere (e.g./kódɔ̀lkó/→ *[kóɾɔ̀lkó]‘bridge.sg’) in Dagbanli words. This, therefore, confirms the fact that [d] and [ɾ] are variants of /d/ in Dagbanli since /d/ has more distribution. The difference is realized in words because the flap [ɾ] as a variant of /d/ is entirely predictable according to the phonetic environment. Again, consider the following data.

(3.31) Distribution of [d] and [ɾ]

[ɾ]		[d]	
pìɾ-bà	'father's sister'	gʊ̀m-dɨ́	'cotton'
pìɾ-gì	'to divide'	tạ̀dạ́b-ô	'writing ink'
dìɾ-gʊ́	'spoon'	sáhɨ́n-dá	'spoil-impf
jáɾ-gʊ́	'rascally'	bɔ̀hɨ̀n-dɨ́	'leran-impf
sáɾ-gɨ	'to slide'	dàm-dɨ̀	'shake-imperf'
kpáɾɨ	'tassel of corn'	láhɨ́n-dɨ́	'put together'
faɾa	'Poverty'	námdâ	'sandal'
kʊ́ɾ-ʧʊ́	'pig'	kʊ́ndʊ́ŋ	'hyna'

The words in (3.31) are all Dagbanli indigenous words and it has been established that each word has a different meaning. It appears in the data that the two sounds /d/ and /ɾ/ occur in different environment: /d/ is found in word-initial and word-medially syllable onset before vowels, while /ɾ/ also occurs only in word-medial syllable coda after vowels. As both sounds occur word-medially but in different linguistic environment, it is most possible they are variants. This distribution of /d/ and /ɾ/ makes good phonetic sense, for [ɾ] is found between vowels (intervocalic), while [d] is found in word-initial or syllable onset and either preceded or followed by a vowel.

The data (cf.3.31) suggests the distributions of /d/ and [ɾ] in Dagbanli are different, and they complement each other, for /d/ is not found in [ɾ]-type environments, nor [ɾ] in [d]-type in word-initial. In this case, the two segments do not contrast, therefore, said to be in complementary distribution in Dagbanli. This, therefore, also confirms the fact that [d] and [ɾ] are variants of the same phoneme /d/ in Dagbanli as they do not contrast. None of the dialects show evidence of contrast between the /d/ and [ɾ] so the conclusion applies to the major dialects and their sub-dialects. The example in (3.32) shows /d/ and [ɾ] occurrences in the sub-dialects.

(3.32) /d/ and [ɾ] occurrences in the sub-dialects

Segment	Variants	Gban	Zun	Jim	Gloss
/d/	dɨ̀m	ʧɨ̀m	tɨ̀m	kʊ̀m	'bite'
[ɾ]	*ɾɨ̀m	*ɾɨ̀m	*ɾɨ̀m	*ɾɨ̀m	'bite'
/d/	*kpádɨ	*kpádɨ	*kpádɨ	*kpádɨ	'corn tassel'
[ɾ]	kpáɾɨ	kpáɾɨ	kpáɾɨ	kpáɾɨ	'corn tassel'

On the existing evidence in (3.32), the sounds are variants and one could expect that further data would show, analogously that /d/ is found in both word-initial but [ɾ] only occur in intervocalic position between vowels. This can be express phonologically in a realization rule as:

(3.33) /d/ → [ɾ] /v____v

→ [d] / #____

This rule shows that by convention, [ɾ] occurrence in certain environments is largely predictable.

The example given so far has involved consonants. A well-known case of variation in vowels is the allophonic variation between the vowels [e] and [ɛ] which may be described by the articulatory term [±ATR]. It is observed that the realisation of /ɛ/ as [e] is attributed to dialectal variations; these two sounds are commonly used in the orthography of Dagbanli, which creates more confusion in their usage. It is attested (Olawsky 1999; Hudu 2016) that [ɛ] and [e] are predictable in terms of their phonetic environment: [e] in word-finally in CV open syllable (e.g. ŋmè 'beat') while [ɛ] in CVC close syllable (e.g. lɛ́h.ó) restricted to word-internal position in Tomo and Naya as summarized and represented in Table (9) Their occurrence

alternates with respect to two particular environments, so that one can only speak of a partly complementary distribution.

Table 9: [e] and [ɛ] distribution indexed by syllable type-Tomo Dialect

Context/Realisation	[e]	[ɛ]
Open syllable, word-internal	(+)	+
Open syllable, word-final	+	-
Closed syllable	-	+

It is attested (Hudu 2010, 2016) that /ɛ/ is lowered in words surfacing as [a]. This observation in Tomo is presented in the data below:

(3.34) [ɛ] lowering to [a] in Tomo

a. /bʲɛ́-gʊ́/ → [bʲáʔʊ́] 'ugly'
b. /bʲɛ́-gʊ́/ → [pʲáʔʊ́] 'sheep-sg'
c. /kpʲɛ́ŋ/ → [kpʲáŋ] 'strength'
d. /ɲɪ̀n-ɲɛ́-gʊ́/ → [ɲɪ̀n-ɲá-ʔʊ́] 'fingernail'
e. /ʃɛ́ŋá/ → [ʃáŋá] 'some'
f. /lɛ́hʊ́/ → [lʲahʊ́] 'adze-sg'
g. /bɛ̀lɪ̀/ → [bʲàlɪ̀] 'accompany'
h. /lɛ̀bɪ̀/ → [lʲàbɪ̀] 'change/become'
i. /pɛ̂m/ → [pʲâm] 'arrow'
j. /bɛ́m/ → [bʲám] 'miserliness'
k. /dɛ̀m/ → [dʲàm] 'miserliness'
l. /tɛ̀ɾɪ̀/ → [tʲà-ɾɪ̀] 'filtering'
m. /tɛ́hɪ̀/ → [tʲáhɪ̀] 'think'
n. /tɛ́lɪ̀/ → [tʲálɪ̀] 'flood'

The data (3.34) show that lowering of /ɛ/ ([e]) to [a] which is only observed when preceding consonant undergoes palatalisation [ʲ]. Similar observations can be made for the other example in (3.34d) where the respective syllable onset is palatalised (or it is a palatal nasal [ɲ]. This indicates that the occurrence of vowel lowering depends on palatalisation of the prevocalic consonant and sometimes the presence

of a velar consonant (3.34a-c) after the vowel in question. This suggests that /ɛ/ is the underlying form.

(3.35) Neutralisation between underlying /a/ and /ɛ/ in Naya

a.	/da-/	[dà-h]	'markets'
b.	/ʤa-/	[ʤà-hì]	'twins'
c.	/ɲɛ-/	[ɲá-hì]	'noses'
d.	/dɛ-/	[dʲà-hì]	'bush pig'
e.	/nɛ-/	[nʲà-hì]	'awaken (many people)'

The data in (3.35) show that the general observation (Bendor-Samuel & Wilson 1969) that /ɛ/ lowers seems to be accurate and there is evidence that the lowering seems to be more pervasive (Hudu 2016). It is argued here that [ɛ], [e] and [a] are realisations of /ɛ/.

(3.36) Variations in front mid vowel (Bendor-Samuel & Wilson 1969)

/bE-/	(bɛ)	<byahi>	'legs (shins)'
/bE-/	(bɛ)	<byaɣu>	'bad'
/bE-/	(bɛ)	<bee>	'leg (shin)'

/ɛ/ is a dialectal variant that appears as [a] after palatalized consonants in Naya dialect and the variant [e] is more prominent in Nan dialect especially its sub-dialect Jim. I suggest here that the surface [e] is pronounced prominently in Jim ruling out /ɛ/ entirely in the dialect. /ɛ/ variation shared by most dialects is the /ɛ/→[a]. It is shared by the major dialects-Tomo, Naya and Nan as well as the sub-dialects Gban and Zun. Following /ɛ/→[e] which is shared by the Naya and Nan. The dialect with fewer /ɛ/ variations is Jim dialect in which its realisation is very rare according to the available data.

(3.37) /ɛ/ →[e] in Jim dialect

a.	/ŋmɛ́/	→	[ŋmè]	'beat'
b.	/bɛ́/	→	[bè]	'be'
c.	/ʃɛ́lɨ́/	→	[ʃélɨ́/	'some/any'
d.	/zɛ̀mànɨ́/	→	[ʤèmànɨ́]	'generation-nom'
e.	/bɛ̀lɨ̀ /	→	[bèlɨ̀]	'accompany'
f.	/lɛ̀bɨ̀/	→	[lébɨ̀]	'change/become'
g.	/pɛ̂m/	→	[pém]	'arrow'
h.	/bɛ́m/	→	[bém]	'miserliness'
i.	/dɛ̀m/	→	[dèm]	'play'
j.	/tɛ̀ɾɨ̀/	→	[tè-ɾɨ̀]	'filtering'
k.	/tɛ́hɨ̀/	→	[téhɨ̀]	'think'
l.	/tɛ́lɨ̀/	→	[télɨ̀]	'flood'

In Nan, the main dialect of Jim, the process described in (3.36) is less frequent as most of the speakers recorded prefer using /ɛ/ like Naya to [e] but in Jim, the realisation of [e] is more frequent and this accounts for one of the major differences between Nan and Jim. The conclusion is that the variation that exist between /ɛ/, [e] and [a] in non-final positions is the secondary articulation of the preceding onset where such secondary articulations can be perceived distinctly.

3.4 Comparison of Dagbanli Dialects

There are four different recognized ways in which dialects can differ from each other. They have been given different labels by different linguist, however, in this thesis, I will use the terms relisational, selectional, systemic and distributional, following (Hawkins 1992). The main dialects would be represented as follows: Tomosili (WD), Nayahili (ED), Nanunli (SD) and Across Dialects (AD) for the purpose of analyisis.

3.4.1 Realisational Differences

The simplest and commonest types of variations between dialects lie in the way particular vowels are pronounced. Consider for example the vowel /ɛ/ in the words /bɛ̀lɨ̀/ 'accompany', /bɛ́/ 'be', /ʃɛ́lɨ́/ 'some'. In WD, this vowel has a quality of [a] a dialectal variant that occurs after palatalized [ʲ] consonants. In ED and SD the vowel in these words appears as /ɛ/. In Jim (SD), the vowel quality is more open as [e]. Thus, the vowel /ɛ/ can be pronounced (realised) in a variety of ways: as [ɛ], [ʲa] or [e] depending on the dialect. Notice that the main concern here is relatively precise phonetic values; the aim is to describe these sounds as accurately as possible and this is done by referring to the vowel system of Dagbanli whose values are relatively stable.

The point about the dialectal differences of this kind is that they leave the phoneme system as a whole unchanged. In all the dialects mentioned in this thesis, there is still a contrast between sets like /dɪ́m/ 'bite' and /dàm/ 'alcohol', /dɛ̀m/ 'play' though the realisation of /ɛ/ varies from dialects to another. All the major dialects have the phoneme /ɛ/ but its relisation varies as it appears as [ʲa] in WD, [e] in SD and [ɛ] ED.

(3.38) /ɛ/ realisations in the Dagbanli dialects

	ED	**SD**	**WD**	
a.	ʃɛ́lɨ́	ʃélí	ʃálɨ́	'some/any'
b.	zɛ̀mànɨ́	ʤɛ̀mànɨ́	ʤʲàmànɨ́	'generation-nom'
c.	bɛ̀lɨ̀	bèlɨ̀	bʲàlɨ̀	'accompany'
d.	lɛ̀bɨ̀	lébɨ̀	lʲàbɨ̀	'change/become'
e.	pɛ̂m	pém	pʲám	'arrow'
f.	bɛ́m	bém	bʲám	'miserliness'
g.	dɛ̀m	dèm	dʲàm	'play'
h.	tɛ̀ɾɨ̀	tè-ɾɨ̀	tʲà-ɾɨ̀	'filtering'
i.	tɛ́hɨ̀	téhɨ̀	tʲáhɨ̀	'think'
j.	tɛ́lɨ̀	télɨ̀	tʲálɨ̀	'flood'

Notice that the realisation of /ɛ/ as [e] is more pronounced in Jim, a sub-dialect of SD, where it rules out /ɛ/ completely. The realisations described here are not positional variants (allophones): they are kind of dialectal allophones- an allonphone which varies according to geographical location rather than according to position in the word. Hawkins (1992) describes this as diaphones (cf. dialectal allophones).

One can predict that if there are dialectal differences in the realisation of /ɛ/ as in the data in (3.38), there will be parallel in the realisation of the neighbouring phonemes /i, a/ for otherwise these phonemes might not remain distinct. For instance, notice that /ɛ/ is pronounced as [a] before palatalized consonants; this puts it very close to the pronunciation of ED /a/ (the vowel of /pâm/ 'plait'). Thus the contrast between /ɛ/ and /a/ is preserved due the pronunciation of /ɛ/ as [a] before palatalized consonants (e.g. $p^{j,}$ $b^{j,}$ ʃ).

Realisational differences are very common in occurrence and it is probably true to claim that any two dialects which are distinguishable will involve realisational variation to some extent; these differences usually pervade the whole vowel system and make up the distinguishing characteristics of a particular dialect. Realisation differences between two dialects calls for precise pronunciation of a particular phoneme or set of phonemes. They do not entail any difference in the overall phoneme system: each dialect has the same set of contrast.

3.4.2 Selectional Differences

A selectional difference arises where two dialects have the same set of phonemes but particular words select different phonemes. The WD (Tomosili and Gbanajosili)

for example, have a phonemic contrast between /a/ and /ɔ/ in words like <dɔɣim> 'birth' vs <daɣim> 'try-perf', <sɔm> 'bitter vs <sam> 'mix', just as ED, SD and their dialects. But there is a small group of words which take /a/ in WD as against /ɔ/ in ED and SD as seen below.

(3.39) [a] ~ [ɔ]

WD	**ED**	**SD**	**Gloss**
báɾ-gí	bɔ́ɾ-gí	bɔ́ɾ-gí	'lost'
láɾ-gá	lɔ́ɾ-gá	lɔ́ɾ-gá	'corner'
láɾ-gí	lɔ́ɾ-gí	lɔ́ɾ-gí	'untie'
dáb-lɨ́m	dɔ́b-lɨ́m	dɔ́b-lɨ́m	'bravery'
záb-ɾí	zɔ́b-ɾí	ʤɔ́b-ɾí	'hair'
sáb-lí	sɔ́b-lí	sɔ́b-lí	'rat'
wálí	wɔ́lí	wɔ́lí	'bear fruit'
kálí	kɔ́lí	kɔ́lí	'sweep'
tálɨ́m	tɔ́lɨ́m	tɔ́lɨ́m	'message'
dám-gí	dɔ́b-gí	dɔ́b-gí	'squat'

The data in (3.39) show vowel alternation between /a/ and [ɔ], which do not contrast, between stems due to dialectal variation. Words that use the vowel /a/ in Tomo and Gban (WD) seem to be pronounced wit [ɔ] in Naya and Zun (ED) as well as Nan and Jim (SD).

In a similar manner, the /ɔ/ in (WD) is pronounced the opposite in ED and SD as [a] in the same linguistic environment in some words. For example:

(3.40) [ɔ] ~ [a]

WD	**ED**	**SD**	**Gloss**
bɔ́hɨ́m	báhɨ́m	báhɨ́m	'learn'
vɔ́ʔ-ó	váʔ-ó	váhó	'leaf'
dɔ́ʔ-ó	dáʔ-ó	dáhó	'stick'
wɔ́ʔ-ó	wáʔ-ó	wáhó	'snake
kɔ̀ʔ-ó	káʔ-ó	káhó	'antelope'
tɔ́ʔ-sɨ	páʔ-sɨ	páh-sɨ	'imitate'

The data in (3.40) show how vowel quality brings about dialectal variation in Dagbanli. It is clear that WD selects /ɔ/ before the glottal sounds while ED and SD pronounce /a/ in the same environment. Another example which can vary in this way is the sound /a/ in WD in some words surfacing as [o] in ED and SD. For example:

(3.41) [a] ~ [o]

WD	**ED**	**SD**	**Gloss**
dàb-lɨ́m	dòb-lɨ́m	dòb-lɨ́m	'bravery'
sàkól-ô	sòkól-ô	sòkól-ô	'fufu'
gáɾ-ó	góɾ-ó	góɾ-ó	'bed'
zàb-ɾɨ́	zòb-ɾɨ́	ʤòbɨ́ɾɨ́	'hair'
pàl-ó	pòl-ó	pòl-ó	'plot'
sál-ô	sól-ô	sól-ô	'crowd'
kạ́ló	kól-ó	kól-ó	'enamel ware'

Another example of simplest type of selectional difference lies in a way the vowels /i/ and /u/ are pronounced. The realisation of /i/ in WD seems also to be pronounced with /u/ in ED and SD. For example:

(3.42) [i] ~ [u]

WD	**ED**	**SD**	**Gloss**
líhí	jólɨ́	jólɨ́	'look'
zɨ́pɨ́l-gó	zópɨ́l-gó	ʤópɨl-gó	'cup'
tɨ́ɾ-gá	tóɾ-gá	tóɾ-gá	'pestle'
dɨ́nɨ́	dónɨ́	dónɨ́	'knee'
dɨ́nɔ́lɨ́	dónɔ́lɨ́	dónɔ́lɨ́	'door'
dɨ́ɾ-gó	dóɾ-gó	dóɾ-gó	'headache'
tɨmó	tómó	tómó	'messenger'

Notice that in (3.42), the words that have /d/ before /i/ (e.g. /dɨ́nɨ́/ 'knee') manifests as [t] in Zun (e.g. [tɨ́nɨ́]) (cf. 3.2), as [ʧ] in Gban (e.g. [ʧɨ́nɨ́]) (cf. 3.2) as [k] in Jim (e.g. [kónɨ́]) (cf. 3.3). Thus, the alternation of [i~u] does not show variation in Zun, a sub-dialect of ED, if the onset is /d/ before /i/.

The point about selectional differences is that there is usually no way of predicting which words will be affected and the number of words may be quite small. Many of the differences between WD against ED and SD can be classed as selectional, such as WD prefers /a/ before voiced coronal consonants while ED and SD pronounce /ɔ/ in the same linguistic environment (e.g. /báɾ-gí/ <barigi> 'lost'→ [bɔ́ɾ-gí] <bɔrigi> 'lost'); for /i/ rather than /u/ (e.g. /tɨ́l-gá/ <tilga> 'pestle'→[tʊ́l-gá] <tulga>); for /a/ rather than /o/ (e.g. /sál-ó/ <salo> 'crowed'→ [sól-ó] <solo> 'crowed'). The phonemes /a/ and /ɔ/, /i/ and /u/ as well as /a/ and /o/ are found in all the dialects (AD), therefore, there is no difference in the phoneme system of Dagbanli AD. The case is just a matter of different choice of phonemes in certain words, which are quite small in number.

3.4.3 Systemic Difference

The systemic difference arises when two dialects have different number of phonemes in their system or some part of their system, that is, a phonemic contrast which is made in one dialect is not in the other. Major systemic differences separate the sounds of a dialect from those of the other dialects (Hawkins 1992). Systemic differences are relatively easy to identify and describe, compare with realisational differences. One characteristic of systemic differences is that they seem to affect only part of the phoneme system and do not usually have repercussions elsewhere. Thus, the phoneme inventory of dialects can be identical except for the contrast of two sounds. Systemic difference is rare in Dagbanli because all the dialects use the same sound system and there is no evidence of WD, ED and SD exhibiting different

number of phonemes and a situation of a phonemic contrast which is made in one dialect is not made in the other.

However, in Gban, a sub-dialect of WD, a known example of this is the distinction between /s/ and /x/, which is pronounced by WD speakers and the dialects of ED and SD but varies in the speech of SD. There is no evidence of phonemic contrast of /s/ and /x/. The actual pronunciation of /s/ varies as speakers of WD and the rest of the dialects have /s/ in onset and intervocalic while Gban has /x/ only in intervocalic. In Gban, /x/ is only found intervocalic but not in initial nor medial like the other dialects, it is produced by the coalescense /g/ and /s/ (e.g. /ŋag-sɨm/→[ŋaxɨm] 'sweetness') in intervocalic and (e.g. *[xɨma] vs /sɨma/ 'groundnut'). The appearance of /x/ in Gban dialect is thus restricted to only intervocalic position as in (3.42). At this point in the sound system, one can suggest that Gban has [x] intervocalic, WD does not have so Gban is thus said to differ systemically.

(3.42) [x] in intervocalic in Gban

/tɔ̀g-sɨ̀/	→	[tɔ̀xɨ̀]	'speak'
/ŋàg-sɨ́m/	→	[ŋàxɨ́m]	'delight/sweetness'
/zàg-sɨ̀/	→	[zàxɨ̀]	'refuse'
/ŋàg-sà/	→	[ŋàxà]	'to be palatable'

Another example found in SD is the distinction between /z/ and /ʤ/. /z/ is pronounced as [ʤ] before vowels.

(3.43) /z/ → [ʤ] in Jim

Root.SG	**WD**	**ED**	**SD**	**Gloss**
zɔ̀ŋ	zɔ̀ŋ	zɔ̀ŋ	ʤɔ̀ŋ	'bat-sg'
zɔ̀ná	zɔ̀n-á	zɔ̀n-á	ʤɔ̀n-á	'bat-pl'
zòm	zòm	zòm	ʤòm	'blind-sg
zò	zò	zò	ʤò	'friend'
zóg-ó	zóʔ-ó	zóʔ-ó	ʤóhó	'head'
záb-ɾɨ́	záb-ɾɨ́	záb-ɾɨ́	ʤáb-ɾɨ́	'hair'
zɨm	zɨm	zɨm	ʤɨm	'flour'
zɔ̀nzó-lɨ	zɔ̀nzó-lɨ́	zɔ̀nzó-lɨ́	ʤɔ̀nʤó-lɨ́	'maggot'

Notice the existence of /z/ in WD and ED but entirely missing in SD in the same linguistic environment. This shows evidence that SD has fewer sounds because it lacks /z/; though some speakers of the major dialect, Nan, use /z/ in rapid speech, which is completely missing in the sub-dialect, Jim. In the parts SD, a systemic difference arises between Nan and Jim which distinguish /zɔ̀ŋ/ from [ʤɔ̀ŋ] 'bat-sg'.

3.3.4 Distributional Differences

A distributional difference arises where two dialects have the same set of phonemes but there is a difference in the distribution of one (or several) phonemes. The distribution of a phoneme refers to the environment in which it may typically occur, for example, word-initial, word-medial (intervocalic) and word final. The biggest distributional differences between dialects of Dagbanli involves the consonants /s, b, d, ɲ, g/. These are presented as follows.

The labial stop /b/ occurs in onset and coda position of CVC stem AD. A distributional difference between ED and WD involves /b/ frequently in ED. In some words, in ED, at the coda of a CVb stem, /b/ is replaced by the labial nasal /m/ in similar words in WD as shown in (3.44). This does not mean /b/ is not found in coda position in WD; it does in some cases (e.g. /sáb/ 'write').

(3.44) /b/ → [m] in CVb stem in WD

/zɪ̀b-sɪ́m/	→	[zɪ̀m-sɪ́m]	<zibsim>	'darkness'
/tɪ́b-sɪ́m/	→	[tɪ́m-sɪ́m]	<tibsim>	'heaviness'
/kɔ́b-sɪ́m/	→	[kɔ́m-sɪ́m]	<kɔ́bsim>	'cry.nom'
/dáb-lɪ́m/	→	[dám-lɪ́m]	<dablim>	'bravery'

Another common distributional difference is the use of the palatal consonant /ɲ/. In WD and ED. /ɲ/ is pronounced in a word when it occurs in initially and medialy but not final. The sound /ɲ/ occurs in SD and manifests as alveolar nasal [n] before front vowels in similar positions of word-initial in Jim. For example:

(3.45) /ɲ/ → [n] / ___ [front vowels] in Jim

/ɲɛ́vílɨ́/	→	[nɛ́vílɨ́]	<nyeveli>	‘soul’
/ɲɨná/	→	[nɨnà]	<nyina	‘teeth’
/ɲé:/	→	[né:]	<nyee>	‘nose’
/ɲú/	→	*[nú]	<nyu>	‘drink’

he consonant /d/ in word-initial occurs in Gban dialect of WD as palato-alveolar affricate [ʧ], in Jim dialect of SD as velar fricative /k/ and in Zun dialect of ED as alveolar stop [t] in some words. For example:

(3.46) /d/→[ʧ] /#___ in Gban

/dɨ́ní/	→	[ʧɨ́ní]	<dini>	‘knee’
/dé:/	→	[ʧé-é]	<dee>	‘antelope’
/dɨkáni/	→	[ʧɨkáni]	<dikani>	‘it’s not there’
/dàbɔ́lɨ́/	→	*[ʧábɔ́lɨ́]	<dabɔli>	‘heap’
/dáb-lɨ́/	→	*[ʧáb-lɨ́]	<dabili>	‘slave’

Also, in Jim, /d/ is pronounced in word-initial as [k] before the high back vowel /u/ as illustrated below. -

(3.47) /d/→[k] /#___ in Jim

/dɨ́ná/	→	[kɔ́ná]	<dina>	‘that one’
/dɨ́ní/	→	kɔ́ní]	<dini>	‘knee’
/dɨ́nɔ́lɨ́/	→	[kɔ́dɔ́lɨ]	<dinɔli>	‘door’
/dì-vjɛ́lá/	→	[kɔ́-vjɛ́là]	<diviɛla>	‘it is good’
/dì-kàní/	→	[kɔ́-kàní]	<dikani>	‘it is not there’
/dì-kpárá/	→	[kɔ́-kpárá]	<dikpara>	‘it is starting’
/dì-bár-gí/	→	[kɔ́-bɔ́r-gí]	<dibarigi>	‘it is missing’
/dì-kɔ́níŋ/	→	[kɔ́-kɔ́níŋ]	<dikuniŋ>	‘it is impossible’
/dàbɔ́lɨ́/	→	*[kɔ́bɔ́lɨ́]	<daboli>	‘heap’
/dáb-lɨ́/	→	*[kɔ́b-lɨ́]	<dabili>	‘slave’

Again, in Zun, the sound /d/ is pronounced in word-initial as /t/ before /i/ as illustrated below

(3.48) /d/→[t] /#___ in Zun

/dɨ́nà/	→	[tɨ́nà]	<dina>	'that one'
/dɨ́ní/	→	[tɨ́ní]	<dini>	'knee'
/dɨ́nɔ́-lí/	→	[kódɔ́-lí]	<dinɔli>	'door'
/dì-vjɛ́lá/	→	[kó-vjɛ́là]	<diviɛla>	'it is good'
/dì-kànì/	→	[tì-kàní/]	<dikani>	'it is not there'
/dì-kpárá/	→	[tì-kpárá]	<dikpara>	'it is starting'
/dì-bár-gɨ́/	→	[tì-bár-gɨ́]	<dibarigi>	'it is missing'
/dì-kónɨ́ŋ/	→	[tì-kónɨ́ŋ]	<dikuniŋ>	'it is impossible'
/dábɔ́lí /	→	*[tábɔ́lí]	<daboli>	'heap'
/dáb-lì /	→	*[táb-lí]	<dabili>	'slave'

This sound substitution in Zun is mostly heard in large units such as phrases and sentences as stated below.

(3.49) dì tì jɛ́lɨ́ → tì tì jɛ́lɨ́] 'don't ever say it.'

Another example of distributional differences involves /h/. In ED, /h/ is only found intervocalically. The distribution of /h/ in ED is thus more limited as its distribution is restricted to mostly intervocalic position. The /s/ in WD surfaces as glottal fricative [h] in word-medial. For example:

(3.50) /s/→ [h] in intervocalic position in ED (Hudu 2018:214)

/má:sílɨ́/	→	[máhílɨ́]	<maasili>	'cool weather after rain'
/nè:-sɨ̀/	→	[nè-hɨ̀]	<neesi>	'awaken-pl.'
/mó:sî/	→	[mɔ́hî]	<moosi>	'become reddish'
/áná:sɨ́/	→	[ánáhɨ́]	<anasi>	'four'
/bìsím/	→	[bìhím]	<bisim>	'milk'
/bí:hí/	→	[bí-hí]	<biisi>	'children'
/bo:sɨ̀/	→	[bɔ́h[ɨ̂]]	<boosi>	'ask'

The sound /s/ in Dagbanli also surfaces as aveopalatal fricative [ʃ] in word-initial in ED. For example:

(3.51) /s/→ [ʃ] / ___v in ED

/sí-á/	→	[ʃí-á]	<sia>	‘mockery’
/sɛ́ʔʊ′/	→	[ʃɛ́ʔʊ′]	<sɛɣu>	‘rainy season’
/sɛ́ɾ-gá/	→	[ʃɛ́ɾ-ga′]	<sɛriga>	‘needle’
/sɨkɨɾɨ̀/	→	[ʃɨkɨ̀ɾɨ̀]	<sikiri>	‘sugar’

The point about distributional differences is that by contrast with selectional differences, its occurrence can be generalized or example, one can say that in certain dialects /s/ is found in word-initial and word-medial or /h/ is not found in word-initial and word-final. The possibility of a general statement like this distinguishes distributional from selectional differences, for otherwise it could be argued that they are the same thing; it could be claimed that WD has /a/ in /bár-gɨ́/, ED and SD has /ɔ/ in [bɔ́ɾ-gɨ́]. The selectional differences, however, cannot be predicted by the phonetic environment: a statement to the effect WD has /a/ while ED has /ɔ/ is impossible. The [a] ~ [ɔ] or [i] ~ [u] alternation across dialects is thus found in only a few words; they cannot be explained on the basis of distribution and will, therefore, be classified as selectional.

3.5 Summary of the Chapter

This chapter demonstrated how the segmental phonemes interact to shape the surface inventory of Dagbanli consonants and vowels, presenting an analysis that has so far been controversies across dialectal (AD). It provided summary of the current status of segmental phonemes in Dagbanli and suggested that Dagbanli has thirty-three (33) consonants and fourteen (14) vowels in its inventory AD.

The velar fricative [ɣ] is proposed as a surface variant in Zun of ED. Four reasons are presented to support the proposal, these include: first, the sound /ɣ/ is spelt with the letter <ɣ> in intervocalic position in Dagbanli orthography in all standard written forms and used independently AD; speakers of Zun in a normal or fast speech substitute /g/ for [ɣ] in word-medial and there is no evidence to show where Zun speakers of the language pronouncing /g/ in intervocalic position.

Second, in a phonemic representation, /g/ in intervocalic position is realized as glottal stop [ʔ] in both WD and ED and appears as [ɣ] in Zun, a sub-dialect of ED. Third, the velar fricative [ɣ] is a positional variant of the velar stop /g/ in word-medial since there is evidence to show that native speakers of Dagbanli pronounce <ɣ> in the orthography which phonemically is pronounced as /g/ AD. Finally, native speakers of Zun speakers of Dagbanli do not alternatively pronounce the velar fricative [ɣ] and velar stop /g/ in intervocalic position in indigenous Dagbanli words. It is very rare to hear such sounds being pronounced in the dialect.

It is attested that the flap /ɾ/ is a variant of the alveolar stop /d/ and the two sounds are in complementary distribution in Dagbanli indigenous words and loan words as well. The sound /ɾ/ is described to be restricted to word-medial position between vowels AD. An attempt to substitute it with /d/ in word initial position makes the construction ungrammatical. The predictability of [ɾ] AD in Dagbanli is discussed noting that it is frequent in indigenous words.

I also discussed the similarities and differences in Dagbanli dialects based on relisational differences, selectional differences, systemic differences, and distributional differences. The four categories of dialectal differences are summarized below:

Table 10: Categories of dialectal differences

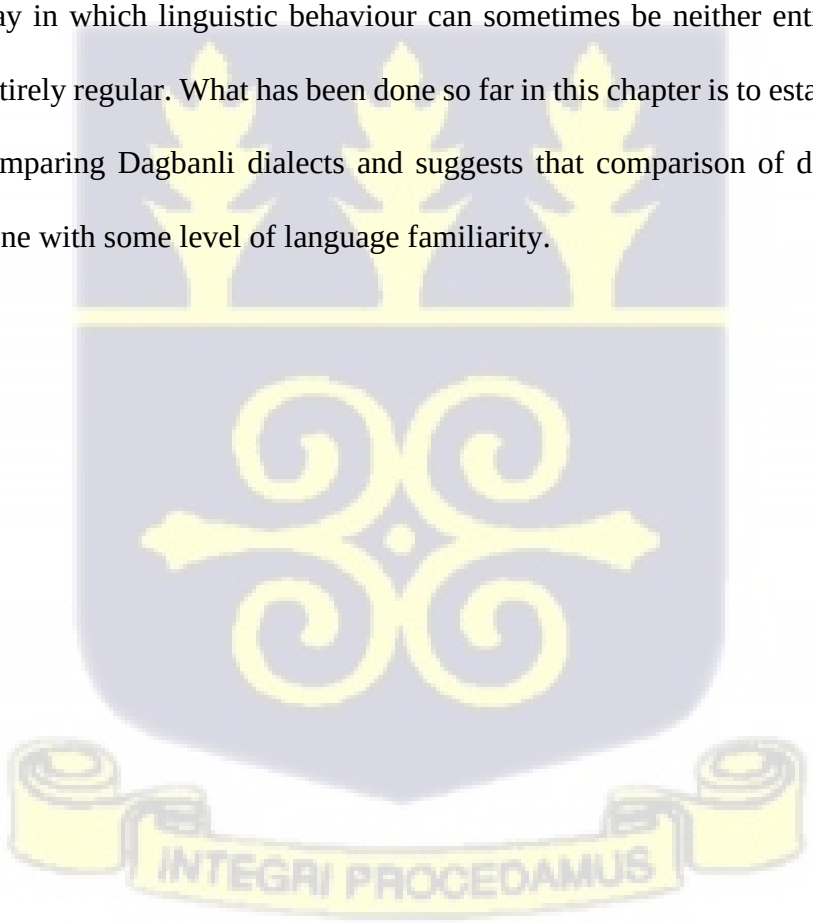
1.Realisational			
	WD	**SD**	**ED**
/ɛ/ /lɛ́hó/	[ʲa]	[e]	[ɛ]
2.Systemic			
	WD	**SD**	**ED**
/z/ /zóg-ó/	[z]	[ʤ]	[z]
/g+s/ /ŋág-sɨ́m/	[x]	[s]	[s]
3.Selectional			
	WD	**SD**	**ED**
/a/ /bàɾ-gɨ́/	[a]	[ɔ]	[ɔ]
/ɔ/ /dɔ́ʔ-ó /	[ɔ]	[a]	[a]
/i/ /tíl-gá/	[i]	[u]	[u]
/a/ /pàl-ó/	[a]	[o]	[o]
4. distributional			
	WD	**SD**	**ED**
/g/ /págá/	[g]	[ʔ]	[ɣ]
/gáɾ-ó/	[g]	[g]	[g]
/d/ /dɨ́n/	[ʧ]	[k]	[t]
/s/ /sí-à/	[s]	[ʃ]	[ʃ]
/s/ /má:sɨ́lɨ́/	[s]	[h]	[h]

Dagbanli dialects are similar because they have the same set of phonemes AD, and there is a contrast between long vowels (e.g. /a:/ <aa>) and short vowels e.g. /a/ <a>). The major difference AD resides in the vowels /a, i, ɛ o, ɔ, u] and the consonants /z, s, d, g, ŋ]. The question now is whether the difference is predictable by a general environment (hence, distributional) or whether it applies only to the words and few others (in which case it would be selectional).

It is important to note that using Table (12) to account for dialectal differences in Dagbanli; all speakers of a particular dialect will not demonstrate the same dialectal variations and a speaker may not always exhibit all the dialectal

characteristics as some speakers may be able to code switch between dialects. Again, Table (12) is not comprehensive because there may be more undocumented dialectal features which are not captured in the data.

I observed that the chief source of segmental variations AD in Dagbanli is in vowel quality. Consonants in the language also show differences but their role is generally much smaller. The alternation of [a~ɔ], [ɔ~a], [a~o] or [i~u] across dialects is found in only a few words; it cannot be explained on the basis of distribution. The alternation of the vowels is, therefore, classified as selectional. Note that selectional implies that the differences are entirely random while distributional implies that they are regular or rule-governed. The examples provided are good demonstration of the way in which linguistic behaviour can sometimes be neither entirely random nor entirely regular. What has been done so far in this chapter is to establish a model for comparing Dagbanli dialects and suggests that comparison of dialects should be done with some level of language familiarity.



CHAPTER FOUR

SOUND CORRESPONDENCES OF DAGBANLI DIALECTS

4.1 Introduction

The chapter looks at some phonological processes that affect the surface realisations of Dagbanli segments across dialects. Phonological processes account for the differences in the distribution of sounds when segments are connected into larger units. I discuss in this chapter some major phonological processes that are characteristic of Dagbanli dialects and give account of the differences in the distribution of sounds. The chapter shall be considering some of the major areas which also provide data for phonology variation of Dagbanli dialects. It will also discuss Dagbanli dialects as part of the phonological processes.

The phonological domains to be discussed include: assimilation and harmony among others. Similar studies in Dagbanli include (Olawsky 1999, 2002; Hudu 2010, 2012, 2013, 2014, 2016, 2018; Inusah & Mahama 2019, Inusah 2019, 2020) and others. Hudu (2014b:2) observes, “phonological processes have the tendency to compromise the featural integrity of segments in various constituents and the asymmetrical effect of these processes on various morphological units is useful in defining the differences between these units”.

This chapter is divided into three sections: section 4.2 explores assimilation as a phonological process, section 4.3 examines Dagbanli cross-dialectal study of harmony system and section 4.4 concludes the chapter.

4.2 Assimilation

Assimilation is a phonological process that takes place when one sound changes its character in order to become more like a neighbouring sound. Nasal consonants are particularly susceptible to assimilation, for instance, in morpheme-final clusters in English, the nasal is always homorganic with the following plosive. "Assimilation involves the process by which a sound acquires some of the features of adjacent sound or by which the sound changes to become phonologically more like the adjacent sound" (Hawkin, 1992:184).

As assessed by Bakovic (2007:335), "a phonological process is called an assimilation if, as a result of its application, two or more segments in a form agree in their value for some phonological feature(s) or feature class(es)." The Assimilation Processes are classified as Local assimilation (LA) which involves two neighbouring sounds. Example of LA is nasal place assimilation and voicing assimilation in American English (Bakovic 2007:335) as in (4.1a) "whereby a nasal is made to agree in place of articulation features with a following consonant" and as (4.1b) "whereby an obstruent is made to agree in voicing with an adjacent (preceding) consonant."

(4.1) a. Place assimilation: negative prefix in- /ɪn/

i.	inapplicable	[æ]		
ii.	impossible	[mp]	imbalance	[mb]
iii.	intolerable	[nt]	indecent	[nd]
iv.	inconceivable	[ŋk]	ingratitude	[ŋg]

(4.1) b. Voicing assimilation: past tense suffix –ed /d/

i.	strayed	[eid]				
ii.	passed	[st]	trapped	[pt]	packed	[kt]
iii.	grabbed	[bd]	buzzed	[zd]	bagged	[gd]

As seen in the data in (4.1), the nasal's locus of articulation varies quite precisely according to the following obstruent. Nasal assimilation is sensitive not only to the locus of the following obstruent, but also to the wider environments in which it occurs. It may operate within a morpheme such as *lamp* ([-mp]), *hint* ([-nt]), *wink* ([-ŋk]). It operates also across syllable boundaries, as in the word's *symphony* ([-mf-]), *concrete* ([-ŋk-]); and across morpheme boundaries, for example /-in/.

The data in (4.1a) present a phonological environment where LA is blocked if a consonant occurs before [æ], thus exposing the basic specification of /n/ and the stop /d/ in (4.1b). It shows /n/ with the feature [+coronal] in (4.1a) becomes a labial [m] before labial consonants [p, b], it becomes an alveolar [n] that is [+coronal] before coronal consonants [t, d] with the feature [+coronal] and the velar [ŋ] with the feature [+dorsal]. Similarly, /d/ with the feature [+voice] in (4.1b) changes to [t] with the feature [-voice] after voiceless segments [p, s, k] also with the feature [-voice] and [+voiced] segment [d] after the segments [b, z, g] which are all [+voice]. Bakovic (2007) observes that…

> …….when there is assimilation, a segment surfaces with the same value(s) for some feature or feature class as an adjacent segment. Assimilation is subject to a variety of restrictions. For example, it can be bounded by morphological and phonological constituents: the place assimilation in (4.1a) applies between prefixes and stems, but not between words (e.g.'in principle' [np], *[mp]). Assimilation can also be dependent on the features or relative position of the segments involved: to wit, only nasal consonants assimilate place in English ('misplace' [sp], *[fp]), and nasals only assimilate to following consonants ('acne' [kn], *[kN]); likewise, the

voicing assimilation in (4.1b) only applies between obstruents in English ('rent' [nt], *[nd]) (2007:336).

Similarly, in Akan a Kwa language spoken in the Southern parts of Ghana, Dolphyne (2006) observes that whenever a nasal consonant occurs before another consonant within a stem word, its production is similar to the neighbouring sound; she describes the process as regular phonological process in all the dialects of Akan as nasals are naturally homorganic with the neighbouring sound.

(4.2) Place assimilation in Akan

buŋkam	[ŋk]	'over shadow
asɛŋkɛse	[ŋk]	'big case'
kɔmpɔ(w)	[mp]	'goitre'
mpanyimfo	[mp]	'elders'
ŋkoa	[ŋk]	'slaves'

(4.3)

akan	+ fo	→	akanfo	'Akan people'
di-kan	+ fo	→	adikanfo	'pioneers'
tan	+ fo	→	ɔtamfo	'enemy'

There are few exceptions to this process where before the nominal suffix *–fo* nasals that occur after the vowel /a/ are not homorganic with the following consonant as seen in (4.3). It is noticed that local assimilation takes place amid a root and suffix of plural forms of nouns, within words and between two stems in compounds where the final labial segment /m/ in the first stem *asɛm* 'case' is realized as dorsal [ŋ] before a dorsal consonant /k/ and both /ŋ/ and /k/ have identical constriction and feature relation [+dorsal].

Similarly, the idea of local assimilation (LA) of place assimilation (PA) yields the same results when it is applied to a Dagbanli data as in (4.4) and (4.5) and the major difference is that while in American English (AE) it occurs between

a stem and a prefix, in Dagbanli it takes place amid a root and a number suffix in nouns, but in a phrase structure in verbs, the relaisation is similar to that of (AE), which applies to all the dialects.

(4.4) Place assimilation in nouns AD

UR	Root.sg	plural	Gloss	PA
tɨ́N	[tɨ́ŋ]$_{stem}$ [-á]$_{suffix}$	[tín]$_{stem}$ [-sɨ́]$_{suffix}$	'town.pl'	[ns]
lɔ́N	[lɔ́ŋ]$_{stem}$ [-á]$_{suffix}$	[lɔ̀n]$_{stem}$ [-sɨ́]$_{suffix}$	'drum.pl'	[ns]
báN	[báŋ]$_{stem}$ [-á]$_{suffix}$	[bán]$_{stem}$ [-sɨ́]$_{suffix}$	'bracelet.pl'	[ns]
sɨ́N	[sɨ́ŋ]$_{stem}$ [-á]$_{suffix}$	[sín]$_{stem}$ [-sɨ́]$_{suffix}$	'pot.pl'	[ns]
kɔ̀N	[kɔ̀ŋ]$_{stem}$ [-á]$_{suffix}$	[kɔ̀n]$_{stem}$ [-sɨ́]$_{suffix}$	'leper.pl'	[ns]

(4.5) Place assimilation in Dagbanli verb phrases AD

Root.sg	Verb phrase	Gloss	PA
pá	[m-]$_{prefix}$ [pá]$_{stem}$	'to put'	[mp]
tú	[n-]$_{prefix}$ [tú]$_{stem}$	'to insult'	[nt]
bá	[m-]$_{prefix}$ [bá]$_{stem}$	'to ride'	[mb]
zò	[n-]$_{prefix}$ [zò]$_{stem}$	'to escape'	[nz]
tà	[n-]$_{prefix}$ [tà]$_{stem}$	'to plaster'	[nt]
gó	[ŋ-]$_{prefix}$ [gò]$_{stem}$	'to travel'	[ŋg]
jé	[ɲ-]$_{prefix}$ [jé]$_{stem}$	'to wear'	[ɲj]

The data in (4.4) show that the process of LA involves number suffixes and roots and in (4.5) it involves a pre-nasal prefix and roots in verbs, which occur across dialects. As noted earlier in this section (cf. 4.1a.i), the process of assimilation is blocked before an intervening vowel in American English. This is one of the interests of the discussion in Dagbanli assimilation. The second interest of discussion here is Hawkins' (1992) claims that nasal assimilation occurs across many boundaries but does not occur before plural forms in English. This for a fact is attributed to an issue of language specific. I argue in this section that place assimilation occurs before plural forms in Dagbanli as seen in (4.4).

4.2.1 Place Assimilation

Place assimilation (PA) in Dagbanli and its dialects preferentially targets coronal segments. As a result of preferential place assimilation, coronal consonants surface usually in syllable onset and maintain their place specifications. Coronals in Dagbanli include: alveolar /t, d, [ɾ], s, z, n, l/, palato-alveolar /ʧ, ʤ, ʃ, ʒ/ and palatal /j, ɲ/ as presented in the figure below:

Alveolar		**palato-alveolar**		**palatal**
t	d			
n				ɲ
		ʧ	ʤ	
s	z	ʃ	ʒ	
l	[ɾ]			j

Figure (4.1): Dagbanli Coronal Consonants

All Dagbanli coronal sounds appear mostly in syllable onset excluding the segments which are phonologically confined. This is in conformity with the idea that coronal consonants have fewer distributional restrictions and are more likely to be licensed in contexts of place contrast reduction (Kang 1994). In this section, I present cases of place assimilation (PA) in Dagbanli dialects.

Jimansili

In Jim, stem-initial coronal consonant /z/ assimilates to the place of palato-alveolar consonant /ʤ/ another coronal before back vowels as shown in (4.6a) but other alveolar coronals do not assimilate in the same environment as shown in (4.6b) except the case of /d/ which appears as [k], which assimilates to a non-coronal [k] before a high back vowel as shown in (4.7).

(4.6) a. /z/→[ʤ] /#____

zɔ̀ŋ	→	ʤɔ̀ŋ	'bat'
zòm	→	ʤòm	'blind'
zóʔ-ó	→	ʤóh-ó	'head'
zò:	→	ʤò:	'fly'
zòli	→	ʤòlì	'mountain'
zòb-ɾɨ	→	ʤɔ̀b-ɾɨ	'blind'
zò	→	ʤò	'friend'

b.

tàɾɨ	→	tàɾɨ	'share'
námdâ	→	námdâ	'sandal'
sàbsɨ-ʔó	→	sàbsɨ-hó	'gecko'
làb	→	làb	'throw'

(4.7) /d/→[k] /#____

díná	→	kóná	'that one'
díní	→	kóní	'knee'
díndɔ́lɨ	→	kódɔ́lɨ	'door'
dì-kàní	→	kó-kàní	'it's not there'
dì-kpáɾá	→	kó-kpáɾá	'it's starting'

Similarly, the alveolar coronal /n/ assimilates acquires the features of the onset segment of CV lexical verbs as see in (4.8). This, across dialects, occurs at morpheme boundaries.

(4.8) Place Assimilation in CV verbs in Nanunli

lá	→	nlà	'laugh'	(cf. n-lá)
pá	→	mpà	'put'	(cf n-pá)
tú	→	ntù	'insult'	(cf. n-tú)
zó	→	ɲʤò	'escape'	(cf. n-zò)
kú	→	ŋkù	'kill'	(cf. n-kú)

The data in (4.8) involve a pre-nasal prefix and CV verb which is frequent in Nan and Jim as nCV (nasal+CV) with no morpheme boundary; this, in all dialects appears as a phrase when a verb root is inflected with an indefinite indicator /n/ with morpheme boundary. This variation, though difficult to notice, is mostly realized in tone. Notice that assimilation of the coronal /n/ to a non-coronal [ŋ] before the dorsal

stops [k, ɡ] occurs optionally in some words in Nan. /n/ surfacing as [m] is determined by the following non-coronal stop.

Across dialects, place assimilation to non-coronal involves the realisation of underlying /n/ as [m]. For example, the plural forms of /san-a.sg/ → [sam-ba.pl] 'stranger' or /kpʊŋkpan-a.sg/ → [kpʊŋkpam-ba.pl] 'name of a tribe', where the nasal is followed by the labial stop [b]. Cross dialectally, a coronal nasal /n/ appears as dorsal /ŋ/ before dorsal segments /k, ɡ, kp, ŋm, gb/ in verb phrases.

(4.9) /n/ assimilation before non-coronal consonants AD

UR	Verb Phrase	Gloss
/ń-kú/	[ŋ́-kú]	'to kill'
/ń-gú/	[ŋ́-gú]	'to protect'
/n-ŋɔ́b-ɨ́/	[ŋ́-ŋɔ́b-ɨ́]	'to eat'
/ń-ŋmé/	[ŋ́-ŋmé]	'to hit'
/ń-gbɨ́-gɨ́	[ŋ́-gbɨ́-gɨ́]	'to sleep'
/ń-kpé/	[ŋ́-kpé]	'to enter'
/ń-ɲá/	[ń-ɲá]	'to see'

The data in (4.9) show that when the nasal /n/ appears before non-coronal consonants /k, ɡ, kp, gb/, the assimilation result is the same in all the dialects. For example, in the word /bɨn-kɔb-gʊ/ →[bɨŋ-kɔb-gʊ] 'animal.'

(4.10) Jim Coronal Consonants

alveolar	palato-alveolar	palatal
t [ɾ] s l	ʧ ʤ ʃ ʒ	j
n		ɲ

Gbanjonsili

In Gban, only stem-initial coronal consonant /d/ optionally assimilates to the place of palato-alveolar consonant /ʧ/ another coronal before a high front vowel /i/ as

shown in (4.11) losing its voicing feature but other alveolar coronals do not assilmilate in the same environment shown in (cf. 46b).

(4.11) /d/→[ʧ] /#____i

dɨnɨ	→	ʧɨnɨ	'knee'
de:	→	ʧe:	'antelope'
dɨndalʊŋ	→	ʧɨndalʊŋ	'crane fly'
dɨɾ-gʊ	→	ʧɨɾ-gʊ	'spoon'
dɨl-gʊ	→	ʧɨl-gʊ	'headache'

(4.12) Gban Coronal Consonants

Alveolar	palato-alveolar	palatal
t d[ɾ] s z l	ʧ ʤ ʃ ʒ	j
n		ɲ

Zundusili

In Zun, only stem-initial coronal consonant /d/ optionally assimilates to the place of another coronal /t/ and loses its voicing feature before a high front vowel /i/ as shown in (4.13) but other alveolar coronals do not assimilate in the same environment shown in (c. 4.6b).

(4.13) /d/→[t] /#____i

dɨ́ná	→	tɨ́ná	'that one'
dì-vʲɛ́lá	→	tɨ́-vʲɛ́là	'it's good'
dì-kànɨ́	→	tɨ́-kànɨ́	'it's not there'
dì-kpáɾá	→	tɨ́-kpáɾá	'it's starting'

Again, in Zun, a similar process of word-internal assimilation occurs as shown in (4.14) in which a non-coronal stem-final labial nasal /m/ changes its feature specification to a coronal nasal /n/ which becomes [t]. Thus, a stem-final /m/ undergoes place assimilation and it is realised as [n] before the suffix /-ti/. In contrast

to this, in some cases the non-coronal nasals /m/ in (4.15) and /ŋ/ (4.16) resists place assimilation in the dialect. This suggests that in other words, /m/ is not a systematic target of place assimilation, which is sometimes targeted and sometimes not.

(4.14)

bɔ̀hɨ̀m	+ ti	→	bɔ̀hɨ̀n-tɨ́	'learn-imperf'
láhɨ́m	+ ti	→	láhɨ́n-tɨ́	'put together
kárɨ́m	+ ti	→	kárɨ́n-tɨ́	'read-imperf'
sáhɨ́m	+ ti	→	sáhɨ́n-tɨ́	'spoil-imperf

(4.15)

tòm	+ ti	→	tòm-tɨ́	*tòn-tɨ́ 'work.imperf'
dàm	+ ti	→	dàm-tɨ́	*dàn-tɨ́ 'shake.imperf'
pàm	+ ti	→	pàm-tɨ́	*pàn-tɨ́ 'weave.imperf'
sàm	+ ti	→	sàm-tɨ́	*sàn-tɨ́ 'mash.imperf'

(4.16)

nɨŋ	+ ti	→	nɨŋ-tɨ́	*nɨn-tɨ́ 'do-imperf'
bàŋ	+ ti	→	bàŋ-tɨ́	*bàn-tɨ́ 'know-imperf'
zàŋ	+ ti	→	zàŋ-tɨ́	*zàn-tɨ́ 'bring-imperf'
gàŋ	+ ti	→	gàŋ-tɨ́	*gàn-tɨ́ 'discriminate-imperf'

(4.17) Zun Coronal Consonants

Alveolar	palato-alveolar	palatal
t d[ɾ] s z l	ʧ ʤ ʃ ʒ	j
n		ɲ

Major Dialects

Place assimilation (PA) AD targets nasals that immediately precede other consonants and the nasals mostly occur at the right edge of the various morphological constituents. Across dialects, it is attested that a coronal nasal /n/ and non-coronal nasals /m, ŋ/ at the right edge of reduplicant prefix assume the place specification of the consonant it immediately precedes as seen in (4.18) where the reduplicants are bolded.

(4.18) PA in reduplicant prefixes across dialects (Hudu 2014b)

a.	**pǿm**-póŋ-ó	[mp]	'right now'
b.	**bòm**-bòŋ	[mb]	'extreme darkness'
c.	**dòn**-dòŋ	[nd]	'court yard'
d.	**zòn**-zó-lɨ́	[nz]	'maggot'
e.	**kòŋ**-kòŋ	[ŋk]	'tin'

Again, the dialects provide evidence of how PA affects a coronal cardinal prefix /n/ which acquires the features of coronal consonants as in **(**4.19) but the non-coronal labial nasal /m/ does not assimilate, as shown in (4.20).

(4.19)	n	+ dà:m	→	ǹ-dà:m	<ndaam>	'one'
	n	+ jí	→	ɲ̀-jí	<nyi>	'two'
	n	+ tá	→	ǹ-tá	<nta>	'three'
	n	+ náhí	→	ǹ-náhí	<nnahi>	'four'
	n	+ nú	→	ǹ-nú	<nnu>	'five'
	n	+ jɔbʊ	→	ɲ̀-jɔ́bʊ́	<nyɔbu>	'six'
	n	+ jɔpɔɨ	→	ɲ̀ -jɔ̀pɔɨ́	<ayopɔi>	'seven'
	n	+ ní:	→	ǹ-ní:	<nnii>	'eight'

(4.20)	n-dà:m	→	*m-dà:m	'one'
	n-jí	→	*m-jí	'two'
	n-tá	→	*m-tá	'three'
	n-náhí	→	*m-náhí	'four'
	n-nú	→	*m-nú	'five'
	n-jɔ́bʊ́	→	*m-jɔ́bʊ́	'six'
	a-jɔ́pɔɨ́	→	*m-jɔ́pɔɨ́	'seven'
	n-ní:	→	*m-ní:	'eight'

The data in (4.19) present /n/ acquiring the place of articulation of the onset sound of Dagbanli single digit numbers one to eight AD. This, also affects possessive and infinitive nasal proclitic (e.g. ǹ-sám-lɪ̂ 'my debt-sg.').

The non-coronal labial nasal /m/ in some cases assimilates to the place of a following stop /d/ as shown in (4.21) in which a stem-final labial nasal /m/ changes its feature specification to coronal nasal /n/ before suffix /di/. Thus, confirming that

/m/ of disyllabic verbs undergoes nasal assimilation and is realised as [n] before the suffx /-di/.

(4.21) /m/→[n]/____di

bɔ̀hɨ̀m	+	di	→	bɔ̀hɨ̀n-dɨ́	'learn-imperf'
láhɨ́m	+	di	→	láhɨ́n-dɨ́	'put together
kárɨ́m	+	di	→	kárɨ́n-dɨ́	'read-imperf'
sáhɨ́m	+	di	→	sáhɨ́n-dɨ́	'spoil-imperf

Example (4.21) shows word internal assimilation where the underlying labial nasal /m/ is assimilated to coronal nasal [n] before a coronal stop /d/ AD. This process occurs in polysyllabic verbs before the suffix /-di/.

A similar case is the non-coronal dorsal nasal /ŋ/ which in some cases assimilates to the place of a following coronal fricative /s/ as shown in (4.22). It usually occurs in free standing stem word and plural forms of nouns in which a stem-final dorsal nasal /ŋ/ changes its feature specification to coronal nasal /n/ before suffix the /ga/.

(4.22)

Root-sg		Plural	
tá:ŋ-gá	→	tá:n-sí	'shea tree-pl'
mó:ŋ-gá	→	mó:n-sí	'mango-pl'
só:ŋ-gá	→	só:n-sí	'rabbit-pl'
nó:ŋ-gá	→	nó:n-si	'bird-pl'
dú:ŋ-gá	→	dú:n-sí	'mosquito-pl'
ja:ŋ-gá	→	já:n-sí	'back-pl'
dá:ŋ-gá	→	dá:n-sí	'local coalpot-pl'

The data in (4.22) show evidence of homoganic place assimilation in simple words in Dagbanli across dialects where there is the pattern of velar nasal /ŋ/ and velar stop /g/ in the same word in the singular form while in the plural forms the velar nasal

/ŋ/ in the root word changes to alveolar nasal [n] to pattern with the alveolar fricative /s/.

It is attested that for the formation of the imperfective forms in Dagbanli, the suffix /-di/ is attached to the verbal root, which alternations were described in (4.21). Interesting is the case of verbs which end in the nasal consonants /m/ or /ŋ/; the suffixation of /-di/ to monosyllabic verbs ending in /m/ does not cause any changes in realisation as in (4.23). In such cases, it observed (Hudu 2014) that while an underlying coronal is always a target, an underlying dorsal place is never a target of PA in Dagbanli.

(4.23)	nɪŋ	+	di	→	nɪŋ-dɪ́	'do.imperf'
	bàŋ	+	di	→	bàŋ-dɪ́	'know.imperf'
	zàŋ	+	di	→	zàŋ-dɪ́	'bring.imperf'
	gàŋ	+	di	→	gàŋ-dɪ́	'discriminate.imperf'

It is notice in (4.23) that there is no PA with underlying non-coronal dorsal nasal /ŋ/. Notice also that unlike the coronal place, the labial place is not always a target. In contrast to the data in **(**4.21), those in **(**4.24) show that /m/ resists PA across dialects. In other words, /m/ is not a systematic target of PA, which is sometimes targeted and sometimes not.

(4.24)	tòm	+	di	→	tòm-dɪ́	'work.imperf'
	dàm	+	di	→	dàm-dɪ́	'shake.imperf'
	pàm	+	di	→	pàm-dɪ́	'weave.imperf'
	sàm	+	di	→	sàm-dɪ́	'mash.imperf'

It is also realized in (4.23) that there is no PA with underlying non-coronal nasals /m/. Observing the data in (4.23) and (4.24) reveal that place assimilation is stopped.

Across dialects, there is evidence that show the coronal /l/ undergoes place assimilation before a palatal coronal /j/ when the suffix /-ja/ is attached to a root verb that has /l/ at CVC stem-final as illustrated below:

(4.25)	wɔ́l	+	ja	→	wɔ̀l-já	'bear fruit'
	kál	+	ja	→	kàl-já	'sweep'
	màl	+	ja	→	màl-já	'make'
	kɔ́l	+	ja	→	kɔ̀l-já	'go home'
	pìl	+	ja	→	pi̩l-já	'start'
	bi̩l	+	ja	→	bi̩l-já	'rape'
	vàl	+	ja	→	vàl-já	'swallow'

Hudu (2018) notes that the lateral and other coronals get preserved in other hetero-morphemic contexts, including sequences of coronals and non-coronals and geminate laterals, as presented in (4.26).

(4.26)	Singular form		plural form (Naya)	
	kɔ̀lgɔ́	→	kɔ̀l-tí / kɔ̀l-sí	'a leather bag'
	tɔ̀l-gâ	→	tɔ̀l-sî	'pestle'
	kɔ́l-gá	→	kɔ́l-sí	'river/dam'
	kpál-gô	→	kpál-tí	'dawadawa spice'
	kpàɾ-gô	→	kpàɾ-tî̩	'gawn'

As seen in the data in (4.26), the stem final coronal /l/ is preserved to pattern with the plural suffix coronal /t/ or /s/ across dialects.

4.2.2 Palatalization

Palatalization is the process whereby a consonant acquires a palatal feature in the form of a superimposition of a high front vowel position. Hudu (2010:13) explains that "all consonants in Dagbanli undergo palatalisation before front vowels with the exception of /w/, which does not occur before front vowels."

Nayahili

In Naya, coronal consonants /s/ and /z/ optionally undergoes assimilation to coronal fricatives [ʃ] and [ʒ] as shown in (4.27) while the dorsal consonants /ŋ/, /k/ and /g/ also optionally undergoes assimilation to coronal palatal nasal [ɲ], and affricates [ʧ] and [ʤ] as shown in (4.28) before the front vowels in stem-initial. "The alternation between [ŋ] and [ɲ] is that of neutralisation, as both nasals are contrastive" (Hudu 2010:13).

(4.27) /s/ →[ʃ]/#_____

/sí-â/	→	[ʃĩ-â]	'bee'
/sɛ́ʔʊ′/	→	[ʃɛ́ʔʊ′]	'rainy season'
/sɛ́r-ga′/	→	[ʃɛ́r-gá]	'needle'

/z/ →[ʒ]/#____

/zɛ́-ʔʊ′/	→	[ʒɛ́ʔʊ′]	'storm'
/zɛ́r-gʊ′/	→	[ʒɛ́r-gʊ′]	'attacker'
/zì-lì/	→	[ʒì-lì]	'load'

(4.28) /g/ →[ʤ]/#____

/gɛ́-lɪ′sɪ′/	→	[ʤɛ́-lɪ′sɪ′]	'hatred'
/gɛ́bá/	→	[ʤɛ́bá]	'hate them'

/k/ →[ʧ]/#____

/kɛ́-ʔɪ′/	→	[ʧɛ́-ʔɪ′]	'rip in pieces'
/kìlɪm/	→	[ʧìlɪm]	'delay'
/kɛ́-ʔʊ′/	→	[ʧɛ́-ʔʊ′]	'broken piece'
/kíʔí/	→	[ʧĩʔí]	'deny'

/ŋ/ →[ɲ]/#____

/ŋìní/	→	[ɲìní]	'you-pl'
/ŋɛ̀ʔɪ́/	→	[ɲɛ̀ʔɪ́]	'nose-pl'
/ŋɛ́rá/	→	[ɲɛ́rá]	'defecate-sg.'

The data in (4.27) and (4.28) present palatalisation of the coronal consonants /s, z/ and dorsal consonants /k, g, ŋ/ which accounts for some of the dialectal differences in Naya. I noticed that all the underlying palatalized consonants are prominent in Tomo while the surface variants occur in Naya as well as Nan. It is realised that the

dialectal difference is as a result of palatal consonants that replace alveolar and velar consonants before front vowels, and that two groups of consonants complement each other in their distribution. The replacement of a coronal /s, z/ or dorsal /k, ɡ, ɲ/ sounds by a palatal one before front vowels is a common phonological process in Naya where a consonant such as /k/ becomes progressively articulated on the hard palate under the influence of a following front vowel till it is replaced by a palatal consonant /ʧ/.

4.2.3 Labialization

Labialization is the processes whereby the lip position of a rounded vowel is superimposed on an adjacent consonant. Olawsky (1999) states that parallel to palatalisation there is labialization [ʷ] before /o/. These assimilations are always optional and undergo variations. It is attested that segments are usually labialised before round vowels [u, ɔ, o, ʊ] apart from /w, kp, ɡb, ŋm/ in Dagbanli. Notice that a consonant which is followed by a rounded vowel takes on the lip-rounding of the vowel and becomes labialized. For instance, /tʷ/ in /tʊm/ ‘work’ is labialized while /t/ in /tɪm/ ‘medicine is not.

In Nanunli, this type of labialization is very noticeable in some words; one of the differences that can be observed in the dialect relates to the type of labialization that occurs with the initial consonant of a stem as illustrated by the following examples:

(4.29) dʷù-ú → dʷù-á ‘room’
sʷù-ú → sʷù-á ‘knife’
tʷù-ú → tʷù-á ‘baobab tree’
kʷɔ́m → kʷám ‘water’
gʷɔ́m → gʷám ‘sleep’

The examples in (4.29) show that stem initial alveolar consonants in CV.V are labial-palatalised in Nan. The velar consonants in CVC stem at the onset position in Nan are also labialized and may again have an alternative pronunciation where the high vowels are pronounced as /ʷ/. In Tomo and Naya, the onset alveolar consonants in the CV.V are all labialized but for the CVC, the onset velar consonants are labialized when the vowel is a low vowel in Tomo and labialized in Naya when the vowel is a high vowel.

4.2.4 Lenition and Fortition as Non-Assimilation Processes

Hudu (2018) describes lenition and fortition as the two broad categories of phonological processes that relate to the strength of segmental stricture and the place specifications of segments associated with these strictures. “Phonological processes are divided into lenition and fortition on the basis of the functions they serve and the context in which they appear. Notice that “both lenition and fortition operate on a segmental level, as opposed to prosodic processes which are located at a suprasegmental level” (Luschutzky 2001:23). Mobariki (2013) assess that..…

> ……lenitions and fortitions are differentiated on the basis of the strength of sound or energy expended in its production. Voiced sounds are called lenis (weak) whereas voiceless sounds are called

> fortis(strong). The fortis/lenis distinction derives from the greater/lesser pressure of air built up under the vocal folds which, in turn, results in the greater/lesser force of articulation. The dualistic typology of processes reflects the force of articulation and involves its modification. Therefore, the processes of the lenition type substitute the fortis sounds with the lenis ones whereas the processes of the fortition type substitute the lenis sounds with their fortis counterparts (2013:110).

Mobariki (2013:112) notes that "the evaluation of the current approach to lenition/fortition leads to the following observations":

a. "there is no exhaustive definition of lenition/fortition whereas the existing ones are either circular in the traditional approach (e.g. Trask 1996, Bussmann1996) or automatic in the current approaches to lenition/fortition."

b. "in the absence of a satisfactory definition of lenition or fortition, it is still not clear what classifies a given process as lenition or fortition."

c. "lenition is extensively covered but there are not equally numerous studies on fortition. it seems only Goman (1979) directly addressed the issue of fortition in consonants, whereas typically, fortition is mentioned as the reverse of lenition and not studied in its own rights."

d. "the current approaches classify processes as lenition/fortition on the basis how a process operates, not on what it does (procedure is considered, but its result is not taken into account at all)." (Mobariki 2013:112)

I discuss the patterns of lenition and fortition as non-assimilation processes that show a straightforward relationship between sound changes and dialect differences of the sort as also discussed in the previous chapter. For instance, it is fairly common in Dagbanli to hear the speakers of Gbanjonsili change the voiceless alveolar fricative /s/ in word-medial in Tomosili for the voiceless velar fricative [x] as

Nayahali will drop the same sound for the voiceless glottal fricative [h] in some words.

4.2.4.1 Lenition

"The term 'lenition' is used to group together a number of segmental processes which are perceived to have certain properties in common; these properties include a similar set of conditioning environments and the perception that the processes involve some kind of phonological weakening" (Honeybone 2001:226). "Classic lenition processes include: 'spirantization' (e.g./t/→[s]), 'voicing' or 'sonorization' (e.g. /f/→[v]), 'debuccalization' (e.g. /s/→[h]) and 'degemination' (e.g. /kk/→[k])." "It can be seen from this short list that effects of the place of articulation of a segment are not typically considered to be relevant to lenition, apart from in debuccalization which can be seen as the loss of place" (Honeybone 2001:227) Harris (1990) notes that "Lenition processes are said to be 'unconditioned' or 'spontaneous' in the sense that they are not caused by neighbouring segments unlike consonantal assimilations or vowel harmony".

Lenition is a kind of weakening, Hyman (1975:165) describes segmental strength as a situation where "segment X is said to be weaker than a segment Y if Y goes through an X stage on its way to zero." "Any change from one segment type to another in this way is thus seen as a lenition; this ties in synchronic lenition processes with the types of process attested in phonological change."

Honeybone (2001:227) notes, "the considerations of weakening and of the patterns in phonological change have frequently been brought together to construct

overarching lenition 'trajectories' or 'scales', which are intended to indicate what counts as lenition, in that stronger segments lenite along the trajectory to become weaker segments." These trajectories show that the logical conclusion of lenition is taken to be elision.

Exhaustive lenition trajectories are difficult to construct; some of such scales include a wide range of processes, some of which seem to be specific to the lenition of the alveolar stop /t/. This vagueness is perhaps evidence that at least some of the processes that have been grouped together in the literature under the label 'lenition' do not really belong to each other as a unified process-type. A nonexhaustive but relatively traditional example of a lenition trajectory is given in Figure (4.2); this seeks to include most of the commonest types of lenitions as a series of stages.

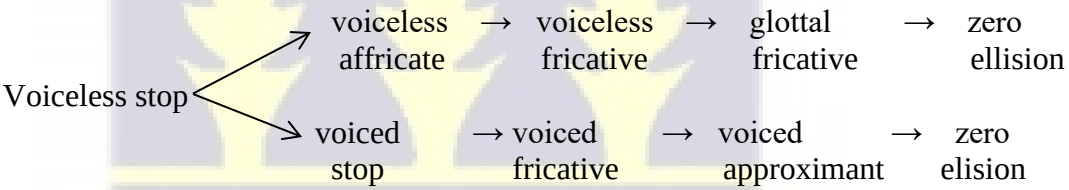


Figure 4.2: Non-exhaustive lenition trajectory

The scale in Figure (4.2) relates to the kinds except for glottalling, that is a special case of debuccalization. Any movement in the direction of the arrow is considered to be a lenition process.

A description of lenitions in Dagbanli is given in (4.30). Dagbanli features the conventional six underlying stops: labial /p, b/, alveolar /t, d/, velar/k, g/ which can all be subjected to lenition in certain linguistic environments. However, lenition seems to affect certain stops more frequently than others. Lenition of labial stops /p,

b/ does not exist in Dagbanli as the lenition of other stops. It is likely that this is due to the fact that the labials actually occur less frequently, although it could possibly be due to the lesser salience of [ɸ, β], for example, than of [s, z, x]. There are a few attestations of the lenition of /g/ in Dagbanli as given in (4.30) which shows an illustration of the type of lenition which can occur:

(4.30) in environment a [__#]: . . . tang-a ... [ʔ]
in environment c [v__v]: . . . paga . . . [ʔ]

The lenition of /d/ is often quite noticeably affricated or spirantized in normal speech in Gbanjonsili dialect. The lenition of /d/ in the dialect, affrication to [ʧ] is frequently recorded in environment e[#__].

(4.31) Lenitions Processes in Dagbanli and its Dialects

a.	/g/→[ɣ]	/pá**g**-á/	vs	Zundusili	[páɣ-á]	‘woman’
b.	/g/→[ʔ]	/[pá**g**-á/	vs	Nayahili	[pá**ʔ**-á]	‘woman’
c.	/k/→[ʔ]	/tà**k**ɪ/	vs	Nayahili	[tà**ʔ**ɪ]	‘change’
d.	/s/→[h]	/máːs**s**ɪlɪ́/	vs	Nayahili	[má**h**ɪ́lɪ́]	‘cool weather’
e.	/d/→[k]	/**d**ɪ́nɪ́/	vs	Jimansili	[**k**ʊ̀nɪ́]	‘knee’
f.	d/→ [ʧ]	/dɪ́nɪ́/	vs	Gbanjonsili	[ʧɪ́nɪ́]	‘knee’

All the lenitions in (4.31) fit well with the lenition trajectory given in Figure (4.2). The data show that lenition occurs in both stem-initial and stem-medial in Dagbanli but does not take place in stem-final position except a stem final of a CVC syllable.

It is noted that lenition does not occur in utterance-initial environment (Honeybone, 2001), there can be difference between the inhibitory effects of the environments [c #__] and [v #__]. Lenition occurs when a consonant is word-initial if it is preceded in an utterance by a word-final vowel; it does not occur if preceded by a word-final consonant (Honeybone 2001). In Jimansili dialect for instance, it occurs in word-initial before a back vowel /u/ but does not violate [v #__] preceding

a word-final vowel in an utterance. Cross linguistically, lenition processes include: debuccalization, intervocalic voicing, degemination, spirantization, gliding, and the ultimate form of lenition, deletion.

Lenition typically carries the notion of some reduction in the degree of constriction of a sound (Bauer 1988; Kirchner 1998). Previous studies of lenition in Dagbanli (Hudu 2005, 2018) show that among the lenition processes, deletion, degemination, debuccalisation and spirantisation result in the loss of underlying oral constrictions. However, there is also some evidence of deletion or manipulation of formal phonological features. For example, Zundusili makes use of feature systems; the coronal stop /d/ weakens to coronal stop [t] in onset position because what is left is the oral place and the feature [-voice]. This section discusses degemination, debuccalisation and Spirantisation as lenition processes in Dagbanli.

4.2.4.1.1 Degemination

Degemination is a process in which a geminate segment is reduced to a single segment as illustrated in (4.32). In Dagbanli, the geminates are usually a word stem-final consonant and initial and a number suffix in a word. In the case of Zun dialect, a dorsal geminate /g/ is reduced to single segment, which further surfaces as dorsal fricative [ɣ].

(4.32) Degemination of dorsal geminates /g/ to [ɣ] in Zun

a.	/bɔ́g-gʊ́/	→	[bɔ́ɣʊ́]	‘arm-sg’
b.	/zʊ́g-gʊ̂/	→	[zʊ́ɣʊ̂]	‘head-sg’
c.	/pág-gá/	→	[páɣá]	‘woman-sg’
d.	/lɔ́g-gʊ́/	→	[lɔ́ɣʊ́]	‘water pot’
e.	/dʊ́g-gʊ̂/	→	[dʊ́ɣʊ̂]	‘cooking pot’
f.	/kɔ́b-gʊ́/	→	[kɔ́b-gʊ́] *[kɔ́bɣʊ́]	‘hair-sg’

It is shown in (4.32) that each noun in (4.32a-e) contains an underlying ambi-morphemic dorsal geminate /g/. The root has a dorsal as coda; the suffix also has a dorsal as onset. Evidence for this comes from the noun in (4.32d), which had no geminate in the underlying form. The data provide evidence that the nouns in (4.32) have an underlying /CVg-gV/ structure and that the surface [CV$_{ɣ}$V] forms, this is as a result of deletion of either the root coda or the suffix onset. The singular and plural forms in (4.33) provide evidence that it is the root-final stop, not the suffix onset one that is deleted.

(4.33) Deletion of root-final geminate /g/ in Zun

a.	/bɔ́g-gʊ́/	'arm'	→	[bɔ́ɣ[ʊ́]-ɾɨ́]	'arms'
b.	/zʊ́g-gʊ̂/	'head'	→	[zʊ́ɣ[ʊ́]-ɾɨ̂]	'heads'
c.	/pág-gá/	'woman'	→	[páɣ[á]-bá]	'women'
d.	/lɔ́g-gʊ́/	'water pot'	→	[lɔ́ɣ[ɨ́]-ɾɨ̂]	'water pots'
e.	/dʊ́g-gʊ̂/	'cooking pot'	→	[dʊ́ɣ[ʊ̂]-ɾɨ̂]	'cooking pots'
f.	/kɔ́b-gʊ́/	'hair'	→	[kɔ́b[ɨ́]-ɾɨ́]	'hairs'

Hudu (2018) reports that degemination in Dagbanli applies asymmetrically because non-dorsal geminates in similar environments are not affected. This is demonstrated with geminate coronals and labials below.

(4.34) No degemination for coronal and labial geminates (Hudu 2018:213)

a.	gbál-lɨ́	'grave-sg.'	→	gbál-á	'grave-pl.'
b.	wʊ́l-lɨ́	'branch'	→	wʊ́l-á	'branch-pl.'
c.	jɛ́l-lɨ́	'issue-sg.'	→	jɛ́l-á	'issue-pl.'
d.	kpíl-lɨ́	'seed-sg.'	→	kpíl-á	'seed-pl.'
e.	láb-bʊ̂	'return-nom.'	→	làb[ɨ̀]	'return.V'
f.	kɔ́b-bʊ̂	'infect-nom.'	→	kɔ̀b[ɨ̀]	'be infected'
g.	fɛ́b-bʊ̂	'whip-nom.'	→	fɛ̀b[ɨ̀]	'whip.V'

Based on the data provided above on Degemination, it is concluded that Degemination in Dagbanli across dailects occurs in the environment between word-final [__#] and word-initial [#____] of a coda-final consonant of a root and onset of a suffix consonant.

4.2.4.1.2 Debuccalisation

"Debuccalisation which is often defined as the loss of oral place of articulation is a weakening phenomenon whereby various consonants reduce to laryngeals" (O'Brien 2012:27). Previous analyses of debuccalisation view it as a lenition process that deletes or manipulates formal phonological features. The term *bucca*, which means 'mouth or cheek', is a Latin root so it is akin to de-oralisation. It is a type of sound change or alternation where a consonant no longer has any obstruction in the oral tract, and the sound that results is a laryngeal consonant (/h/, /ɦ/, /ʔ/).

Examples of debuccalisation, which are well accepted by most authors who work on lenition, include: Spanish s-aspiration (/s/→[h] word-final) and English t-glottalization (/t/→[ʔ] syllable-final). To avoid controversies in the definition of debuccalisation, O'Brien (2012) assumes that "debuccalisation is any sound change or synchronic alternation that turns an oral consonant into a laryngeal consonant ([h], [ɦ], or [ʔ])." The lenition processes cross-linguistically have similar environments (e.g., inter-sonorant position and syllable/word-final position)".

Previous descriptions of debuccalisation in Dagbanli have often been quite profound. General overviews of Dagbanli, such as Olawsky (1999), Hudu (2010, 2018) mention the possible results of the debuccalisation but hardly mention of

possible effects across dialects. Hudu (2018) notes that debuccalisation is a term used to describe any phonological process that results in the loss of underlying oral constriction of a segment. In Dagbanli like many languages, it targets coronals (e.g. /t, d, s, z/) and dorsals (e.g. /k, g, x, ɣ/) making them glottals (e.g. /h, ʔ/). These processes occur in the environments of ʌ[___#] 'word-final' or ʙ[___c] 'coda consonant' and c[v___v] 'intervocalic' which favours a special case of debuccalization, which is widely recognized as a type of lenition process. Other cases of debuccalisation occur in the environment ɛ[#__] 'word-initially.

In Nayahili dialect, the case of debuccalisation is recorded where the dorsal segment /g/ changes into [ʔ] in postvocalic position and in some cases post-consonantal positions as shown in (4.35):

(4.35) Debuccalisatio /g/ to [ʔ] in Naya

a.	/jágʊ´/	→	[jáʔʊ´]	'bead'
b.	/sɪ´gɪ´/	→	[sɪ´ʔɪ´]	'go down'
c.	/zóg-ō/	→	[zóʔ-ō]	'head'
d.	/ʧɔ́g`ɪm/	→	[ʧɔ́ʔɪ́m]	'be weak'
e.	/lóg-lɪ́/	→	[lóʔ-lɪ́]	'side-sg.'
f.	/gòhɪ̀/	→	*[ʔòhɪ̀]	'wait'

Another case of debuccalisation in Naya is the dorsal /k/ to [ʔ] that serves to show the patterns of lenition in a similar environment as in (3.36).

(3.36). Debuccalisation (/k/ to [ʔ] in Naya

/sàkɪ̀/	→	[sàʔɪ̀]	'be sufficient'
/tàkɪ̀/	→	[tàʔɪ̀]	'to change'
/jàkɪ̀/	→	[jàʔɪ̀]	'too much'

A similar case of debuccalisation in the dialects is the coronal /s/ to dorsal [h] as also illustrated in (3.37) where /s/ becomes [h] in underlying CV:sV words in the environment of c[v__v] 'intervocalic'.

(3.37). Debuccalisation /s/ to [h] in Naya

a.	/bí:sí/	→	[bíhí]	'child-pl.'
b.	/bó:sí/	→	[bɔ́hɨ̂]	'ask'
c.	/àná:sí/	→	[ánáhɨ́]	'four'
d.	/kú:sí/	→	[kʊ́hɨ́]	'cry/prick'
e.	/má:sílí/	→	[máhɨ́lɨ́]	'cool weather'
f.	/nè:sì/	→	[nɛ̀-hì]	'awaken-pl.'
g.	/mó:sî/	→	[mɔ́hɨ̂]	'become reddish'

The example in (3.37) shows coronal debuccalisation in which the long vowel in the underlying form is shortened before [h]. The data provide synchronic alternations that support the presence of underlying long vowels. Also, there is a general pattern of positional asymmetry (Hudu 2014b) observed in several phonological processes in Dagbanli [h] surfaces as a variant of /s/ in Tomo and Gban dialects which exhibit positional effects in /s/ debuccalisation (e.g. /pí-**sí**-tá/ →[pí-**h**í-tá] 'thirty'. Hudu (2014b) provides detailed discussions of this general pattern of positional asymmetry observed in phonological processes in Nayahili dialect.

Across dialects, debucalisation process is blocked when the coronal /s/ occurs in an onset of a CV:sɨm structure and in forms with the nominalising suffix -sɨm. Also, vowel shortening is blocked as illustrated in (3.38a-c). It is noted that labials, on the other hand, maintain their stricture in intervocalic position, as shown in (3.38d-e) and like the coronal, there are no CV:bVC that makes it possible to explore a perfect asymmetry.

(3.38) Application of debuccalisation in Naya Hudu (2018)

a.	/bì:sɨ̂m/	*[bì:-hɨ̂m]	'hot-nom. (heat)'
b.	/tò:sɨ̂m/	*[tò:-hɨ̂m]	'able-nom. (wherewithal)'
c.	/mò:sɨ̂m/	*[mò:-hɨ̂m]	'red-nom.'
d.	/dàbɛ̂m/		'fear'
e.	/ta:bó/		'timber'

However, in Gbanjonsili, the process of debuccalisation of the underlying coronal may not fail and the loss in oral constriction is not blocked when /s/ is an onset of a heavy syllable in such words with CV:sɨm structure; this will be realized as CV:xɨm where the coronal /s/ becomes a dorsal /x/ as seen (3.39).

(3.39) debuccalisation of /s/ to [x] in Gban.

/bì:sî̀m/	→	[bìxî̀m]	'hot-nom. (heat)'
/tò:sî̀m/	→	[tɔ́xî̀m]	'able-nom. (wherewithal)'
/mò:sî̀m/	→	[mɔ́xî̀m]	'red-nom.'

Based on phonological perspective, the debuccalisation of /s/ → [h] (cf. 3.37) may not be assumed to constitute lenition since both sounds are fricative while from an articulatory perspective; it does constitute lenition, given that [s] has a stronger stricture than [h] (Hudu 2018). It is a fact that /s/ and other coronals are preserved as coronals in some intervocalic positions making the application of debuccalisation asymmetrical AD in Dagbanli. It is evident that debuccalisation always targets dorsals [h, ɣ, ʔ] but does not always target coronals and labials.

4.2.4.1.2.1 Coalescence

In Gbanjonsili dialect, the dorsal stop /g/ coalesces with coronal fricative /s/ to produce a dorsal fricative [x]. The dorsal in the proces loses its stricture but maintains its place specification while the coronal maintains its stricture but loses its place specification. This in the other dialects is pronounced differently from Gban dialect.

(3.40) Dorsal coronal coalescence in Gban (/g + s/ → [x]).

a.	/tɔ̀gsɨ̀/	→	[tɔ̀xɨ̀]	'speak'
b.	/ɲàgsɨ́m/	→	[ɲàxɨ́m]	'sweetness'
c.	/zàgsɨ̀/	→	[zàxɨ̀]	'refuse'
d.	/lágsɨ́/	→	[láxɨ́]	'put together'

The (/g + s/ → [x] coalescence is a case of preservation which is similar to the resistance of the dorsal to nasal place assimilation. (Hudu 2018) observes that a sequence of labial stop [b] and alveolar fricative /s/ does not coalesce into one segment. Thus, no place specification triggers a change in the place of a contiguous segment in a non-assimilatory way except the dorsal as illustrated below:

(3.41) No labial-coronal coalescence (Hudu 2018:224)

a.	/sàbsɨ̀-ʔʊ́/	→	*[sàxɨ̀-ʔʊ́]	'wall gecko-sg.'
b.	/gàbsɨ̀/	→	*[gàxɨ̀]	'stain'
c.	/tɪ́b-sɪ́m/	→	*[tɪ́xɪ́m]	'heavy-Nom. (weight)'
d.	/pɔ̀bsɨ̀/	→	*[pɔ̀xɨ̀]	'blow air with the mouth'

On the contrary, Gbanjonsili dialect show evidence in some cases that [x] is the product of coalesce of non-coronal labial nasal /m/ and the coronal fricative /s/ in intervocalic position as in (3.42). This proves that there is labial-coronal coalescence in the dialect.

(4.42) labial-coronal coalescence in Gban

a.	wómsɨ `	→	wóxɨ́	'train/nurse.'
b.	wómsɨ́m	→	wóxɨm	'tiresomeness'
c.	wómsɨ́-bó	→	wóxɨ́bó	'train/nurse.'
d.	ɲɪmsá	→	ɲɪ́xá	'neem tree'
e.	tàmsɪ́m	→	tàxɪ́m	'forgetfulness'
f.	ɲɔ̀msá	→	ɲɔ̀xá	'lime'
g.	màmsɨ̀-lɨ̀	→	màxɨ̀lɨ̀	'relationship'

A new development in Gban dialect also show evidence of a sequence of coronal lateral [l] and fricative /s/ which does not coalesce into one segment but the /s/ becomes dorsal fricative [x] with the lateral sound preserved. This is illustrated below:

(4.43) /s/ as [x] in post-consonatal in Gban

/gálsɨ/	→	[gál[ɨ]xɨ]	*[gáxɨ]	‘large’
/bílsɨ/	→	[bɨl[ɨ]xɨ]	*[bɨxɨ]	‘rub’
/ɲɛ́lsɨ/	→	[ɲɛ́l[ɨ]xɨ]	*[ɲɛ́xɨ]	‘shine’
/màlsɨm/	→	[màl[ɨ]xɨm]	*[màxɨm]	‘sweetness’
/pɔ̀lsɨ̀/	→	[pɔ̀l[ɨ]xɨ̀]	*[pɔ̀xɨ̀]	‘lime’
/wàl-sɨ̀/	→	[wàl[ɨ]xɨ̀]	*[wàlxɨ̀]	‘struggle’

4.2.4.1.3 Spirantisation

Spirantisation as a lenition process in Dagbanli targets only the velar stops /k, ɡ/ and the alveolar stop /d/ before front vowels reducing the stops to affricates [ʧ, ʤ] across dialectal. Spirantisation of the velar stops /k, ɡ/ to become affricates [ʧ, ʤ] is more prevalent in loan-words with the dorsal as an underlying final segment. The underlying forms of the loan words shown in (4.44) below are based on the dialect of Hausa and English spoken in Ghana, which are the source of the loan-words. The other source is Arabic.

(4.44) Spirantisation (/ɡ, k/ → [ʤ, ʧ]/__front vowels)

/ɡ/ → [ʤ]

a.	/bá:**ɡ**î/	→	[bá:**ʤ**î]	‘bag’	(English)
b.	/gáng**ɡ**î/	→	[gán**ʤ**î]	‘gang’	(English)
c.	/má:**ɡ**î/	→	[má:**ʤ**î]	‘maggi’	(English)
d.	/**ɡ**ɨlɨmá/	→	[**ʤ**ɨlɨmá]	‘respect’	(Hausa)

/k/ → ʧ]

e.	/màlí**k**î/	→	[màlí**ʧ**î]	'name'	(Arabic)
f.	/mɔ́lí**k**î/	→	[mɔ́lí**ʧ**î]	'subjects'	(Arabic)
g.	/mílí**k**î/	→	[mílí**ʧ**î]`	'milk'	(English)
h.	/àlàhɨ**k**í/	→	[àlàhɨ**ʧ**í]	'sin'	(Hausa)
i.	/**k**ɨjámá/	→	[**ʧ**ɨjámá]	'year after'	(Housa)
j.	/**k**ɪ́rɪ́**k**î/	→	[**ʧ**ɪ́rɪ́**ʧ**î]	'valuable'	(Hausa)
k.	/sí**k**ɪ́rí/	→	[sí**ʧ**ɪ́rí]	'sugar'	(English)
l.	/má**k**élé/	→	[má**ʧ**élé]	'blacksmith'	(Hausa)

The stops /k, g/ and affricates [ʧ, ʤ] alternation that underlies the process of spirantization in Dagbanli is evident in word-initial AD as in (4.44d) and (4.44i-j) and word-medial as in (4.44a-c), (4.44e-h) and (4.44k-l).

This is in contrast with Dutta's (2012) argument that "spirantization is never found in word-initial and medial position citing evidence from Assamese language". The data in (4.44) in Dagbanli loan words provides evidence to support the claim of spirantization occurring in word-medial though the process is more prominent in word-initial in Naya dialect as seen in (4.45).

(4.45) Spirantisation (/g, k/ → [ʤ, ʧ]/__front vowels) in Naya

/g/→ [ʤ]

/gé-lɨ́nsɨ́/	→	[ʤélɨ́nsɨ́]	'hatred'
/gɛ́bá/	→	[ʤɛ́bá]	'hate them'

/k/ → /ʧ]

/ké-hɨ́/	→	[ʧé-hɨ′]	'rip in pieces'
/kɨlɨ́m/	→	[ʧɨlɨ́m]	'deley'
/kɛ́ʔʊ′/	→	[ʧɛ́ʔʊ́]	'broken piece'
/kíhí/	→	[ʧíhí]	'deny'

The data in (4.45) present palatalisation of underlying consonants /k, g/ which accounts for spirantization in some of the dialects under discussion. It is observed that all the underlying palatalized consonants are prominent AD.

More evidence is provided in Gban dialect where the alveolar stop /d/ spirantizes at word-initial position to become an affricate [ʤ] before front vowels as seen in (4.46). This alternation is only restricted to word-initial in the dialect and does not occur in loan words in the language.

(4.46) Spirantisation (/d/ → [ʤ] /__front vowels) in Gban

a.	/dɪ́nɪ́/	→	[ʤɪ̃nɪ́]	'knee'
b.	/dé-é/	→	[ʤé-é]	'antelope'
c.	/dɪ́kànɪ́/	→	[ʤɪ̃kànɪ́]	'it's not there'
d.	/dɪ́ɾ-gʊ́/	→	[ʤɪ̃ɾ-gʊ́]	'spoon'

Sheffer (1995) observes that Tiberian Hebrew has surface geminates which blocks spirantization but exactly how the gemination blocks spirantization has not been explained. The process of spirantisation is blocked in word-initial and word-medial before bsck vowels in AD (e.g., /dini/→[dʊnɪ] 'knee') in the language.

4.2.4.2 Fortition

"Fortition is any phonological process in which some segment becomes stronger or more consonant-like, the above definition highlights the nature of the fortition processes which affect the lenis sounds, transforming them into the fortis ones" (Trask 1996:149). "Fortition processes, also referred to as strengthening or centrifugal, perform the listener–friendly function and since it[fortitions] strengthen the clarity of perception, they enhance contrast for the sake of a better, sharper perception. They have a perceptual teleology. Fortition operates independently of a context (rely on the system inventory) and it is style-sensitive (appear in formal/emphatic speech). Its operation also affects the segments in strong positions"

(Mobariki 2013:111). Kenstowicz (1994:35) concludes that "the most typical environment for fortition in cross linguistics is word initial." Some of the processes of fortition attested in languages include: Stopping in Hausa (Kraft & Kraft 1973), Devoicing in Pennsylvania German (Kelz 1971), Flapping in Nepali (Acharya 1991) etc. Five types of fortition processes have been attested in Standard Persian (a language spoken in Iran) and some of its dialects, which show that fortition processes occur in interconsonantal. Such processes include: **c**onsonant insertion in Eqlidi dialect (e.g./deh/ →[deji] 'a village'), Vowel insertion in Sabzevari dialect (e.g./zaxm/→[zaxom]'wound'), Lengthening in Sabzevari dialect (e.g. /leb±s/→[lub±s] 'attire'), stopping in Sharrezaee dialect (e.g. /ha.vu/→[ha.bu] 'a rival wife'), Aspiration in Standard Persian (e.g. /cerm/→[c^{h}erm) 'worm' and Devoicing in Kermani dialect (e.g. /kad/→[kat] 'dung') (Mobariki 2013). The consonant insertion and vowel insertion are examples of Epenthesis.

In this section, I discuss the phonological processes that support the application of fortition processes in Dagbanli AD and in which contexts fortition processes apply in Dagbanli. I also demonstrate that word-initial position has the highest frequency for fortition processes to occur in Dagbanli, which supports Kenstowicz's (1994) idea that word-initial is the typical position for fortition.

Hudu (2018) is the most extensive study of fortition in Dagbanli. In relation to place specification and observes that in stricture terms, fortition produces a result directly opposite to that of lenition. While lenition is significantly influenced by the loss of place features, fortition in Dagbanli does not lead to the emergence of place features in contexts where they are absent underlyingly. It is, however, noted that the enhancement that is given to affected segments guarantees the presence of place

features associated with these segments. Hudu (2018) describes two types of fortition in Dagbanli: stopping and degemination.

4.2.4.2.1 Stopping

The first observed patterns of fortition in Dagbanli are stopping which demonstrates that in Nanunli and its sub-dialect Jimansili, the fricative /z/ becomes affricate [ʤ] before vowels (/z/ → [ʤ]). In the speech of most Nan and Jim speakers, the affricate [ʤ] surfaces in all contexts mainly word-initial ruling the fricative [z] out of the dialects entirely, this is presented in (4.47).

(4.47) Stopping in the Nan Dialect (/z/ → [ʤ] / __ [back vowels])

/**z**ʊʔ-ʊ/	→	[**ʤ**ʊʔ-ʊ]	'head'
/**z**ɔn-a/	→	[**ʤ**ɔn-a]	'bats'
/**z**ɔm/	→	[**ʤ**ɔm]	'blinds'
/**z**o/	→	[**ʤ**o]	'escape'
/**z**ɔ-ja/	→	[**ʤ**ɔ-ja]	'mountains.'

In (4.47), the alternation /z/ ~ [ʤ] shows that /z/ in Dagbanli words is underlying representation because the word-initial position is a typical position for fortition and stoping is a kind of fortition process. The data also provides evidence of Initial Consonant Mutation (ICM) in which the distribution of the fortes emerges in initial or postconsonantal position.

4.2.4.2.2 Gemination

The second pattern of fortition process is germination which targets labials. The gemination of a labial nasal [m] is described to happen optionally in word-final positions and before the second or third person clitics /a, o/ in Naya. When the nasal

geminates, it becomes tone-bearing and syllabic producing three syllables. When it does not geminate, it produces only two syllables.

(4.48) Labial germination in Naya (Hudu 2018:217)

a.	/làʔm/	[là.ʔm̀-m ó] / [làʔ.m ó]	'sexual intercourse'
b.	/sàʔm/	[sà.ʔm̀-m á] / [sàʔ.m á]	'spoil you'
c.	/jɔ́hm/	[jɔ́.hḿ-m á] / [jɔ́h.m á]	'deceive you'
d.	/bɛ̀hm/	[bɛ̀.hm̀-m ó] / [bɛ̀h.m ó]	'doubt him/her'
e.	/ʄĭlm/	[ʄĭ.lḿ-m ó] / [ʄĭl.m ó]	'delay him/her'

Another instant of gemination is also observed in other contexts in Naya dialect in which a labial /b/ becomes a geminate in the plural suffix /-ba/ when the suffix attaches to the root such as for man (/dɔ́-ɔ́/ [dó-ó] 'man-sg.' [dɔ́-bbá] 'man-pl.' [dò ʄɔ̌ʔɨŋ-gó] 'weak man-sg.)'. Dagbanli also exhibit ambisyllabic alveolar and labial geminates which results from morphological concatenations as demonstrated in (4.49).

(4.49) Alvolar and labial geminates in Naya (Hudu 2018:218)

gbál-lɨ́	'grave-sg.'	→	gbál-á	'grave-pl.'
wól-lɨ́	'branch-sg.'	→	wól-á	'branch-pl.'
jɛ́l-lɨ́	'issue-sg.'	→	jɛ́l-á	'issue-pl.'
kpíl-lɨ́	'seed-sg.'	→	kpíl-á	'seed-pl.'

Labial

láb-bô	'return-nom.'	→	làb[ɨ]	'return.V'
kɔ́b-bô	'infect-nom.'	→	kɔ̀b[ɨ]	'be infected'
fɛ́b-bô	'whip-nom.'	→	fɛ̀b[ɨ]	'whip.V'

Hudu (2018) concludes that in patterns of fortition, the place specification of the underlying forms, alveolar /z, l/ or labial /b, m/ in (4.49) and (4.49) are maintained. The asymmetry observe is that whereas phonological processes are triggered to block germinate dorsals in contexts where they would otherwise have occurred

underlyingly, coronal and labial germinates are permitted to surface either as a product of the phonology proper or due to a morphological concatenation.

The previous study describes two types of fortition processes in Dagbanli: the first demonstrates Stopping (cf.4.2.4.2.1) while the second illustrates Gemination (cf. 4.2.4.2.2). In addition to the two types, I introduce Devoicing and Epenthesis as processes which are applied in Dagbanli and some of its dialects as fortition. Jimansili and Zundusili dialects out of the six dialects show devoicing process while all the dialects show epenthesis.

4.2.4.2.3 Devoicing

Devoicing process is realized in Zundusili where the voiced alveolar stop /d/ is realized as voiceless alveolar stop [t] before high front vowel /i/ (e.g. /d/ → [t]). The differences observed is dialectal as presented in (4.50). In Jimansili, the /d/ becomes velar stop [k] before high back vowel /u/ in word-initial (e.g. /d/ → [k]) as in (4.51).

(4.50) Devoicing in Zun Dialect (/d/ → [t] / ___/i/)

a.	/dínà/	<dina>	→	[tínà]	‘that one’
b.	/díní/	<dini>	→	[tíní]	‘knee’
c.	/dínɔ̀lí/	<dinɔli>	→	[tídɔ̀li]	‘door’
d.	/dífɛ́lí/	<difɛli>	→	[tífɛ́lí]	‘pillow’
e.	/díkpíní/	<dikpini>	→	[típkíní]	‘wall’
f.	/díb-gí/	<dibigi>	→	[tíbgí]	‘escape’
g.	/díb-gá/	<dibiga>	→	[tíbgá]	‘chewing stick’
h.	/díɾ-gʊ/	<dirigu>	→	[tíɾ-gʊ́]	‘spoon’
i.	/dì-lín-díhí/	<dilindihi>	→	[tì-lín-tíhí]	‘numbness’

The data in (4.50) show that the voiced stop /d/ has been changed to voiceless stop [t] in word-initial domain before a front high vowel. I argue that the alternation of [d]~ [t] show that /d/ in Dagbanli words in word-initial position is a typical position

for fortition and devoicing is a kind of fortition process. Devoicing process at word-initial is the position of fortition while at word-final is the position of lenition. Another example of devoicing as a fortition process which only occur Jim dialect is presented in (4.51).

(4.51) Devoicing in Jim dialect (/d/ → [k] / ___ /u/)

a.	/dínà/	<dina>	→	[kónà]	'that one'
b.	dɨ́nɨ́/	<dini>	→	[kónɨ́]	'knee'
c.	/dínɔ̀lɨ́/	<dinɔli>	→	[kódɔ̀lɨ]	'door'
d.	/dífɛ́lɨ́/	<difɛli>``	→	[kófɛ́lɨ́]	'pillow'
e.	/díkpínɨ́/	<dikpini>	→	[kópkínɨ́]	'wall'
f.	/díb-gɨ́/	<dibigi>	→	[kóbgɨ́]	'escape'
g.	/dɨ́b-gá/	<dibiga>	→	[kóbgá]	'chewing stick'
h.	/dír-gó/	<dirigu>	→	[kór-gó]	'spoon'

Similarly, the data in (4.51) show that the voiced stop /d/ has also been changed to voiceless stop [k] in word-initial domain before a back vowel /u/. I suggest here that the alternation of [d] ~ [k] show that /d/ occurring in word-initial position is also a typical position for fortition. It is observed from the words in both Zun and Jim that the dialects preserve the phoneme /t/ and /k/ but /d/ is maintained in Dagbanli and the asymmetry observe is that the stop /d/ is permitted to surface either as a product of phonology or morphology. "Morphological fortition is found in individual languages only in specific morphological environments while phonological fortition occurs whenever the relevant phonological environment occurs, regardless of morphological composition" (de Lacy & Bye 2008:26).

The [d]~[k] alternation of Jim also seem to provide a picture of lenition, because of the change in oral place but I consider it more of fortition. Clearly, the alternation of [d]~[k] show a shift from voiced to voiceless.

4.2.4.2.4 Epenthesis

The common insertion in Dagbanli and related dialects is the epenthetic vowel [ɪ] which is inserted between two consonants or stem final consonant to ease articulation. Vowel insertion is the process whereby a vowel is added word-initially, word-medially or word-finally and the general result is an additional syllable. The process of adding in word-initial is referred as *prothesis*, word-medial is *epenthesis* and word final is *epithesis*. Dagbanli speakers tend to apply these rules to words cross dialectal. Epenthesis happens in all the dialects of Dagbanli and commonly found "in verbs, nominal and adjectival roots that underlyingly have only one vowel" (Hudu 2010:17). "In verb roots, the epenthetic vowel is observed in citation forms of roots with the structure CVC and CVCC. In all instances, the epenthetic vowel is [ɪ] except when the root vowel is /i/, in which case the epenthetic vowel harmonises with the root vowel, emerging as [i]" as presented in the data below.

(4.52) Epenthesis in CVC verb roots (Hudu 2010:17)

	CVC roots		CVCm roots		CVCC roots	
[i]	lìh[ì]	'look'	tìh[ì]m	'sneeze'	jíʔs[î]	'wake up'
[ɪ]	pɪ̀l[ɪ]	'cover'	bɪ̀l[ɪ]m	'roll'	bɪ̀ls[ɪ]	'fondle with'
[ʊ]	ŋʊ̀b[ɪ]	'chew'	bʊ̀h[ɪ]m	'parasite'	bʊ̀ʔs[ɪ]	'describe'
[ɛ]	fɛ̀b[ɪ]	'whip'	bɛ̀h[ɪ]m	'doubt'	bʲɛ̀rg[ɪ]	'over boiled'
[ɔ]	bɔ̀ʔ[ɪ]	'split'	bɔ̀h[ɪ]m	'learn'	tɔ̀ʔs[ɪ]	'speak'
[a]	tàɾ[ɪ]	'share'	gbáɾ[ɪ]m	'besmear'	tàbl[ɪ]	'stick to'

The data (4.52) show possible vowel insertions as fortition process in the dialects of Dagbanli.

In fortition process in Dagbanli AD, the vowel [ɪ] is characterized as a lexical vowel and its second function concerns the role as an epenthetic vowel under

entirely predictable conditions. Across dialects, I observe that an interesting context where epenthesis applies is mostly after syllable-final consonant cluster as seen in (4.53). A number of nouns display a more complex syllabic structure having roots of the type CVCC.

(4.53) Vowel epenthesis for CVCC roots

/namd-/	→	námd[ɨ]-lɨ́	'sandal'
/ɲims-/	→	ɲíms[ɨ́]-lɨ́	'neem tree'
/sabs-/	→	sàbs[ɨ]-gú	'gecko'
/galm-/	→	gál[ɨ́]n-lɨ́	'blameworthy'
/gbɨ́ʔm-/	→	gbɨ́ʔ[ɨ]n-lɨ́	'lion'

Epenthesis process in Dagbanli allows phonological patterns of inserting [ɨ] after the alveolar nasal /n/ in verbs as in /zan[ɨ]bʊ/ 'stand.imperf', /ʤɨn[ɨ]bʊ/ sit.imperf. Comparing these patterns to nouns; there is no vowel insertion in word-medial after nasal consonants /m, n, ŋ/ in any of the dialects as illustrated below. This suggests that epenthesis process in Dagbanli is blocked in word-medial by the nasal consonats /m, n, ŋ/ since the insertion of vowel [ɨ] fails.

4.54. Blocking vowel epenthesis after nasals /m, n, ŋ/

After /m/		After /n/		After /ŋ/	
*nám[ɨ]dá	'sandal'	*bɨ́n[ɨ́]dɨ́	'faeces'	*pɔ́ŋ[ɨ́]lɨ́	'money'
*nɨ́m[ɨ́]dɨ́	'meat'	*tán[ɨ́]dɨ′	'mud'	*báŋ[ɨ́]dá	'intelligent person'
*gɔ́m[ɨ́]dɨ́	'cotton'	*nɨ́n[ɨ́]tɔ́rɨ́	'saliva'	*báŋ[ɨ́]lɨ́	'kind of leaf'
námdá	'sandal'	bíndɨ́	'faeces'	pɔ́ŋlɨ́	'money'
nɨ́mdɨ́	'meat'	tándɨ́	'mud'	báŋdá	'intelligent person'
gɔ́mdɨ́	'cotton'	nɨ́ntɔ́rɨ́	'saliva'	báŋlɨ́	'kind of leaf'

In Zun, epenthesis occurs internally after the velar fricative [ɣ] due to the fact that it only surfaces in intervolic as a variant of velar stop /g/. A similar case is possible in the major dialects after the glottal stop /ʔ/, which is also a variant of /g/.

(4.54) epenthesis of [ɨ] after [ɣ] in Zun

dág-ɾɨ́	→	dáɣ[ɨ]ɾɨ́	*dáɣɾɨ́	'dirt'
pág-bá	→	páɣ[ɨ]bá	*páɣbá	'women'
zàg-sɨ́	→	zàɣ[ɨ]sɨ́	*zàɣsɨ́ '	refuse'
mɔ̀g-lɨ́	→	mɔ̀ɣ[ɨ]lɨ́	* mɔ̀ɣlɨ́	'river'
sóg-ló	→	sóɣ[ɨ]ló	*sóɣló	'patience'
bɔ̀g-lɨ́	→	bɔ̀ɣ[ɨ]lɨ́	*bɔ̀ɣlɨ́	'lion'

The major dialects allow the epenthesis of /i/ after the labial stop /b/ as illustrated below:

(4.55) epenthesis of [ɨ] after /b/ in Naya

kɔ́b-gá	→	kɔ́b[ɨ]gá	'hundread
bìdɨ́b-gá	→	bìdɨ́b[ɨ]gá	'boy.
dáb-sá	→	dáb[ɨ]sá	'days'
kɔ́b-lɨ́	→	kɔ́b[ɨ]lɨ́	'bone'
tɨ́b-lɨ́	→	tɨ́b[ɨ]lɨ́	'ear'
záb-rɨ́	→	záb[ɨ]ɾɨ́	'hair'

Across dialects, "Dagbanli permits vowel insertion to borrowed words at word-final. It is also worth noting that the vowels that are added in word final are restricted to /u/" (Inuah & Mahama, 2019:285) as in (4.56) and /i/ as in (4.57).

(4.56) /u/ epenthesis in loan words AD

paip	→	pá:.pú	'pipe'
kʌp	→	ká.pó	'cup'
te:bl	→	té:.bú.lú	'table'
tu:b	→	tù.pú	tube
kɔ:t	→	kó:.tú	court

(4.57) /i/ epenthesis in loan words AD

ʧu:z	→	tú:.sí	'choose'
lait	→	lá:.tí	'light'
ka:d	→	ká:.ɾí	'party'
ʧɜ:ʧ	→	ʧó:.ʧĩ	'church'
ple:t	→	plé:ti	'plate

As seen in (4.56) and (4.57), notice that the epenthesis of /i/ and /u/ in Dagbanli loanwords are not to satisfy phonotactic constraints but for perceptual similarities between the source language (English) and the target language (Dagbanli). One concludes here that in Dagbanli and its dialects, epenthesis occurs to break consonant clusters when the cluster occurs in both onset and coda position.

The data presented in Dagbanli and its dialects support fortition processes in the language. It shows that fortition processes in Dagbanli tend to occur frequently in the domain of word-initial position and sometimes word-medial. I suggest that the word-initial position has the high frequency for fortition processes to occur in Dagbanli and its dialects, thus supports Kenstowicz's (1994) idea of word-initial being the typical position for fortition. I also argue that devoicing and epenthesis additionally explains the four observed types of fortition in Dagbanli and its dialects. Stopping and germination as described in previous studies are the other two fortion processes in the language.

4.3 Harmony

Harmony which is a phonological assimilation "encompasses consonant harmony, vowel harmony, and vowel-consonant harmony. This can be construed in one or two ways in which two segments may interact at a 'distance harmony' across one unaffected segment or a 'continuous harmony' in which string of segments may be involved assimilation" (Rose and Walker 2011:241). These are illustrated in (4.58a-b).

(4.58) Segments interaction in harmony (Rose and Walker 2011:241)
a. "Distance Harmony (consonant harmony)" "Cx Vy Cz → Cz Vy Cz"
b. "Continuous Harmony (vowel-consonant harmony)" " Cx Vy Cz → Cz Vz Cz"

The examples in (4.58) show how segments interact in harmony systems. "Vowel harmony can operate at a distance depending on how one construes intervening consonants or vowels that are apparently unaffected by the assimilation while vowel-consonant harmony can operate at a distance, skipping over some segments" as noted by (Rose and Walker 2011:241).

The focus of this discussion is vowel harmony among others. Archangeli and Pulleyblank (2007:354) notes that "the most commonly observed pattern in phonological systems is that two or more segments must resemble each other with respect to some feature(s)" and there are two ways this can account for harmony which pattern is canonical: (i) "literally, all segments within a word must show agreement for the harmonic feature" as in (4.59a) and (ii) "all vowels within a word must show agreement for the harmonic feature" as seen in (4.59b):

(4.59) Canonical harmony (Archangeli and Pulleyblank 2007:354)
a. [X_F X_F X_F . . . X_F]
b. [V_F . . .V_F . . . V_F . . . V_F]

In (4.59a), it is shown that in a harmonic domain, all segments within a word agree for a particular harmonic feature while that of (4.59b) shows that within the same linguistic environment, only the vowels agree for the same harmonic features. The symbol {X} represents all segments, {V} represents vowel segments and {$_F$} represents harmonic features.

Dagbanli is one of the languages that exhibits canonical harmony illustrated in (4.59b) where nine surface vowels fall into two tongue root categories: (i) advanced tongue root [+ATR] /i, e, o, u/ and (ii) retracted tongue root [-ATR] [ɨ, ɛ, ʊ, ɔ, a] and within a word, all the vowels belong to a single category. Olawsky (1999) describes the [-ATR] set [ɨ, ɛ, ʊ, ɔ, a] as allophones of the [+ATR] counterparts /i, e, u, o,], this Hudu (2014b, 2016) observes that the two sets of [+ATR] vowels / i, e, o, u / and [-ATR] vowels [ɨ, ɛ, ʊ, ɔ, a] do not usually occur together in the same word noting that [+ATR] variants surface in CV words where [-ATR] vowels never occur while [-ATR] vowels surface in CVC words and all non-final positions outside harmonic context where their [+ATR] variants do not also occur, this is illustrated below:

(4.60)

[+ATR]		[-ATR]	
CV stem	Gloss	CVC stem	Gloss
[tí]$_{root}$ [-hì]$_{suffix}$	'tree-pl'	[tɨm]$_{root}$ [-sá]$_{suffix}$	'heavy'
[tú]$_{root}$ [-ɾì]$_{suffix}$	'insults'	[jʊ́ɾ]$_{root}$ [-lɨ́m]$_{suufix}$	'love'
[té]$_{root}$ [-lî]$_{suffix}$	'filter it'	[tɛ́m]$_{root}$ [-lɨ̂]$_{suffix}$	filter it'
[kò]$_{root}$ [-ɾê]$_{suffix}$	'desire'	[dɔ́ɾ]$_{root}$ [-tɨ́]$_{suffix}$	disease-pl'
		[gbá]$_{root}$ [-lɨ́]$_{suffix}$	'leg'

The standard analysis of this case in Dagbanli in terms of vowel-to-vowel harmony agrees with the canonical harmony illustrated in (4.58b) and this supports Murray (1996) idea that "vowel harmony is a phonological process where all the vowels in a word are selected either from set I vowels or from set II vowels that are incompatible with each other". The following section examines vowel harmony in Dagbanli dialects focusing on harmony for backness, rounding, height, and complete.

4.1.1 Vowel harmony

"A phenomenon of vowel harmony is the restriction on the distribution of vowels which involves a relation between non adjacent segments." Rose and Walker (2011:246) refer to vowel harmony as assimilations among vowels that may be separated by consonants and its domain is typically within a word and that harmony can operate in a leftward (regressive) or rightward (progressive) direction, or bi-directionally.

I argue that harmonic processes in Dagbanli and its dialects occur bi-directionally indicating evidence of both progressive and regressive processes. The progressive process spreads from stems to suffix and the regressive process spreads from suffix to stem. In Akan (Kwa language spoken in Ghana), progressive harmony spreads from stem to suffix while regressive propagates from verb stem to affix. In this section, I discuss vowel harmony in Dagbanli dialects focusing on harmony for [ATR] and hight, rounding, backness, and complete.

4.3.2 Harmonic Features

Rose and Walker (2011:247) notes that "vowel harmony typically occurs within a word or smaller domain and indicates that assimilations are observed for individual features such as backness, rounding, height, and tongue root advancement /retraction, as well as harmony for all vowel place features". It is noted that "vowel place is used as a cover term to refer to features that are typically classified as vocalic, that is, ones applicable to backness, rounding, height and tongue root posture." It is established from literature that Dagbanli and other Ghanaian

languages (e.g., Akan) make use of the contrast found between [+ATR] and [-ATR] and [round] as the features for describing vowel harmony within the domain of the phonological word.

Archangel & Pulleyblank (2007:356) mention that "voicing exhibit harmonic behaviour and it is assumed that the common case where all vowels are voiced is due to vowels typically being voiced." Rose and Walker (2011) identify rounding, backness, tongue root advancement, nasality, etc. as 'harmonic' features and note that "while features like [sonorant] and [consonantal] may not exhibit assimilatory properties, place features like [labial], [coronal], and [dorsal] may not (often) exhibit harmonic properties of either the local spreading or long-distance varieties."

In this thesis, I aim at placing vowel harmony in a larger phonological context to determine what features might be specific to vowel harmony in each of the Dagbanli dialects. With respect to the class of harmonic features, evidence suggests that there is differential behaviour of features in the dialects as the properties of those features and their interactions are not specific to some of the dialects.

4.3.3 Conditions on Harmonic Elements

Archangeli and Pulleyblank (2007:356) state, "deviation from the canonical harmony pattern occurs when either the targeted element or the triggering element is somehow restricted". This section examines the limitations placed specifically on the target and trigger in vowel harmony. Triggers are the segments that cause harmony while targets are the segments that undergo harmony.

It is established in literature that Dagbanli has the following harmonic patterns: [+ATR] harmony (only restricted to vowels and intervocalic consonants

that occur in morphological constituents), back harmony (which affects all vowels), round harmony (restricted to high vowel targets) and complete harmony (restricted to vowels separated by not more than a laryngeal segment). It is observed that a root /i/ (the only lexically contrastive [+ATR] vowel in Dagbanli) triggers [+ATR] targeting vowels in all other constituents. A detailed account of /i/ as the only contrastive [+ATR] vowel in Dagbanli is given in Hudu (2010).

Dagbanli like other languages has both high and low round vowels, so it is necessary that "harmony must restrict the targets to only those segments that actually undergo the harmony". Archangeli and Pulleyblank (2007) explains that "the restriction to high vowel targets is common cross-linguistically stating that in a survey of round harmony systems, Kaun (1995) reports that imposing conditions on triggers and/or targets of round harmony systems is more common than the absence of such conditions".

Hudu (2014b) observes that in Dagabni, "a root vowel may trigger harmony targeting vowels in non-lexical morphemes and vice versa. A vowel of one lexical root is not a target of harmony triggered by a vowel of another lexical root, as harmonic feature spreading does not cross the boundaries of two lexical roots." Example (4.61) illustrate a case of inherent conditions in which "[+ATR] harmony is triggered by high vowels, where lexically, only high vowels contrast for [ATR]; also, it is seen that [-ATR] harmony is triggered only by non-high vowels, where high vowels are retracted". "There are also cases where the conditions must be overtly stated because the set of triggers is a subset of the segments carrying the harmonic feature" (Archangeli and Pulleyblank 2007).

4.3.4 Domain of Harmony

Harmony is described to be delimited by its domain of application and refers to the maximal constituent to which harmony is confined (Rose and Walker 2011). The domain of harmony is restricted in some way, whether phonologically or morphologically. Phonologically, harmony can be restricted to apply within the domain of syllable (Archangeli and Pulleyblank 2007; Rose and Walker 2011).

Odden (1994) observes that harmony operating between adjacent syllables is common and notes that in vowel harmony, syllable adjacency is difficult to tease apart from blocking and non-interactivity. Morphologically, a standard domain of harmony is the word in which harmony applies across internal morpheme boundaries. The "word" may correspond to the morphological notion of word, or be described as the "phonological word," a prosodic constituent, if clitics are included. It is noted that vowel harmony is often used as a diagnostic for determining word boundaries (Bauer 2003; Rose and Walker 2011).

It is attested in Dagbanli and its related dialects that the domain of harmony is the phonological word (Dakubu 1997; Olawsky 1999, 2002; Hudu 2010, 2013, 2014b, 2016). Dakubu (1997) observes that the phonological word in Central Mabia languages typically consists of two morphological units: (i) a thematic CV syllable which has a full range of articulatory contrasts and (ii) a mono/bi-syllabic suffix which has restricted vowels and consonants. Olawsky (2002) notes that the phonological word in Dagbanli is usually composed of smaller prosodic units such as feet, syllables or moras, which in turn are built from combinations of segments. Hudu (2014b) states that Dagbanli words can be classified into three major forms: simplex, complex and compound words. The simplex word consists of only one

lexical root for instance, verbs in Dagbanli are mostly short in a CV syllable form without a coda or CVC syllable root with a coda in the infinitive form and does not require an affix.

However, the underlying phonological feature composition of a nominal /adjectival root appears in complex words, which consist of more than one lexical root inflected with only one number suffix as presented in (4.61) below:

(4.61) Complex words (Noun + Adjective)

Simplex (noun)	Simplex (adjective)	Complex	Gloss
tú-á ‘baobab’	kʊɾ-lɨ ‘old’	tu-kʊɾ-lɨ	‘old baobab’
ʃĭ-á ‘bee’	pal-o ‘new’	ʃɨ-pal-o	‘new bee’
mì-á ‘rope’	ji-a ‘shirt’	mi-ji-a	‘short rope’
tí-á ‘tree’	bɨl-a ‘small’	tɨ- bɨl-a	‘small tree’
bí-á ‘child’	vʲɛ-lɨ ‘nice	bɨ-vʲɛ-lɨ	‘nice child’
sú-á ‘knife’	sabi-lɨ ‘black’	su- sabi-lɨ	‘black knife’
sú-á ‘knife’	sabi-lɨ ‘black’	*su-a- sabi-lɨ	‘black knife’

The data in (4.61) show the distinction between simplex nouns and adjectives in the singular forms and complex nouns consisting of only two lexical roots. The asymmetry between roots and affixes in terms of vowel distribution is obvious for Dagbanli and other Mabia languages such as Konni (Cahill 2007). “In addition to the root and suffix, the harmonic domain in Dagbanli also includes pronominal and locative clitics” Hudu (2010:161). He mentions that the only constituent that is obligatory is the lexical root, for typical nouns and adjectives, a bound root and a number suffix is what is minimally required for harmony to take place. For verbs, constituents that form part of the harmonic domain are the free root, aspectual suffixes and post-verbal locativeand pronominal clitics. These constituents are shown in (4.62).

(4.62) The Domain of harmony (Hudu 2010:162)

"[[[root] number, aspect, derivational] affix pronouns, locative]$_{clitic}$"

"It is noted that the domain of [+ATR] harmony is only restricted to vowels and intervocalic consonants that occur in these morphological constituents. Word-initial and word-final consonants are not part of the [+ATR] domain in Dagbanli. While the vowels are harmonic triggers and targets of [+ATR], intervocalic consonants are only non-harmonic targets" (Hudu 2010:162).

4.3.5 Harmony Patterns

Rose and Walker (2011) identify the following as harmonic patterns: Consonant harmony (assimilation between consonants), Local vowel-consonant harmony (involves vowels and consonants triggered by either), non-local vowel-consonant harmony (relatively rare) and Vowel harmony (assimilations among vowels). In this section, I discuss vowel harmony in Dagbanli and its dialects. Vowel harmony typically occurs within a word or smaller domain and it is described as assimilations among vowels in which the assimilating vowels may be separated by consonants observed for individual features and for feature clusters. Harmony for height, rounding, backness, and complete are the vowel harmony processes that operates cross dialectal.

4.3.5.1 Height Harmonic Pattern

Cross-linguistic studies dealing with height harmony in Dagbanli include Dakubu (1997); Olawsky (1999); Hudu (2010, 2012, 2013, 2014b) observe that vowel harmony in Dagbanli relates to how the sets of [+ATR] vowels and [-ATR] vowels

do not usually occur together in the same phonological word. In Dagbanli and its related dialect, it is attested that two broad patterns of height harmony have been observed in previous research (Hudu 2010, 2012, 2013). [ATR] harmony in Dagbanli can operate in a leftward (regressive) or rightward (progressive) direction. The first one which is a progressive pattern of harmony is triggered by a high vowel /i/ and targets high [-ATR] vowels that surface in suffixes, enclitics or as epenthetic vowels. The second one which is a regressive pattern is triggered by the mid vowels /e, o/ and targets non-high root vowels (Hudu 2014b).

In these processes, the spreading in each pattern is described to be bounded by the limit of a stem morpheme and adjacent suffixes or clitics. It is noted that a vowel of one lexical root is not a target of harmony triggered by a vowel of another lexical root since harmonic feature spreading does not cross the boundaries of two lexical roots. The data in (4.63) illustrates progressive pattern of harmony that show word pairs with the same suffixes or epenthetic vowels; the non-root vowels are always [-ATR] except when the root vowel is /i/.

(4.63) /i/ as trigger of left-to-right [+ATR] harmony (Hudu 2014b:18)

Root-to-affix harmony		**[-ATR] roots**	
[pín]$_{root}$ [-î]$_{suffix}$	'gift.'	[biɲ́]$_{root}$ [-ɨ́]$_{suffix}$	'thing'
[díʔ]$_{root}$ [-í]$_{suffix}$	'mirror'	[dʊ́ʔ]$_{root}$ [-ɨ́]$_{suffix}$	'cook'
[tí]$_{root}$ [-bû]$_{suffix}$	'vomiting'	[dá]$_{root}$ [-bô]$_{suffix}$	'buying'
[dí-h[í]]$_{root}$ [-bû]$_{suffix}$	'feeding'	[dɔ́l[ɨ́]]$_{root}$[-bô]$_{suffiz}$	'following'
[jìh]$_{root}$ [-ì]$_{suffix}$	'jittery'	[gbáh]$_{root}$ [ɨ´]$_{suffix}$	'catched'
[píh[í]]$_{root}$ [g[î]]$_{suffix}$	'postpone'	[pɔ́h[ɨ́]]$_{root}$ [gɨ́]$_{suffix}$	'plucked'
[jíʔ]$_{root}$ [[í]]$_{suffix}$	'jump'	[jáʔ]$_{root}$ [[ɨ´]]$_{suffix}$	'jumping'

The data in (4.64) illustrates regressive pattern triggered by mid vowels [e, o] and targeting non-high root vowels. The final mid vowel is preceded by one or more mid

vowels in the harmonic domain surfacing as [+ATR] to show a right-to-left spread of the feature [+ATR] with the final mid vowel as trigger.

(4.64) Right-to-left harmony with [o] as trigger (Hudu 2016)

suffix-to-root harmony		**[-ATR] roots**	
[dóɾ]$_{root}$ [-ó]$_{suffix}$	'disease'	[dɔ́ɾ]$_{root}$ [-tɨ́]$_{suffix}$	'diseases'
[mòl]$_{root}$ [-ô]$_{suffix}$	'announcement'	[mɔ́l]$_{root}$ [-ɪ̂]$_{suffix}$	'announce'
[dèm]$_{root}$ [-ó]$_{suffix}$	'play with him.'	[dɛ́m]$_{root}$ [-á]$_{suffix}$	'plays'
[ʧ̀òɾ]$_{root}$ [-ê]$_{suffix}$	'blow'	[ʧ̀ɔ́ɾ]$_{root}$ [-tɨ̂]$_{suffix}$	'blows'
[bé]$_{root}$ [-ê]$_{suffix}$	'shin'	[bɛ́]$_{root}$ [-hɨ̂]$_{suffix}$	'shins'
[kòɾ]$_{root}$ [-ê]$_{suffix}$	'desire'	[kɔ̀ɾ]$_{root}$ [-sɨ̂]$_{suffix}$	'desires'

A major observation is that the suffixed mid vowels target preceding low vowels and change them into [+ATR]. The data in (4.65) illustrate this idea.

(4.65) Advanced low vowel before domain-final mid vowel (Hudu 2014, 2016)

	UR [-ATR] forms		**[+ATR] harmony**	
a.	pál-lɨ́	'new-sg.'	pa̱l-ó	'new-pl.anim.'
b.	kál-tɨ́	'enamel ware-pl.'	ka̱l-ó	'enamel ware-sg.'
c.	dà-má	'buy-imper.'	da̱-ó	'buy it.anim.'
d.	bálɪ̂	'ride it.inanim.'	ba̱-ô	'ride it.anim.'
e.	gáɾ-tɨ́	'bed-pl.'	ga̱ɾ-ó	'bed-sg.'
f.	tàdáb-tɨ̂	'writing ink-pl.'	ta̱da̱b-ô	'writing ink-sg.'
g.	tàtáb-tɨ̂	'look-alike-pl.'	ta̱ta̱b-ô	'look-alike-sg.'

It is observed (Hudu 2014b, 2016) that Dagbanli has a pattern of harmony in which the root vowel agrees both in height with a suffix /i/. The suffix -i/-hi is the trigger of harmony and targets an underlying non-high or [-ATR] root vowel.

(4.66) Plural nominal suffix as trigger in [+high] harmony patterns

Root	singular	plural	
kpá:n-	kpán-gá	kpín-î	'guinea fowl'
wàɾ-	wàh-ʊ́	jùɾ-î	'horse'
náʔ-	náh-ʊ́	níʔ-î	'cow'
ká-	ká-hɪ́	ʧ̀î	'guinea corn'
bɨ̀l-	bɨ́l-á	bí-hí	'small

The pattern presented in (4.66) suggests that the suffix /i/ changes root ([+low]), [-ATR] vowels into [+high, +ATR] and this may result into a complete neutralisation with the suffix vowel.

It is a fact that the low vowel is subject to some restrictions in harmonic contexts so the opacity of the low vowel to harmony triggered by a high vowel fails harmonic process. The data in (4.67) show that the spread of [+ATR] from a root /i/ to a suffix /a/ fails given evidence that final mid vowels do trigger harmony onto root /a/. Hudu (2010) argues that the pattern in (4.67) is part of a broader restriction on the height specification of a trigger and target within a harmonic domain.

(4.67) Low vowel as non-targets of [ATR]

a.	pí-â	*[píâ]	'bury you'
b.	bí-á	*[bíá]	'child-sg.'
c.	tìbá	*[tì bá]	'give them'
d.	dìm-á	*[dìmá]	'eat-imper.'
e.	kpím-á	*[kpímá]	'dead person-sg.'
f.	vìh á	*[vìhá]	'investigate you'
g.	kpìh[ì]-má	*[kpìhì-máffi]	'put off-imper.'

The fact that height harmony resulting in [-high] vowels surfacing as [+high] is not observed anywhere else in the phonology of Dagbanli (see Hudu 2010, 2014b, 2016).

The data in (4.63–4.67), which illustrate the height harmonic pattern in Dagbanli, present some level of dialectal variations based on the different ways in which the height harmony process operates in the dialects. The data show evidence that [+ATR] harmony is frequent in the speech of Tomo (e.g. díní 'knee') while the [-ATR] harmony is frequent in Naya and Nan dialects (e.g. doni 'knee').

4.3.5.2 Round harmony

Across dialects, survey of round harmony in Dagbanli and its dialects is found in Hudu (2010, 2013, 2014b) who provides examples of round harmony occurrence in Dagbanli but not across dialects. Cross dialectally, Dagbanli rounding harmony manifests in reduplicated as well as non-reduplicated forms. The reduplicated forms are root-controlled process regressively targeting vowels in a reduplicant prefix and the vowel of a fixed syllable as presented in (4.68) and (4.69) in which the reduplicants are bolded and the fixed syllabus are put in italics in (4.69). In all the dialects, round harmony occurs among non-high vowels producing suffixal alternations between o/ʊ or a/ɨ but high round vowels are observed not to trigger round harmony.

(4.68) Rounding harmony (Hudu 2014b:22)

a.	kpɨl-lɨ	'round'	**kp**ɨ-kpɨl-lɨ	'portably round'
b.	kpàn-gá	'wing'	**kpɨŋm**-kpàŋ	'(mature) wing'
c.	bɔ̀n-gá `	'darkness'	**b**ɔ̀ -bɔ̀ŋ	'extreme darkness
d.	pɔ̀ngó	'now'	**p**ɔ̀**m**-pó-ŋó	'right now'

(4.69) Rounding harmony (Hudu 2014:22)

a.	**p**ɔ̀**m**-pɔ̀ŋ-ʃʃɨ-hɨ̀	'strychnos fruit-pl'
b.	**d**ɔ̀**n**-dɔ̀ŋ	'court yard'
c.	**kp**ɨ́-*lɨ́n*-kpɨ́-hɨ́	'epilepsy'
d.	**sá**-*lɨn*-sá-hɨ́	'tiny ant-pl.'
e.	**p**ɔ̀-*lɔ̀m*-pɔ́ŋ	'Sterculia Tomentosa'
f.	**k**ɔ̀-*lɔ̀ŋ*-kɔ́-hɨ́	'beetle-like insect-pl.'

The difference between the data in (4.68) and the one in (4.69) is that the data in (4.69) lack synchronic non-reduplicated forms. The data in (4.68) and (4.69) show rounding harmony in which the reduplicant vowel and the vowel of the fixed syllable are underlyingly /ɨ/ as seen in (4.69a-b) and (4.69c-d) where the roots lack round

vowels. In the rest of the data, the reduplicant and all preceding vowels surface as [ʊ] to justify that the root has [o] or [ʊ]. It is observed that in non-reduplicated forms, domain-final [o, ʊ] are the triggers targeting a root or epenthetic [ɨ].

(4.70) Rounding harmony in Naya

a.	tóm-ô	'messenger-sg.'	cf.	tɨm	'send'
b.	zón-ô	'stranger-sg.'	cf.	zɨŋ	'alienate'
c.	té:n lóɾô	'thick beard'	cf.	lɨɾɨm	'to mess up'
d.	sóm-ô	'bosom friend-sg.'	cf.	sɨm-nɨmá	'friend-pl.'
e.	báh[ó]-gó	'adder-sg.'	cf.	báh[ɨ]-sɨ	'adder-pl.'
f.	bɨlkɔ̀ʔ[ó]-nô	'villain-sg.'	cf.	bɨlkɔʔ[ɨ]n-sɨ	'villainy'

It is noteworthy from the data in (4.70) that words such *as tʊm-o, zʊn-o, lʊɾo* are derived from the verb roots *tɨm, zɨŋ,* and *lɨɾɨm* revealing that the underlying root is /ɨ/. In addition, it shows that the plural form of the noun *sʊm-o* has /ɨ/ as in *sɨm-nɨma* when there is no domain-final round vowel.

It is attested that the process of vowel harmony is blocked if the same vowel /ɨ/ that triggers rounding harmony surfaces in verb roots; this results in non-rounding harmony as seen below:

(4.71) Blocking rounding harmony

tɨm ó	*tʊm ó	'send him/her'
zɨŋ ó	*zʊŋ ó	'alienate him/her'
sɨŋ ó	*sʊŋ ó	'treat him/her with contempt'
dɨm ó	*dʊm ó	'bite him/her'
tɨɾ ó	*tʊɾ ó	'point at him
mɨɾɨ-bʊ	*mɨɾʊ-bʊ	'getting close'

The data show how rounding harmony is blocked. The process fails in the forms in (4.71) because there is a word boundary between the trigger and the target. As observed in rounding harmony in reduplicated forms and the non-reduplicated forms, in all cases where rounding harmony applies, the target vowels are located in

bound nominal roots reduplicant and fixed affixes, all of which are bound forms. The phrases *tɨm-o* 'send him' in (4.71a) and the noun *tʊm-o* in (4.71a) 'messenger' both have the same underlying segmental sequences (/tɨm o/). Also, *zɨŋ-o* in (4.71a) and *zʊn-o* in (4.71b) have (/zɨŋ o/) as their under-lying form but both *tɨm* and *zɨŋ* vowel is not a target of rounding harmony.

Rose and Walker (2011:242) state that "languages that show round harmony often also show harmony for another feature, hence a number of languages show both round harmony and backness harmony". The next section discusses backness harmony.

4.3.5.3 Backness harmony

Backness harmony occurs in Dagbanli when both triggers and targets are drawn from the set of back vowels. Dagbanli back and front vowel qualities are presented in (4.72), which maybe long or short except [ɛ].

(4.72) Dagbanli back and front vowels

	Front		Back
High	i	ɨ	u
			ʊ
Low	e		o
	ɛ		ɔ
		a	

Backness harmony in Dagbanli is a property of a phonological word, that is, it characterizes a whole word at a time and the distribution of the vowels makes it necessary for the vowels of only one set to occur in any given word. Vowels in a word in Dagbanli across dialects are alike in backness in which vowels from the

same set being drawn either from the set of front vowels (4.73) or back vowels (4.74) occur depending on the environment.

(4.73) words with a set of front vowels in Naya

a. lìhì ‘look’
b. tìhìm ‘sneeze’
c. pín-î ‘gift-sg.’
d. díʔ-í ‘mirror-sg.’
e. dí-hí-bû ‘feed-imperf.’
f. gbé-é ‘hoe’
g. dé-é ‘bush pig’

(4.74) words with a set of back vowels in Naya

a. zɔ́n-ô ‘stranger’
b. sɔ́m-ô ‘bosom friend-sg
c. tɔ́m-ó ‘messanger’
d. vɔ́ʔ-ɔ́ ‘leaf’
e. dɔ́ʔ-ɔ́ ‘stick’
f. kɔ̀ʔ-ɔ́ ‘antlop’
g. dɔ́ɾ-ó ‘disease-sg.’
h. mòl-ô ‘announcement-sg.’

Backness harmony in Dagbanli and its dialects produces alternations in suffix vowels, which take their cue from the backness of the preceding vowel, as shown in (4.75b-e). In Naya, within roots, there is a reason for one to postulate that backness harmony is progressive (harmonic features spread from root to suffix) in Dgabani. The evidence comes from epenthetic vowel in word-medial syllables; this vowel harmonizes with the vowel of the preceding syllable rather than the following one.

(4.75) Root-to-affix backness harmony

a.	tɔ́m-ô	‘messenger-sg.’	cf. tɨm	‘send’
b.	báh[ɔ́]-gɔ́	‘adder-sg.’	cf. báh[ɨ]-sɨ	‘adder-pl.’
c.	bɪ̀lkɔ̀ʔ[ɔ́]-nô	‘villain-sg.’	cf. bɨlkɔʔ[ɨ]n-sɨ	‘villainy’
d.	ɲɨ́nv[ɔ̀]-ʔô	“tootache.”	cf. ɲíní	‘tooth’
e.	tɨ́ɲj[ɔ̀]-ʔô	“far-village-sg.”	cf. tínsí	‘town-pl’

It is attested in Dagbanli (Hudu 2018) that two patterns of backness harmony occur in the language and both are triggered by the high central vowel /ɨ/ (cf4.75) and targeting only back vowels. The first pattern occurs as a result of back vowels losing their backness in harmony with a derivational suffix /ɨ/ as illustrated in (4.76), where the surface forms of the singular nouns on the left column result from nasal place assimilation and deletion of the final vowels.

(4.76) Back vowels harmonise with suffix /ɨ/ (Hudu 2018:225)

a.	/sʊ̀m-gá/	[sʷʊ̀ŋ́]	'good-sg	sʷʊ̀m-á	'good-pl.' sím-sî 'befit'
b.	/dʊ́m-gâ/	[dʷʊ́n̂]	'enmity-N'		dím-dî 'mutual enmity'
c.	/fɔ́n-gâ/	[fʷɔ́ŋ̂]	'neighbourhood-sg.'		fɪ́n-dî 'go in different directions'

The second pattern occurs as a result of back vowels surfacing as [ɨ] in grammaticalised forms in Nayahili, Nanunli, Jimansili and Zundunsili dialects as shown in (4.77). In the process, the roots are reduced to prefixes and again the loss of backness, onset dorsals also become labial-dorsals through labial insertion or spreading from the vowel.

(4.77) /u, ʊ/ reduction in grammaticalised forms in Nayahili (Hudu 2018:226)

a. kól-gá	'river-sg.'	/kʷʊ̀l-kpán-gá/	[kpɨ̀l-kpáŋ́á]	'river side'
b. kól-gá	'river-sg.'	/kʷʊ̀l-kpɪ́nî/	[kpɨ̀l-kpɪ́nî]	'a river in Yendi'
c. kól-gá	'river-sg.'	/kʷʊ̀l-ʤínî/	[kpɨ̀l-ʤínî]	'name of a village'
d. gʊ̀n-gá	'kapok tree-sg.'	/gʷʊ̀n-tíŋlî/	[gbɨ̀n-tíŋlî]	'down a kapok tree'
e. dù-ú	'room-sg.'	/dʷʊ̀-kpín-ɨ́/	[dɨ̀-kpɪ́n-ɨ́]	'wall of a room"
f. zʊ́g-gô	'head-sg.'	/zʷʊ́ʔ píl-gʊ́/	[zɪ́pɪ́l-gʊ́]	'head cover-sg. (hat)'

In some context, words with underlying /ʊ/ preceeding dorsal consonant /k/ in Tomosili is pronounced as [ɨ] after labio-dorsal /kp/ or /gb/ in Nayahili, Nanunli and the other dialects except Gbanjonsili as illustrated in (4.78).

(4.78) labial-dorsal onsets with back vowels (Hudu 2018:230)

a.	kʷólʷóŋkʷó-ʔô	kpɨ́lɨ́ŋkpɨ́-ʔô	'hiccups'
b.	kʷòlkpár-gá	kpɨ̀lkpár-gá	'fairy, bush sprite
c.	kʷòkpál-gá	kpɨkpál-gá	'the fan palm'
d.	kʷòlɨ̀ŋgbʷólʷóŋ	kpɨ̀lɨ̀ŋgbɨ́lóŋ	driedleaves for healing'
e.	kpʷòŋkàŋá	kpɨ̀ ŋkpàŋá	forearm.sg.
f.	tɨkʷòblá:kʷóm	tɨkpɨ̀blá:kpɨ́m	'Cassia occidentalis.sg.'

4.3.5.4 Complete harmony

"Complete harmony is a situation in which some harmony systems show assimilation for all vowel quality features, often referred to as vowel copy harmony; in some systems, harmony that produces identical vowels operates across other segments" (Rose and Walker 2011:256). Vowel copy harmony occurs across coronal consonants in certain morphological contexts (Paradis and Prunet 1989). Steriade (1987) explains that "many patterns of this kind are restricted to vowels separated by no more than a laryngeal segment".

Halle (1995) explains that the formalism for assimilatory processes where articulator spread from one segment to other "accounts directly for the common phenomenon where all features of a vowel are spread to a preceding or following vowel without regard for the nature of the intervening consonant(s)". The notion is that a vowel is able to acquire the features of an adjacent vowel at a long distance across intervening consonants.

Tomosili and Gbanjonsili dialects exhibit vowel copy harmony across coronal and dorsal consonants in certain morphological contexts that produces vowel identity in native morphemes. In Tomosili and Gbanjonsili dialects of Dagbanli, several morphemes are spelled out as vowel suffixes whose quality is

identical with that of the stem vowel; among such morphemes are nominal suffix (encodes number along with other semantic properties) of noun/adjective and aspectual or transitivizing suffix of verbs. This is illustrated in (4.79).

(4.79) Complete harmony in Tomo and Gban dialects

a.	dóɾ-ó	'disease-sg.'	cf.	dɔ́ɾ-tɨ́	'disease-pl
b.	mòl-ô	'announcement-sg	cf.	mɔ́l-ɨ̂	'announce'
c.	zóʔ-ó	'head-sg'	cf.	zóʔ-ɾɨ́	'head-pl'
d.	dóʔ-ó	'pot-sg'	cf.	dʊʔ-ɾɨ́	'pot-pl'
e.	dáŋ-á	'wound-sg'	cf.	dán-sɨ́	'wound-pl'
f.	láŋ-á	'net-sg'	cf.	lán-sɨ́	'net-pl'

Notice from the data in (4.79) that all the words have /ɨ/ in the plural suffix revealing that the underlying form of the target (suffix) vowel before complete harmony takes place is /ɨ/. This shows that that the vowels in the root spread freely across intervening consonants as seen in the data.

Nayahali dialect exhibit vowel copy where the mid vowel /o/ in the root surfaces as [o] as in (4.80) and this process is similar in Nanunli, Jimansili, and Zundusili dialects. This process is in Tomosili shows that the underlying form is /a/ which occurs in the root (eg. sákól-o 'fufu', sál-ô 'crowd') the feature [+back] is maintained.

(4.80) Complete harmony in Nayahili

a.	sòkól-ô	'fufu'	cf. sákól-ó
b.	sól-ô	'crowd'	cf. sál-ô
c.	gór-ó	'bed'	cf. gáɾ-ó
d.	pòl-ó	'plot'	cf. pál-ó
e.	kól-ó	'enamel ware'	cf. kál-ó

Based on the data in (4.79) and (4.80), complete harmony in Dagbanli and its dialects appears to depend on morphology in which the root segments serve as

triggers while the suffix segments serve as targets across intervening consonants. The spread of the vowel in harmonic direction defined as root-to-suffix which exhibit left-to-right harmony restricting the triggers to the root vowels which results in a vowel copy also suggests that complete harmony in Dagbanli is progressive.

4.4 Summary of the Chapter

The chapter sought to demonstrate how a variety of phonological processes affect the surface realisations of Dagbanli segments across dialects. It has attempted to synthesize and elucidate the main contributions of recent research into assimilation systems and harmony systems among others. There has been considerable progress made over the study of assimilation and harmony in Dagbanli with different themes and theoretical approaches. Within the limits that this chapter affords, I have discussed certain phonological processes that are characteristics of the Dagbanli dialects and account for the phonological processes which reveal the differences in the distribution of consonants and vowels between the dialects.

In local assimilation of place assimilation, I have argued that while places assimilation in other languages (e.g., Akan) occurs between a stem and a prefix, in Dagbanli and its dialects, it occurs between a stem and a suffix (e.g.$[sɪŋ]_{stem}$ + $[á]_{suffix/}$ → /sɪŋ-á/ ‘pot’). It is also noticed that Nanunli and Jimansili dialects exhibit places assimilation of stem and prenasal prefix in some CV lexical verbs (e.g. $[m]_{prefix}$ + $[bá]_{stem}$ → / mbá/ ‘ride.sg’), which across dialects, it is a phrase structure (e.g., /m-bá/ ‘my father’). The difference is a result of tone. It is demonstrated that place assimilation occurs before plural forms (e.g. $[sɪŋ]_{stem}$ + $[sí]_{suffix/}$ → /sín-sí/

'pot.pl') across boundaries in Dagbanli across dialects and this contradicts Hawkin's (1992) observation that nasal assimilation occurs across so many boundaries in English but does not occur before plural forms. This shows that Hawkins observation is a fact that may be attributed to language specific.

The process of place assimilation is block before labial /m/ and dorsal /ŋ/ nasal consonants when the suffix /-di/ is attached to a verbal root (e.g. [tʊ̀m]$_{root}$ + [di]$_{suffix}$→/tʊ̀m-dɨ́/ 'work.imperf'; [nɪ̀ŋ]$_{root}$ + [di]$_{suffix}$ → /nɪ̀ŋ-dɨ́/'do.imperf'). This is an interesting case for verbs which end in the nasal consonants /m/ or /ŋ/; the suffixation of /-di/ to monosyllabic verbs ending in /m/ does not cause any changes in realisation.

On the other hand, the final /m/ of disyllabic verbs undergoes nasal place assimilation and it is realised as coronal [n] before the same suffix /-di/ in word-internal assimilation (e.g. [bɔ̀hɪ̀m]$_{stem}$ + [di]$_{suffix}$ → /bɔ̀hɪ̀n-dɨ/ 'learn.imperf) in Tomosil and Gbanjonsili dialects and (e.g. [bɔ̀hɪ̀m]$_{stem}$ + [di]$_{suffix}$ → /bàhɪ̀n-dá/ 'learn.imperf) in Nayahili and the rest of the dialects where the suffix high vowel /ɨ/ changes to non-high [a] due to dialectal variations.

Other phonological processes I discuss were the patterns of lenition and fortition as non-assimilation processes that show a straightforward relationship between sound changes and dialect differences. The lenition processes discussed in Dagbanli include degemination in Nayahili (e.g. /bɔ́g-gʊ́/ → [bɔ́ʔ-ʊ́] 'arm-sg'), debuccalisation in Tomosili and Gbanjonsili dialects (e.g. /pí-**sí**-tá/ →[pí-**hí**-tá] 'thirty' and spirantisation in Gbanjonsili (e.g. /dini/→ [ʧɪ̃nɪ̃] 'knee'). I have argued that fortition processes observed in Dagbanli is more frequent in word-initial and this include: stopping in Nanunli and Jimansili dialects (/zo/ → [ʤo] 'friend'),

geminate in Nayahili (e.g./làb[ɨ]/→[láb-bô] 'return-nom.'), devoicing in Zundusili dialect (e.g./dɪfɛlɨ/→[tɪfɛlɨ] 'pillow') and Jimansili (e.g. /dɪfɛlɨ/→[kʊfɛlɨ]'pillow') and vowel epenthesis in all the dialects (e.g. /namd-/$_{root}$ → námd[ɨ]-lɨ́ 'sandal').

The second goal of this chapter addressed the current issues in phonological processes that sought to explain the domain for harmony system in Dagbanli and focused on harmonic features for height, rounding, backness, and complete/vowel copy. It is attested that the domain of vowel harmony is the phonological word and noted that harmonic processes in Dagbanli and its related dialects occur bi-directionally indicating evidence of both progressive and regressive processes. The progressive process spreads from stems to suffixes while regressive process spreads from suffixes to stems.

I argued that complete harmony in Dagbanli and its dialects depends on morphology where the root segments serve as triggers while the suffix segments serve as targets across consonants. The spread of the vowel in harmonic direction is described as root-to-suffix which exhibit left-to-right harmony restricting the triggers to the root vowels which results in a vowel copy suggesting that complete harmony in Dagbanli is progressive.

CHAPTER FIVE

SUPRASEGMENTAL PHENOMENA

5.1 Introduction

Hitherto, it is attested that consonants and vowels form the basic units or segments on which speech is based. These segments are, in turn, grouped together to form syllables, words and sentences, but referring to syllables and words as combinations of speech sounds is slightly oversimplified. This is because the segments have certain inherent suprasegmental or prosodic properties that form part of their makeup and the features may be superimposed on each segment within the syllable or word. These properties include pitch, length and stress, which are often referred to as prosodic features or suprasegmentals.

Dagbanli is one of the many languages that have long and short vowels that may change the meaning of a given word all together. This is shown in (5.1) where the differences in the pairs of words come from the different durations of the vowels. Notice that some of the examples show in addition to length, other contrasts. For example, (5.1d-e) have tonal difference while (5.1f-g) have in addition to tonal differences, vowel quality difference. In such instances, it is not clear what is responsible for the meaning difference.

(5.1) Contrast involving vowels length in Dagbanli

a.	mí-bû	'raining'	mí:-bû	'becoming sour'
b.	pì-já	'buried'	pì:-já	'choose-perf.'
c.	báŋá	'bangle'	bá:ŋ-á	'praise singer-sg.'
d.	mànɨ́	'me'	má:n-í	'okra-sg'
e.	té	'filter'	fè:	'scarce'
f.	kpɛ́-bô	'entering'	kpé:-bû	'boiling'
g.	tòlɨ	'hot'	tù:lí	'first'

Dagbanli also shows short and long consonants in pairs of words such as those shown in (5.2). Long and short consonants are also found in many other languages, including Italian, Finnish, Turkish and Hungarian. Some long consonants (or vowels) may be analyzed as double consonants (or vowels), which is referred to as geminates. Geminates usually occur when a word ending in one segment is pronounced as with another word beginning with an identical sound segment.

(5.2) Contrast involving consonant length in Dagbanli

jɛ́l	'talk'	jɛ́l-lɨ́'	'issue'
làb	'throw'	láb-bô	'return-nom'
kɔ̀b	'infect'	kɔ́b-bô	'infect-nom'
fɛ̀b	'whip'	fɛ́b-bô	'whip-nom'
kpíl	'seed'	kpíl-lɨ́	'fruit'

All sounds give us a subjective impression of being relatively higher or lower in pitch. Pitch is the auditory property of a sound that enables us to place it on a scale that ranges from low to high. Pitch is a feature of only voiced sounds where the vocal folds vibrate. It is the vibration that gives sounds the pitch feature. If the vocal folds do not vibrate, pitch will not be realised. Pitch is especially noticeable in sonorant sounds which are vowels, glides, liquids and nasals because they are unique in the sense that they are all voiced. Even stop and fricative consonants convey different pitches. This is particularly noticeable among the voiced obstruents but not their voiceless counterparts: stops /b, d, g, gb/ are voiced and therefore give off pitch; their voiceless counterparts /p, t, k, kp/ are voiceless, and therefore do give off pitch. In the same vein, voiced fricatives /v, z, ʒ/ give pitch; but their voiceless counterparts do not: /f, s, ʃ/.

Stress is another suprasegmental feature of speech. It does not apply to individual sounds but to larger units, characteristically syllables and words. We say a syllable is stressed when it is pronounced with relatively greater amount of energy than the adjacent syllables. In the word *secure*, for example, the *cure* sounds more prominent than the *se*, therefore, the stress is said to be on *cure* (the second syllable of the word). It is noted that the perception of stress involves "increased duration, heightened pitch, or sometimes more subtle aspects of vowel or consonant quality" (Kenstowicz 1994:48). There is probably no doubt that a "stressed syllable is pronounced with a greater amount of energy than an unstressed syllable, which usually leads to an increase in loudness of a stressed syllable."

Olawsky (1999) was the first to claim that Dagbanli marks stress which is largely predictable in the language and notes that Dagbanli stress is correlated with a higher amplitude and longer duration; distinct from tone. On the contrary, (Hudu 2007) shows that the vowels which Olawsky described as stressed are neither longer in duration nor higher in intensity than vowels that are supposed to be unstressed. This assertion supports the widely held view among many linguists (e.g. Hudu 2010) that Dagbanli like other Mabia languages is not stress marking.

This chapter aims to discuss suprasegmental phonology of Dagbanli, which are non-segmental features that describe both isolated units and segments that occur in larger units such as phonological word, syllable structure and intonation. The discussion describes the syllable structure and the status of tone and intonation in Dagbanli. The properties of syllable structure and tone traditionally form a special category of suprasegmental features. Kenstowicz (1994:44) notes that "the autonomy of the suprasegmentals is reflected in the fact that orthographic systems

register their presence through diacritic marks or accents rather than with separate letters". This, Olawsky (1999) observes that Dagbanli does not use diacritics in its orthography, but it is necessary to make use of stress and tone in the phonological description. Stress notion in Dagbanli phonology has been established and proved that stress does not exist in the phonology of the language. The issue that remains unresolved is about mora-counting in the description of Dagbanli phonology.

The chapter is structured as follows. Section 5.2 provides the description of syllable structure distinguishing light syllables from those that are heavy. Section 5.3 describes prosodic structure. Section 5.4 introduces the status of tone and intonation in Dagbanli. The chapter is summarized in section 5.5.

5.2 Dagbanli Syllable Structure

As a second largest unit in the prosodic hierarchy, the syllable is difficult to define phonetically. Ladefoged (1993:243) states that "there is no agreed phonetic definition of a syllable. Although nearly everybody can identify syllables, almost nobody can define them." Zec (2007:163) notes that "the syllable is an organizing principle for grouping segments into sequences, thus, a representational device that encompasses principles of segment." For instance, the sequence of segments in the Dagbanli morpheme [sàlímà] 'story' can be completely broken into licit substrings of sounds, each dominated by a syllable.

(5.3)

Phonologically, there is no doubt that syllables are significant units for languages and the heart of phonological representation. In Dagbanli phonology, the syllable functions as a natural domain for the application of many phonotactic constraints as many phonological rules are expressed with reference to the syllable, this will be illustrated in the following sections. The distribution of sounds is based in large part on the notion of the syllable, an aspect which will become clearer further below.

The syllable is generally stated in terms of the consonants (C) and the vowels (V) that make it up and the processes affect the relative distribution of the consonants and the verbs within a word. For the description of syllable structure in Dagbanli, I adopt the concept of the syllable's internal structure by Kenstowicz (1994), which generally involves an obligatory *nucleus (N)* preceded by an optional consonant *onset (O)* and followed by an optional consonantal *coda (C).* Sequence of a nucleus, and a coda as a subconstituent is called *rhyme (R).* Thus, the syllable is represented as [$_{\text{Syllable}}$Onset[$_{\text{Rhyme}}$Nucleus/Coda]] as illustrated on Figure (5.1).

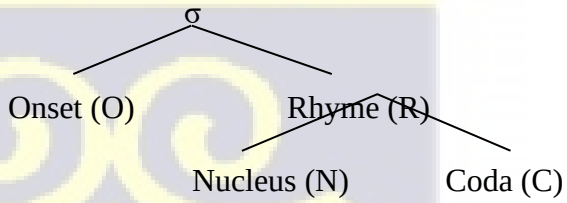


Figure 5.1: The structure of the syllable

In addition, one can distinguish between light and heavy syllables, depending on the units that make up the Rhyme, that is the nucleus and coda elements. It is generally assumed that CV is a light syllable and CVC where the coda is an obstruent is also light (bit). However, CVC where the coda is a sonorant may be a heavy syllable in

some languages; CV: and CVV are heavy syllables by virtue of the fact that they have a long vowel and a diphthong respectfully. A light syllable is monomoraic, but a heavy syllable is bimoraic. The mora is observed to be a constituent of the syllable intervening between the [σ] and the phoneme string.

Olawsky (1999) postulates that the moras do not play a role in the description of Dagbanli phonology citing two reasons: first mora is not perceived as a natural rhythmic unit in Dagbanli -a fact which he assumes holds for mora-counting languages like Japanese. Second, the organisation of phonemes in Dagbanli does not depend on moraic structure. I argue in this section that Olawsky's assumptions are not accurate for Dagbanli like other languages where weight-by-position applies to coda consonants so that both CVV and CVC with sonorant coda syllables are treated as heavy syllables, which hold for mora-counting. I also show that Dagbanli is a moraic structural dependent. The question whether Dagbanli is mora-counting or not will be discussed in this chapter on syllable quantity.

5.2.1 Basic Syllable Shapes

References to the term "syllable" have already been made earlier in this work. Zec (2007:163) notes that "under minimal assumptions, the principal subparts of the syllable are the nucleus and the two margins, the onset and the coda. The nucleus contains the most sonorous segment, where sonority is an abstract property of a segment." Segments typically occurring in the nucleus are represented as V and those typically in the margins as C. V does not necessarily refer to 'vowel'. In some languages, for example Dagbanli, the V slot can also be occupied by a nasal

consonant [N] (Inusah & Mahama 2019, Hudu & Nindow 2020). The typology of basic syllable inventories presented in (5.4) is attested across languages.

(5.4) Basic syllable shapes (Jakobson 1962)
a. CVC
b. CV
c. VC
d. V

In (5.4), the sequence in example (5.4a) corresponds to a syllable with all three principal subparts, (5.4b) contains only the onset and the nucleus, (5.4c) contains the nucleus and the coda and (5.4d) only the nucleus. "The CV syllable figures in all language-specific inventories, and has a special status as the least-marked syllable shape" (Zec 2007:164).

"The inventories of syllable shapes vary according to languages and a given inventory always corresponds to a possible language type. A syllable has to contain a nucleus, and this of course is also the property of all syllable shapes" as stated in Zec (2007) and elaborated in Inusah & Mahama (2019). Language types whose syllables have onsets but no codas are listed in (5.5). The onset is obligatory in (5.5a) as in Senufo (Kientz 1979) and optional in (5.5b) in Fijian (Hayes 1995) as described by Zec (2007:163).

(5.5) Systems without coda (Zec, 2007:163)
a. Onsets are required: CV
b. Onsets are optional: CV, V

In other languages, syllables possess all three subparts, which yields two further types; the onset is obligatory in (5.5a), as in Cairene Arabic (McCarthy 1979), but not in (5.5b), as is the case in Turkish (Clements and Keyser 1983).

(5.6) Systems that allow codas (Zec 2007:164)

a. Onsets are required: CV, CVC
b. Onsets are optional: CV, V, CVC, and VC

The illustrations of syllable shapes in (5.5) and (5.6) exhaust the possible language types projected from the basic syllable shapes as there are no dependencies between constituents. If a language requires onsets, it does not ban or require codas, and vice versa. While there is a clear asymmetry between onsets and codas, no dependencies hold between them.

This section, I discuss the syllable structure of Dagbanli as the number of syllable types in Dagbanli is limited. A syllable in Dagbanli and its dialects have the following kinds of structure that is dominated by the sequence in example (5.4) and corresponds to a syllable with all three principal subparts as presented in (5.7), except (5.7c), which contains only the nucleus and the coda.

(5.7) Dagbanli syllable types

a. CVC
b. CV
c. *VC
d. V(:)
e. CV:
f. N

An onset is generally required but vowel-initial syllables (e.g. V/VC) do occur as in (5.7c-d), which must be regarded as exceptional. The most basic syllable shape is the CV structure being the prototypical syllable structure. Dagbanli also exhibits CVC closed syllable type with obligatory onset and coda as in (5.7a) but has a system that does not allow complex onsets (CCV) and codas (VCC). Dagbanli and its dialects also have a syllabic nasal which occurs rarely in the lexicon of the language.

5.2.1.1 V Syllable

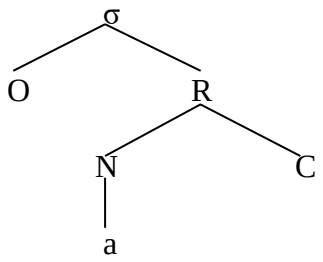
The Vowel (V) syllable structure is a basic syllable shape that has only the nucleus and does not violate (5.6b) where onsets are optional, but violates (5.6a) where the onset is required. Its occurrence is very restricted in Dagbanli. It is used mostly to encode grammatical meaning such as pronominal reference. In Dagbanli, the V syllable is typically [o] 'he/she or [a] 'you. Also, it includes other [+ATR] short vowels [i, e, u] and long vowels [i:, e:, u:, o:]. The V syllables are also derived from foreign words from Arabic via Hausa (Inusah & Mahama 2019). This is illustrated in (5.8).

(5.8) Vowel-initial words in Dagbanli loan words

a. [à.dá.ká] 'box'
b. [à.nà.bi] 'prophet'
c. [à.làh.ɾí] 'Sunday'
d. [à.ɾì.zí.ɣĩ] 'treasure'

An additional clue for the exceptional status of such examples is the fact that apart from the pronominal reference, there are no Dagbanli verbs where initial vowels are found. Also, V syllables occur after CV syllables: in this case, [a] forms a V syllable in certain nouns (e.g. tì-á 'tree', tù-á 'baobab tree') and in verbs containing a long vowel. In these cases, the verbal suffix /-i/ forms a syllable at word end (e.g. dà:-í 'push'; ŋmà:-í 'cut'). Notice that V syllables are rare and their use is limited to specific groups of words. Second, syllables without a consonantal onset are generally avoided and occur only in loans and some few other exceptions. See the V syllable structure is illustrated.

(5.9) V Syllable Structure



5.2.1.2 N Syllable

The syllabic nasal consonants occur most commonly as [n, m, ŋ] are likewise restricted to pronominal reference and focus marking (e.g. /n/). In word-final position, only the labial and velar [m, ŋ] are admitted (e.g. /sɨŋ/ 'pot; /sɨm/ friend' */sɨn/). Welmers (1973:68) states that "syllabic nasals as pronominal morphemes are exceedingly common in Niger-Congo. The pronoun is most frequently a first-person singular form, but sometimes third person singular."

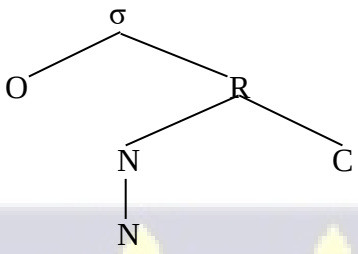
In Dagbanli and its dialects, nasals [m. n, ŋ] have a special status as they occur in isolation as pronouns (5.10a-b) or as a verbal prefix (5.10c-i). The syllabic nasal with its function as a pronoun refers to the first person singular.

(5.10) Syllabic Nasals

a.	/n/	<n>	'1.sg'
b.	/m/	<m>	'poss. Pron-1.sg'
c.	/m-má/	<m ma>	'my mother'
d.	/m-bɔ́ʔɨ́/	<m bɔɣi>	'to ask'
e.	/n-tà/	<n ta>	'to plaster'
f.	/n-zò/	<n zo>	'to escape'
g.	/ŋ-gú/	<n gu>	'to protect'
h.	/ŋ-kú/	<n ku>	'to kill'
i.	/ŋ-ŋúb-[ɨ]'/	<n ŋubi>	'to chew'

Notice that the nasals occurring in syllabic position in (5.10) are [n, m, ŋ] – that is, the alveolar nasal /n/ may surface as [n, m, ŋ]. This is valid for /n/ as a personal pronoun, possessive pronoun and as the verbal ('infinitive') prefix (see Olawsky 1999). The palatal nasal [ɲ] is disfavoured as a syllabic consonant, which is due to its severe lack of inherent sonority (Bell 1978). Also, the doubly articulated labil-velar nasal [ŋm] does not occur as a syllabic sound. The example in (5.11) presents the nasal [N] in the V slot in a syllable.

(5.11) N Syllable Structure



The syllable structure in (5.11) shows the syllable type that consists of the nasal [N]. The data in (5.10c-i) have the V.CV syllable shape. The VCV sequence, according to Zec (2007), is cross-linguistically syllabified as V.CV (e.g. /n.tà/) rather than VC.V (e.g. /*nt.à/), a phenomenon known as onset first principle. This violates the minimalist requirement that regards the V (or N) component as indispensable, especially in languages such as Dagbanli . For example, Katamba (1989) emphasises that the rhyme is the only essential element of the syllable in English, and what is true of English is also true of other languages. This therefore supports the reason why Dagbanli does not have *VC syllable shape.

5.2.1.3 CV Syllable

The consonant-vowel (CV) sequence is a pattern that is found in almost all languages since the syllable is an open one without a coda. Zec (2007) describes the pattern as "the universal CV syllable shape that emerges as the least marked by virtue of satisfying all constraints on syllable form". CV-syllable type is a very regular syllable pattern in terms of its manifestation in the Dagbanli lexicon. It is also the first syllable structure a child articulates in Dagbanli at the early stage of language acquisition. CV syllable is represented by many words of different categories, and as a part of longer words, as exemplified below:

(512) CV syllables words

a.	/pá/	<pa>	'put'
b.	/tú/	<tu>	'insult'
c.	/bá/	<ba>	'ride'
d.	/zò/	<zo>	'escape'
e.	/tà/	<ta>	'plaster'
f.	/ʒá-ʔǒ/	<ʒeɣu>	'storm-sg.'
g.	/ʒɛ̀-ɾɨ́/	<ʒɛri>	'soup'

CV in Dagbanli requires a nucleus and onset consonant and does not violate the onset principle. Notice that not every consonant can occur as an onset with a vowel of any quality. Velar consonants [k, ɡ, ŋ, x, ɣ] are not realised at the onset of CV syllable before /e/ and /i/, and complex labial-dorsal stops are rare before the back vowels /o/ and /u/ as in (5.14). The syllable structure in (5.13) illustrates CV syllable structure of /bá/ ride'.

(5.13) CV syllable structure

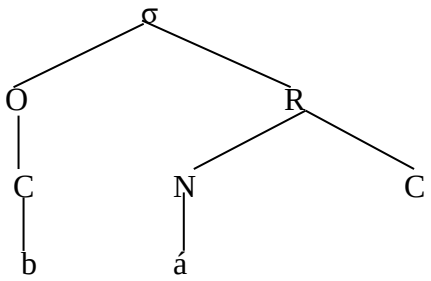


Table (11) illustrates ill-formed CV syllable types of certain consonant-vowel combinations; all other combinations of CV syllables occur regularly. Note that /a/ is the only vowel found as a nucleus with all consonants, whereas all other vowels are restricted in their occurrence.

Table 11: Ill-formed CV syllables (cf. Olawsky 1999:168)

	/a/	/e/	/i/	/o/	/u/
/k/		*[ke]	*[ki]		
/g/		*[ge]	*[gi]		
/ŋ/		*[ŋe]	*[ŋi]		
/x/		*[xe]	*[xi]		
/ɣ/		*[ɣe]	*[ɣi]		
/kp/				*[kpo]	*[kpu]
/gb/				*[gbo]	*[gbu]
/ŋm/				*[ŋmo]	*[ŋmu]

The language also has a CV.V syllable type that constitute two syllables: CV and V syllables. This type of syllable contains a long vowel, a sequence of two identical vowels which is always realised as two syllables. The syllable structure contains nucleus which of course is also the property of all syllable types and the onset is obligatory but no coda. It does not ban coda completely as it requires codas in CVVN syllables. The dialects of Dagbanli treat CV syllable as two syllables or bimoraic as Davis (2011) observes that "a short vowel is underlyingly monomoraic

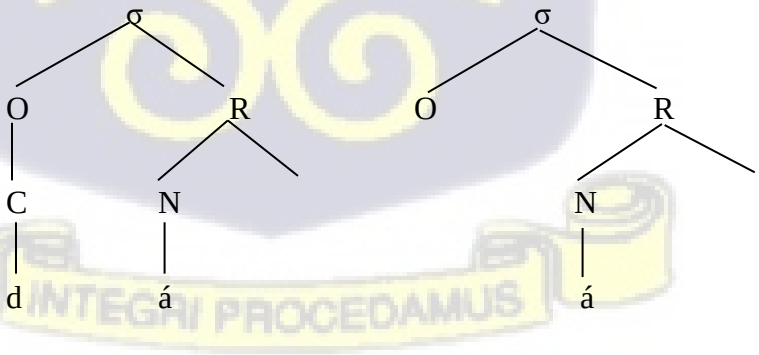
while a long vowel is bimoraic." CV.V syllable comprises stem which has two morphemes: the CV root and a V number suffix as in (5.14). It is evident that in a plural form, the second V suffix morpheme is deleted before it occurs with the plural maker /-hi/, which constitute a second syllable of the stem.

(5.14) CV.V syllable

Root-sg		plural	
dá-á	→	dá-hí	'market-pl'
bá-á	→	bá-hí	'dogpl'
ɲé-é	→	ɲé-hí	'nose-pl
zó$_t$-ó	→	zɔ́-hí	fly-pl
dú-ú	→	dú-ɾí	'room-pl'

The data in (5.14) rebuff Olawsky's (1999) assumption that CVV words in Dagbanli are consistently characterised as one rhythmic unit, thus, as one syllable and notes that CV .V syllable is never realised as two separate prosodic units. This he argues as one of the reasons for his hypothesis that moras do not play a significant role in Dagbanli phonology. I argue in this thesis that his hypothesis is inaccurate for moras do play a vital role in Dagbanli phonology. The CV.V syllable structure of the word [dá-á] 'market' is represented graphically in two syllables as below:

(5.15) CV.V syllable structure



5.2.1.4 CVC syllable

The CVC closed syllable structure comprises onset consonant C, nucleus V and coda consonant C and it is represented as [$_{Syllable}$*Onset*[$_{Rhyme}$*Nucleus Coda*]]. CVC syllables in Dagbanli are subject to constraints allowing only certain consonants to be in syllable final position. A further distinction is made between codas in word-internal and word-final position. The few sounds occurring as the final consonants of a CVC word are [ŋ, m, n, l, ɾ, ʔ, b] as seen in (5.16), some of these words are usually particles, conjunctions, or grammatical markers.

Whereas the velar nasal [ŋ] and labial nasal [m] are typical word endings (word-final position) found in nouns and verbs (see also Olawsky 2002; Hyman & Olawsky 2004), [b], [l], [ɾ], [ʔ] and [n] do not occur in word-final position in lexical categories. Words that end in the oral consonants [b, l, ɾ, ʔ] get epenthetic vowels. This can be observed in the examples in (5.17) (see Hudu 2010 for further discussion on vowel epenthesis).

(5.16) Words ending in a consonant (CVC roots)

a.	[m]	→	/zɔ̀m/	<zom>	‘blind’
			/kɔ́m/	<kom>	‘water’
b.	[ŋ]	→	/zɔ̀ŋ/	<zɔŋ>	‘bat’
			/tɔ̀ŋ/	<tɔŋ>	‘trap’
c.	[n]	→	/lán/	<lan>	‘again, (*particle/adverb)*’
			/ná:n/	<naan>	‘if, (*COND marker)’*
d.	[l]	→	/hál/	<hal>	‘till’ *(short form of ‘hali’)*
			/kʊ́l/	<kul>	‘just’ (*emotional particle)*
e.	[b]	→	/sàb/	<sab>	‘write’
			/làb/	<lab>	‘throw’
f.	[ɾ]	→	/kòɾ/	<kor>	‘desire-sg.’
			/dɔ́ɾ/	<dor>	‘disease-pl’.
g.	[ʔ]	→	/bɔ̀ʔ/	<bɔɣ>	‘split’
			/páʔ/	<paɣ>	‘woman’

(5.17) Epenthesis in CVC verb roots

lìh[i]	'look'
pɨl[ɨ]	'cover'
ŋʊ̀b[ɨ]	'chew'
fɛ̀b[ɨ]	'whip'
bɔ̀ʔ[ɨ]	'split'
tàɾ[ɨ]	'share'

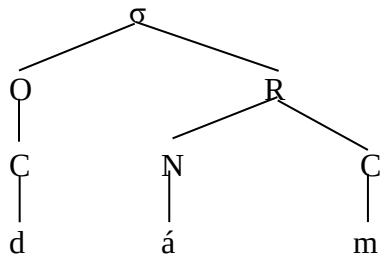
Hudu (2010:17) observes that "there is another difference in the final distribution of the two nasals [m, ŋ]. Unlike /m/, some instances of final /ŋ/ are due to assimilation of a root-final /m/ or /n/ to the velar place of a /g/ suffix onset and deletion of the suffix vowel. An example is the word /lɔ́n-gá/ → [lɔ́ŋ] 'frog-sg". It is evident that there is an underlying *-ga* suffix comes from the plural form of the noun, [lɔ̀n-sɨ́] which shows that there is a distinct /lɔ̀N/ root as in (5.18). Besides, all Dagbanli nouns that take a *-si* plural suffix have a *-ga* singular suffix (see Olawsky 1999 on Dagbanli nominal classification).

(5.18) plural form of CVN nouns

CVNroot	CVN-si	
tá:ŋ-gá	tá:n-sí	'shea nut. pl'
mó:ŋ-gá	mó:n-sí	'mango.pl'
só:ŋ-gá	só:n-sí	'rat.pl'
nó:ŋ-gá	nó:n-sí	'bird.pl'
dú:ŋ-gá	dú:n-sí	'mosaquito.pl'

The data in (5.18) refutes Olawsky's (1999, 2002) claim that examples like these are part of an independent phonological process of velarisation of word-final /n/. The tree diagram in (5.19) shows the CVC syllable structure of the word *dám* 'alcohol'

(5.19) CVC syllable structure



5.2.1.5 CV: Syllable

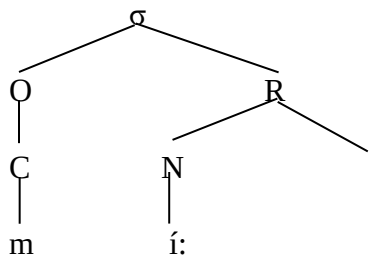
The language also has a CV: syllable type that comprises contrastive long vowels [i;, e:, u:, o:]. This type of syllable contains a long vowel, a sequence of two identical vowels are relatively common in the language and are the product of coalescence of two vowels, they belong to one syllable. The syllable structure contains nucleus which of course is also the property of all syllable types and the onset is obligatory but no coda. It does not ban coda completely as it requires codas in CV:N syllables. Like CV.V syllable that comprises CV and V syllables, the vowel in CV: syllable belongs to one syllable as seen below:

(5.20) CV: syllable

mí:	<mii>	'sour'
pì:	<pii>	'choose'
dó:	<doo>	'lying posture'
kpé:	<kpee>	'boiled'
fè:	<fee>	'scarce'
tù:	<tuu>	'move round'

The tree diagram in (5.21) shows the CV: syllable structure of the word *mí:* 'sour'

(5.21) CV: syllable structure



5.2.1.6 CV:N Syllable

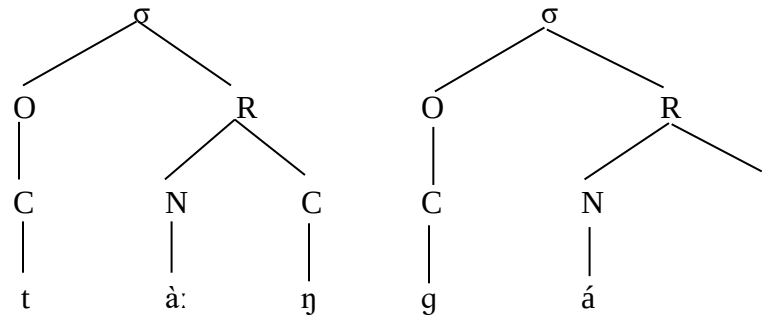
CV:N syllables are allowed in Dagbanli and its dialects. The alveolar nasal [n] is found after a long vowel mostly in Tomosili but other consonants are not found in this position. In word-internal, CV:N syllables are more common, where the alveolar nasal [n] occur as coda consonants in the stem. Hudu & Nindow (2020) note, "while syllables of this structure exist in Dagbanli, it is relatively marked in simplex words." For instance, CV:N syllable words; the nasal typically assimilates to the place features of the following consonant. This is illustrated in (5.22).

(5.22) Final nasal after long vowel

tà:N-gá	→	tà:ŋ-gá	'shea nut-sg	cf. tà:n-sí	'shea nut. pl'
mó:N-gá	→	mó:ŋ-gá	'mango-sg'	cf. mó:n-sí	'mango-pl'
só:N-gá	→	só:ŋ-gá	'rabbit-sg'	cf. só:n-sí	'rabbit-pl'
nó:N-gá	→	nó:ŋ-gá	'bird-sg'	cf. nó:n-sí	'bird-pl'
dú:N-gá	→	dú:ŋ-gá	'mosquito-sg	cf. dú:n-sí	'mosquito-pl'
dà:N-gá	→	dà:ŋ-gá	'hearth-sg'	cf. dà:n-sí	'hearth-pl'
bá:N-gá	→	bá:ŋ-gá	'singer-sg'	cf. bá:n-sí	'singer-pl'

The tree diagram in (5.22) shows the CV:N syllable structure of the word tà:ŋ-gá 'shea nut'

(5.21) CV:N syllable structure



5.2.1.7 Role of mora in Dagbanli syllable structure

This section provides evidence to show that Dagbanli is a mora-counting language and the organisation of phonemes in Dagbanli phonologically depends on moraic structure. Mora is a prosodic unit which serves as one of the indicators of syllable weight. The mora is described as a measure from which quantity is predictable. Davis (2011) refers to the term "quantity" in modern phonology, "as either segmental duration or syllable weight-phenomena which frequently distinguish between syllables that are light from those that are heavy". "A piece of evidence to show that mora is a unit of weight comes from the cross-linguistic generalization that phonological quantity is found only in languages that distinguish between light and heavy syllables" (Hayes 1989:26).

Broselow (1995) notes that "the concept of mora surfaces from the study of languages in which two adjacent segments in syllable rhyme may carry different pitches (McCawley 1968) or in which the position of stress, accent, or tone depends on an opposition between light (CV) syllables and heavy (CVV or CVC) syllables

(Newman 1972)". This explains the fact that it[accent] occurs either on the penultimate syllable, if the latter is long, or on the antepenultimate, if the penultimate is short. A syllable with a final consonant is considered long while a long vowel is thus comparable to two short vowels (e.g VV) or to a "short vowel + consonant" (VC). Thus, mora count encodes both the opposition between heavy (bimoraic) and light (monomoraic) syllables, and the equivalence of various types of heavy syllables. Hyman (1985) notes that "mora has a dual role: first "it represents the well-known contrast between light and heavy syllables where a light syllable has one mora and a heavy syllable two. Second, it counts as a phonological position" where a long segment is normally represented by two moras.

Dagbanli counts CV.V and CVC with sonorant coda syllables as heavy while CV syllable is light. "Since syllable onsets seem not to contribute to syllable weight (Everett and Everett 1984), they are assumed to have no moraic value". Thus, the syllables in Dagbanli described as C_0VV or C_0VC are equivalent in terms of their mora count. Hayes (1989) observes that "in languages with contrastive vowel length, long vowels have two moras and short vowels have one". Perlmutter (1996) confirms that "languages that have contrasts between short and long vowels and, in some cases, between single and geminate consonants, are said to have contrasts in phonological quantity." "Languages such as Luganda, for example, exhibits both types of contrast, e.g., *wela* 'refuse' versus *weela* 'rest' and *yiga* 'learn' versus *yigga* 'hunt'" (Tucker 1962). Dagbanli, for instance, exhibit vowel type of contrast between short and long vowels as illustrated in (5.22) where length is transcribed by double letters.

(5.22) Contrast between short and long vowels

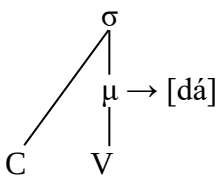
a.	<mani>	'me'	<maani>	/má:n-ɨ́/	'okra-sg.'
b.	<mibu>	'raining.'	<miibu>	/mí:-bû/	'becoming sour'
c.	<fe>	'finger-V'	<fee>	/fè:/	'scarce'
d.	<kpɛbu>	'entering'	<kpeebu>	/kpé:-bô/	'boiling'
e.	<tuli>	'hot'	<tuuli>	/tù:lɨ́/	'first'

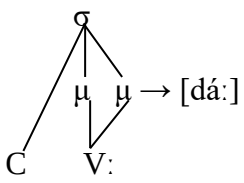
The examples in (5.22) show a well-known contrast between CV light and CV.V /CVV(C) as in (5.22a) heavy syllables where a light syllable has one mora and a heavy syllable has two. A light syllable includes a single peak, as in (5.23a); and a heavy syllable includes two peaks, as in (5.23b). In support of this, Davis (2011) notes that "a short vowel is underlyingly monomoraic while a long vowel are bimoraic".

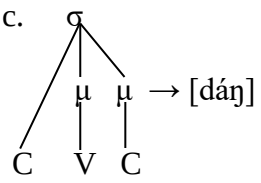
(5.23) a. Light b. Heavy

Phonologically, "moras has dual functions of serving as both sub-syllabic constituents and as units of timing. In the former capacity, they characterize syllable weight, and in the latter, segment length" (Zec, 2007:244). The focus here is on vowel length, which is captured in terms of structural positions within the syllable where a short vowel is associated with one mora, and a long one with two. This mode of representing length highlights the contrast between a long vowel and a short vowel where a long vowel is associated with two moras. Segment count does not need to correlate with mora count, and indeed it does not in the case of long vowels.

This is represented in a common unit of measure - the mora: a light syllable has one, and a syllable with a long vowel or closed with coda sonorant as represented in (5.24) of Dagbanli words: *dá* 'buy', *dá:* 'market', *dáŋ* 'clan' where μ = mora:

(5.24) a. 

b. 

c. 

In Dagbanli, CV.V word is a prosodic word which contains at least two moras or syllables, which are heavy or bimoraic as represented in (5.24b). This accounts for a phonological position where a long segment (e.g., dáá) is normally represented by two moras.

Back to the issue of mora-counting in Dagbanli, notice that at the level of the mora, it is attested in Dagbanli (Hudu 2010, 2014c) across dialects that "mora exists as an active unit in Dagbanli phonology". This is evident in the distribution of the vowels /ɨ/, /ʊ/ and /a/ occurring in three positions such CVC roots, roots with more than one syllable and suffixed roots as illustrated in the data in (5.25) to (5.27).

(5.25) CVN words

[ɨ]		[ʊ]		[a]	
a. tɨm	'send'	f. tʊ̀m	'work'	l. záŋ	'take'
b. dɨ̀m	'bite'	g. dʊ̂ŋ	'enemity'	m. dám	'alcohol'
c. sɨŋ	'pot'	h. lʊ́ŋ	'drum'	n. dáŋ	'family'
d. zɨm	'flour'	i. bʊ́ŋ	'donkey'	o. tám	'stand on'
e. nɨŋ	'do'	k. kʊ́ŋ	'empty'	q. mám	'girlfriend'

(5.26) roots with more than one syllable

[ɨ]		[ʊ]		[a]	
a. bɨ̀h[ɨ]m	'milk'	e. bʊ̀ʔs[ɨ]	'describe'	i. tàbs[ɨ]	'touch'
b. bɨ̀l[ɨ]m	'roll'	f. bʊ̀h[ɨ]m	'share'	j. jàʔs[ɨ]	'toss'
c. bɨɾɨm	'confuse'	g. kʊ́lɨ	'go home'	k. láh[ɨ]m	'gather'
d. mɨlɨ	'rub'	h. tʊ̀ʔl[ɨ]	'imstigate	l. sáh[ɨ]m	'spoil'

(5.27) CV roots

[i]		[ʊ]		[a]	
a. ʃí-hí	'bees'	e. zʊ́-hɨ́	'princes'	pá	'put'
b. tí-á	'tree'	f. nʊ́-hɨ́	'hands'	bá	'ride'
c. pí-á	'ten'	g. bʊ́-á	'goat'	tá	'plaster'
d. bí-hí	'children'	h. pʊ́lɨ́	'stomach'	dá	'buy'

It is evident from the data that the vowels [ɨ] and [ʊ] are only restricted from CV words, however, they occur in words with more than one syllable, or one closed Syllable with a sonorant coda.

There is evidence in Dagbanli phonology across dialects that support the idea of mora-counting. In Dagbanli, the position of a coda nasal described as moraic segments comes from the position of nasal coda as tone-bearing unit. Cross dialectally, sonorant nasals are the consonants that occur at the coda of CVC words in Dagbanli. Lengthening may occur as a result of the loss of a suffix vowel in a CVN stem that would otherwise follow the nasal. This provides an area in which bimoraic sequences, whether disyllabic or monosyllabic, may be expected to count as equivalent. Examples are presented in the data below:

(5.28) lengthening and tone-bearing nasals

a.	kɔ̀ŋ-á	→	kɔ̀ŋ́:	'leper-sg.'	cf. kɔ̀ŋ 'lose'
b.	zʊ́ŋ-á	→	zʊ́ŋ́:	'bat-sg.'	cf. zʊ́m 'be blind'
c.	sʊ̀ŋ-á	→	sʊ̀ŋ́:	'good-sg.'	cf. tʊ̀m 'work'
d.	tàm-á	→	tàḿ:	'manure-sg'	cf. tàm 'forget'
e.	dám-â	→	dâḿ:	'wine-pl.'	cf. [dàm] 'shake'
f.	kɔ̀m-â	→	kɔ̀ḿ:	'water-pl.'	cf. [kám] 'any'

The data in (5.28a–c) present evidence of assimilation of a root-final nasal to the place of the suffix onset, deletion of the root vowel and compensatory lengthening of the preceding velar nasal and the coda nasal also bears the tone left behind by the deleted suffix vowel. In Dagbanli as in (5.28d–f), the singular forms have no number suffixes unlike the plural forms. Notice that the long and tone-bearing nasals suggest the existence of a singular morpheme that is elided and leaves behind features that are similar to the pattern in (5.27a–c). The nasal coda pattern with vowels is an indicator that compensatory lengthening and tone-bearing nasals support the analysis that both short and long codas are moraic. The data in (5.28) therefore illustrate that the mora is an active unit in Dagbanli phonology, and that a domain with more than one mora has a unique phonological property (see Hudu 2010 for further discussion).

Constraints on minimal word shape provide another illustration of mora counting in Dagbanli. In Dagbanli and its dialects, CV.V and CVC words are heavy and also words consisting of two light syllables (e.g. /sà.nà/ ‘stranger’). In most of the dialects, the two-mora constraint is obeyed when a root has a coda or two consonants in the coda showing evidence of bimoraic and by inserting a vowel to the right of the stem only adds another mora to make it three as in (5.29). Thus, the dialects enforce the two-mora minimum, one by adding a syllable and one by lengthening the monosyllabic stem. The minimal word in Dagbanli and its dialects also constitutes the minimal domain of tone assignment.

(5.29) Mora counting in Dagbanli in CVCC roots (Hudu 2010:17)

a.	/namd-/	→	[námd[ɨ]-lɨ]	'sandal'
b.	/ɲims-/	→	[ɲíms[ɨ]-lɨ]	'neem tree'
c.	/sabs-/	→	[sàbs[ɨ]-gó]	'gecko'
d.	/galm-/	→	[gál[ɨ]n-lɨ]	'blameworthy'
e.	/gbɨʔm-/	→	[gbíʔ[ɨ]n-lɨ]	'lion'
f.	/tɔ̀ʔs-/	→	[tɔ̀ʔs[ɨ]]	'spak'
g.	/bɔ̀ʔs-/	→	[bɔ̀ʔs[ɨ]]	'describe'

The CVCC monosyllabic words are also heavy and assuming that final consonants are extrametrical, this pattern can be analyzed as a requirement that words contain at least two moras.

Another process related to mora counting is the common shortening of vowels in closed syllables. McCarthy & Prince (1990) describes this shortening as an effect of an upper limit of two moras per syllable. Notice that the vowel must be shorten in order to accommodate a moraic consonant within the same syllable.

In Dagbanli, both close syllable and trisyllabic shortening occurs in CVCVCV and CVC with sonorant coda and a long vowel (e.g. V: shortens to V). It is attested that in many languages like Buli (Akanlig-Pare 2005), this V: shortening to V occurs when the coda consonant is a sonorant and therefore is a mora unit. The Syllable shortening is the process of reducing the final syllable in a word by deleting it to form a stem word and this occurs across dialects. Cross dialectally, a closed syllable shortening occurs in CVC stem that has nasal at the coda. The CVC stem usually comprises of onset consonant C, nucleus V and coda consonant C. In the process of the closed Syllable Shortening, CVC syllable is reduced to CV stem. Notice that closed syllable shortening result from a general constraint on syllable structure and prohibits long vowel from occurring in the roots. The shortening

occurs because the syllabification rules can license only a single V-position (or mora) of an underlying long vowel when it occurs in a closed syllable.

M-Deletion is a rule that allows deleting a stem-final nasal in stems that can be reformulated as the effects of stray erasure on unsyllabified segments, if bare roots count as domains for syllabification. Across dialects, the CVC word has nasal at word final position and therefore the rule is applicable. For example, the data in (5.30) show CVC stems that end with nasals and present the products of m-Deletion where the stem-final nasal /m/ is deleted to produce a CV stem. Notice that nasals [m, n, ŋ] are the only consonants that occur at coda of a close syllable in Dagbanli words except in the case of CVCV reduction (e.g. /bɔgʊ/ 'arm' /kab-li/ 'break'→ [bɔg-kab-li] 'broken arm-sg'). In order to form other stem words, the coda nasal is deleted through m-deletion and the syllable reshaped by reducing the coda C to form a new word that has the CV syllable. Note that the M-deletion process occurs during compounding.

(5.30) m-deletion in Nayahili

	[CVC]$_{stem}$		[CV]$_{stem}$	
a.	dám 'alcohol'	→	dà-káʔ-lí	'raw alcohol'
b.	zóm 'blind'	→	zò-dɔ́ʔ-ó	'blind stick'
c.	ɲɔ́m 'sent'	→	ɲɔ́-bíɛʔ-ó	'badsent'
d.	kɔ́m 'water'	→	kó-víɛlí	'good water'

As seen in the data in (5.30), the final [m] is considered here as inherent part of the root and not a part of a suffix, so the process is more of deletion but not shortening in Dagbanli. Another development of the mora counting is the trisyllabic shortening in which the final vowel in CV.CV.CV syllable is reduced by deleting it to form a CV.CVC stem cross dialectally as illustrated below.

(5.31)	[CVCVCV]$_{syllable}$		[CVCVC]$_{stem}$	
a.	ná.pɔ́.n-á	'foot-pl.'	ná.pɔ́ŋ	'feet'
b.	sá.lɨ́.má	'story.sg'	sá.lɨ́m	'narate'
c.	dà.gbá.n-â	'Dagomba person'	dà.gbán	'Dagomba state'
d.	dà.gó.já	'merchandise'	dà.gól	'trade'
e.	ɲɛ̀.vɨ́.jâ	'soul.pl'	ɲɛ̀.vɨ́l	'soul'

The data in (5.31) show the product of trisyllabic shortening in CV.CV.CV word with only the vowel in the final syllable deleted. In trisyllabic shortening, there is resyllabification of the onset C in the third syllable to the coda position of the second syllable after the nucleus is deleted.

5.3 Prosodic Structure

Prosodic phonology is a theory that explains the idea of prosodic structure, which is also the determinant of phonological rule domains. The prosodic hierarchy is the name for an ordered set of prosodic category types which constitute possible node labels for prosodic structures and in the standard view are stipulated by phonological theory. Prosodic category types are presented in the figure below:

Utterance (υ)
|
Intonational Phrase (ι)
|
Phonological Phrase (φ)
|
Prosodic Word (ω)
|
Foot (F)
|
Syllable (σ)

Figure 5.2: Prosodic category types (Selkirk 2011)

"The Prosodic Morphology Hypothesis requires that templatic restrictions be defined in terms of prosodic units. The units of prosody are the mora (μ), the syllable (σ), the metrical foot (F) and the prosodic word (ω)" (Selkirk 2011). Nespor & Vogel (1986) and Selkirk (1980) discuss a model presenting a prosodic hierarchy in which "the prosodic word (ω) is the highest unit within the prosodic structure". The prosodic hierarchy in Figure (5.3) evolved from that of Selkirk (1980) which specifies what the prosodic units are.

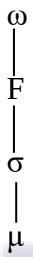


Figure 5.3: Prosodic Hierarchy

Notice that one thing that follows from such a model is the minimal word requirement (Kenstowicz, 1994; McCarthy & Prince, 1995).

The mora (μ) is the familiar unit of syllable weight (Prince, 1980; Hyman, 1985; McCarthy and Prince, 1986, 2007; Zec, 1988; Hayes, 1989; Ito, 1989) and others. The most common syllable weight typology in Dagbanli is CV, (C)N syllable (light) and CVV(C), CVC syllables (heavy). So Dagbanli prosody is quantity-sensitive. I discuss prosodic word in the next section.

5.3.1 The Prosodic Word

This section is a contribution to the study of prosodic word (ω) in Dagbanli and its dialects. I discuss prosodic word and other units within the prosodic structure in

Dagbanli and the various aspects concerning the definition of the prosodic word in the realm of prosodic word development, phonotactic role of prosodic word and prosodic word prediction

"The prosodic word is the basic unit of prosodic hierarchy and its notion is decisive for a proper account of the asymmetries between morphological and syntactic structure on the one hand, and prosodic structure on the other" (Booij, 1999). The Prosodic Hierarchy derives the notion minimal word and according to the prosodic hierarchy (cf. figure 5.3), "any instance of the category prosodic word must contain at least one foot (F). By Foot Binarity, every foot must be bimoraic or disyllabic. By transitivity, then, prosodic words mostly contain at least two moras or syllables. In quantity-sensitive languages, the minimal word is bimoraic" (McCarthy and Prince 1996). The idea of of word minimality effect occurs in Dagbanli, it was first analyzed by (Dakubu, 1997) and Olawsky, 1999; Hudu, 2010, 2014b) offers further analysis. Dagbanli CVV(C), CVC syllables are heavy or bimoraic, while CV, (C)N syllables are light (Hudu and Nindow 2020). I, therefore, suggest here that Dagbanli prosody is quantity-sensitive. The entailed bimoraic minimum is responsible for the following alternations, which involve both augmentation and truncation phenomena.

(5.32) a. Nayahili dialect

Bimoraic stem

sàʔm	sàʔm-á	'spoil it'
jɔ́hm	jɔ́hm-á	'deceive it'
làʔm	làʔm-á	'put together'

b. Monomoraic stem

bɔ́ʔ-ʊ	bɔ́ʔ-ɾí	'arm-pl'
zʊ́ʔ-ʊ̂	zʊ́ʔ-ɾî	'heads'
páʔ-á	páʔ-bá	'woman-pl'
kɔ́b-gʊ́	kɔ́b-ɾí	'hair-pl.

Final nasal consonant is, however, preserved in stems in (5.32a) which could not be made any shorter and still fulfill the minimality requirement but in (5.32b), the suffix vowels are deleted. In Dagbanli, constraints on prosodic (ω) well-formedness thus promote augmentation and truncation. Iambic, Trochaic and Syllabic are the types of foot. Note that Feet is binary under syllabic or moraic analysis, thus, it differs with respect to the position of the syllable which is refer to as left-headed (trochaic) or right-headed (iambic) feet.

Dagbanli prefers trochaic feet, which is most evident in nouns. It is noted that in some cases, the prosodic word coincides with the morphological word since the idea of the word as a prosodic unit facilitates the description of syllabification. The prosodic word functions as the domain where syllabification takes place as illustrated below.

(5.33)	dɔʔó	[dɔ.ʔó]	/dɔg-/$_{root}$	[-ó]$_{suffix}$	‘stick’
	páʔá	[pá.ʔá]	/pág-/$_{root}$	[-á]$_{suffix}$	‘woman’
	dàgóli	[dà.gó.li]	/dàgól-/$_{root}$	[-i]$_{suffix}$	‘merchandise’

The example in (5.33) show nouns (e.g.dɔʔ-ó) which are syllabified as [dɔ.ʔó], but morphologically structured into the root /pág-/ and the suffix /-á/. Notice that syllabic and morphological structured do not necessarily coincide.

Peperkamp (1999) notes that “phonologically, morphological words do not necessarily behave as a unit, for example, derivational affixes and compound elements can be treated independently by phonological word-level rules”. Prosodic words are typically characterized as being the domain that includes the following:

(5.34) a. "phonotactic generalisations"
b. "stress assignment rules"
c. "phonological rules (word-level rules)"
d. "the relevant constituent for factoring out possibilities (gapping in complex words" (Booij 1995)

The notion of prosodic word in Dagbanli has touched on each of the four areas noted by Booij (1995). Based on the behavior of prosodic word (ω) described in (5.34). The magnitudes of constraints on the makeup of prosodic constituents for the phonotactics as in (5.34a) of Dagbanli words are twofold. (i) Lexical words in Dagbanli are independent without further morphological operations, so each word obeys the wellformedness constraints on prosodic words. (ii) Phonotactic constraints in Dagbanli that hold for lexical words only, and not for all prosodic words, can be expressed in terms of conditions that require the alignment of morpheme edges with edges of prosodic constituents.

Prosodic word[ω] in Dagbanli may be smaller than grammatical word (which consists of a number of grammatical elements that occur together in a fixed order) or comprise of more than one grammatical word as in the case for *host+ clitic* as presented in verbs below:

(5.35)	màl[ɨ]	'make'	cf.	màl lɨ́	'make it'
	zàŋ	'take'	cf.	zàŋ nà	'bring it'
	kpàŋ-s[ɨ]	'encourage'	cf.	kpàŋ sô	'encourage him/her'
	n sám-lî	'my debt'	cf.	n sâm	'to mash'
	m bâ	'my father'	cf.	m bá	'to ride'

Notice that in (5.35) clitics in Dagbanli are not preceded by hyphens (Hudu 2014b) (e.g. [màl]$_{host}$ [ɨ]$_{clitic}$) like affixes.

In addition, there might also be a non-isomorphy between the morphological structure and the prosodic structure of a complex word. Note that compounds in Dagbanli differ from complex words in that they combine two simplex words

without restrictions on their inflection (Hudu 2014b, Inusah & Appah 2021). For example, in the case of compounds, the word-final case suffix belongs morphologically to the whole compound, but prosodically to the second constituent only. The dative form of the compound *nàà bí-á* 'chief child' is nààbíhí 'chief children', with the following two structures, where (ω) stands for 'prosodic word'.

(5.36) Morphological Structure: [[[nà-á] [bí]]hí]
Prosodic Structure: {nà-á}$_{\omega}$ {bí-hí}$_{\omega}$

The example (5.36) illustrates associative construction that combines two nouns in which the second noun associated with the first. The prosodic structure in Dagbanli compound consist of only two lexical roots in which the final vowel of the second lexical item of the compound is elided and in some cases the vowel is reduced to a weak vowel [ɨ] all together due to its position within the compound. Hudu (2014b) observes that such reduction is not phonological, as it does not affect the phonology in any way and with the exception of the vowel elision or reduction; the first root of the compound remains phonologically distinct from that of a complex word in all other ways. Other examples of prosodic structure of compound words in Nayahili dialect are presented below.

(5.37) prosodic structure of compound words in Naya

Compound word	Prosodic structure		
náhó zóhô	{náhó}$_{\omega}$	{zóhô}$_{\omega}$	'cow's head'
wɔ́bgó mâ	{wɔ́bgó}$_{\omega}$	{mâ}$_{\omega}$	'elephant's mother'
bá-á bín-dí	{bá-á}$_{\omega}$	{bín-dí}$_{\omega}$	'dog's shit'
báʔ-á kɔ́l-gó	{báʔá}$_{\omega}$	{kɔ́l-gó}$_{\omega}$	'soothsayer's sack

Hudu (2013) describes phonological word in Dagbanli as a lexical root accompanied by prefixes, suffixes, proclitics and enclitics as notice in the compound words in

(5.37). In the prosodic structure (e.g.{zóhô}$_{ω}$), crucially contains a stem {zóh-} and a suffix{-ô}. Thus, {zóhô} forms single prosodic word and this applies to {náhó} as well. "Given the requirement of prosodic minimality" (McCarthy & Prince 1986), the suffix suffix {-ô} cannot form an independent prosodic word in the language. Compounds in Dagbanli , therefore, form one phonological word and are characterized by tone.

The compound which is combination of two potentially prosodic words is an example of a phonological word which differ from phonological phrase, a unit higher than the prosodic word. The differences may occur phonological, morphological, morpho-syntactic and semantic. The focus here is on the phonological differences, which is not universal language-specific. Phonological phrase (φ) is described here based on language structure of Dagbanli.

Phonological phrase (φ) in Dagbanli consists of several phonological words onlike compund which often form one phonological word comprising prosodic words as in (5.38).

(5.38) Compound as phonological word in Nayahili

sá-kóʔ-á	{sá-}$_{ω}$	{kóʔ-á} $_{ω}$	*{-á}$_{ω}$	'hail.pl'
jɨ́l-páʔ-á	{jɨ́l-}$_{ω}$	{páʔ-á}$_{ω}$	*{-á} $_{ω}$	'house wife'
kpá:-gál-lɨ́	{kpá:-}$_{ω}$	{gál-lɨ́}$_{ω}$	*{-lɨ́}$_{ω}$	'guineafowl egg
dá-jʊ́l-ɨ́	{dá-}$_{ω}$	{jʊ́l-ɨ́}$_{ω}$	*{-lɨ́}	'pot for drinking pito'
bɨ́n-pʲɛ́l-lɨ́	{bɨ́n-}$_{ω}$	{pʲɛ́l-lɨ́}$_{ω}$	*{-lɨ́ }	'white calico'
wáh-ʒʲɛ́ʔ-ʊ́	{wáh-}$_{ω}$	{ʒʲɛ́ʔ-ʊ́}$_{ω}$	*{-ʊ́}	'type of snake'
tí-kpíl-lí	{tí-}$_{ω}$	{kpíl-lí}$_{ω}$	*{-lí}	'medical pill'
gbán-pʲɛ́l-lɨ́	{gbán-}$_{ω}$	{pʲɛ́l-lɨ́}$_{ω}$	*{-lɨ́}	'western person'

The data in (5.38) show a phonological word comprising prosodic words which also indicate that a suffix which is a possible syllable does not constitute a prosodic word.

I, therefore, agree with Hudu (2014b) on the fact that compounds often form one phonological word.

As seen in (5.38), maintaining a high tone of a root prosodic word or the first constituent in a phonological word brings distinction between a phonological word and a phonological phrase which consist of several phonological words. For example, the phonological word *sá-páʔ-á* which literally means 'rain's wife' but actually means 'dragonfly', maintains the high tone of the first prosodic word making it different from the phonological phrase *sa̰-páʔ-á* with a low tone on the first prosodic word. The point of these comparisons is that while phonological words sometimes convey non-compositional meanings, phonological phrases are compositional in meaning. This is supported by Appah (2013) assertions that "phrases are by definition compositional, if a word group is non-compositional or partially compositional then it is probably a compound and not a phrase".

It is attested in that in tone languages, compounds may also differ with respect to the distribution of tones (Aikhenvald 2007). In Dagbanli , the tone of each prosodic word of a phonological word in compounds may be distinct from nouns as they appear free, e.g.

(5.39)	waɾ [L]	+	dɨbga [LH]	→	waɾ-dɨbga [HM]
	horse'		stick		'stallion'

In the Wu dialects of Chinese, phonological words differ from Phonological phrases with respect to tone sandhi (Anderson 1985). I suggest here that in Dagbanli, different criteria may be used for different phonological phrase types.

(5.40) Phonological phrase types in Nayahili

a. Those formed by simple juxtaposition of two prosodic words constitute a phonological phrase (e.g. wɔ́bgɔ́ mâ {wɔ́bgɔ́}$_{ω}$ +{mâ}$_{ω}$) 'elephant's mother'

b. The other type of phonological phrase formally identical to a possessive construction consists of two phonological words (e.g. sà-kɔ́ʔ-lɨ́ (rain's stone) 'hail'

These phonological phrases are formally indistinguishable from phonological words which are possessive constructions, such as {náhɔ́}$_{ω}$ {zɔ́hô}$_{ω}$ 'cow head'

Further examples illustrating both criteria in (5.40) of phonological phrase types are presented in (5.41) for the type in which two prosodic words constitute one phonological phrase and in (5.42) for the type identical to a possessive construction that consists of two phonological words.

(5.41) Phonological phrase type I

nàá jílí	→	{nàá}$_{ω}$	+	{ jílí}$_{ω}$	'chief's house
m bì-á	→	{m}$_{ω}$	+	{bìá}$_{ω}$	'my child'
bíŋ káhlɨ́	→	{bíŋ}$_{ω}$	+	{káh-lɨ́}$_{ω}$	'unripe's thing'
dɔ́ŋ-kɔ̀ʔɔ́	→	{dɔ́ŋ}$_{ω}$	+	{kɔ̀ʔɔ́}$_{ω}$	'slim knee'
dɔ́n-bí-á	→	{dɔ́n}$_{ω}$	+	{bí-á}$_{ω}$	'knee's cap'
láŋ-pʲél lɨ́	→	{láŋ}$_{ω}$	+	{pʲél-lɨ́}$_{ω}$	'net white'

(5.42) Phonological phrase type II

bɨ̀n-pʲél-lɨ́	→	{bɨ̀n-ɨ}$_{ω}$	+	{pʲél-lɨ́}$_{ω}$	'thing of white'	('calico')
kàɾím-zɔ́ŋ-á	→	{kàɾím}$_{ω}$	+	{zɔ́ŋ}$_{ω}$	' hall of reading'	('school')
nà-páʔ-á	→	{nà-á}$_{ω}$	+	{páʔ-á}$_{ω}$	'wife of chief'	('queen')
sà-kɔ́h[ɨ]-lɨ́	→	{sá-á}$_{ω}$	+	{kuh[ɨ]-lɨ́}$_{ω}$	'rain of stones'	('hail')

It is argued that these Phonological phrases are formally indistinguishable from possessive constructions which are phonological words. Note that the first example, *bɨ́n-pʲél-lɨ́* 'calico' in (5.42), for instance, is lexicalised, but it may well occur as a

spontaneously produced construction of noun plus adjective, referring to a 'white thing', and not necessarily to 'calico'. Such noun–adjective constructions are particularly interesting since these adhoc combinations of nouns and adjectives in a phonological phrase (nominal phrase) containing an adjectival phrase are built in the very same way as lexicalised noun–adjective compounds–which may be a good reason to call these constructions phonological words in Dagbanli.

Further evidence occurs morphologically in which plural marking on phonological words occur only in noun-noun phonological phrase structure. This is illustrated below:

(5.43)	nà-páʔ-bá	+	tóm-bá	→	nà-páʔ-bá tóm-bá
	{nà-}$_{ω}${páʔ-bá}$_{ω}$		{tóm-bá}$_{ω}$		{nà-}ω{páʔ-bá}$_{ω}$ {tóm-bá}$_{ω}$
	'queen-pl'		'messenger-pl'		'queens' messengers

The Phonological phrase in (5.43) shows plural marking on both components where *nà-páʔ-bá* is been modified by *tóm-bá*. In a phonological word, this would have been realized as *náá-tóm-bá* where the plural is marked only on the final prosodic element (e.g.{tóm-bá}$_{ω}$). Again, while the Phonological phrase compricss two Phonological words, it consisits of three prosodic words, thus, the Phonological phrase is a higher unit than prosodic phrase. The phonological phrase structure in Dagbanli is therefore left headed (LH) since the obligatory head initial (e.g., nà-páʔ-bá) is followed by the modifier (tóm-bá) (cf. Inusah 2015).

5.3.1.1 Development of prosodic word

Phonologically, it is noteworthy that a child language acquisition occurs spontaneously. O'Grady (2005) observes that nothing is more imperative to a child's progress than the acquisition of language. It is attested that a "child phonology data has long been noted for its variability as some children speakers appear to prefer the use of certain segments in speech over others." (Demuth 1996. Vihman et al.1985). A child may use certain segments in some contexts but not others (e.g., Demuth 1996; Bodua-Mango 2015, Inusah 2016a).

Hitherto, the variation in the segmental realization of children's early words has made it difficult to identify common stages of development across languages (Demuth 1996). In spite of this, notwithstanding certain types of inter-speaker and intra-speaker variation, recent research on the prosodic development of words has identified several stages in the acquisition of prosodic structures (Fee 1992, Demuth 1995a, Demuth & Fee 1995). I provide here an account of inter-speaker variation in Dagbanli at different stages in the development of prosodic words and show that children work concurrently at different levels of phonological structure.

Following the prosodic hierarchy presented in (figure 5.3), Demuth (1995) and Demuth & Fee (1995) introduce four major stages in the acquisition of English and Dutch prosodic words by children.

Stages	Prosodic Words Development	Syllable Structure
Stage I	Core Syllables – CV	a. core syllables– CV b. no vowel length distinctions
Stage II	Minimal Words/Binary Feet	a. core syllables - (C)VCV b. closed syllables - (C)VC c. vowel length distinctions - (C)VV
Stage III	Stress-Feet	a. one stress-foot per word b. two feet per word
Stage IV	Phonological Words	a. extrametrical syllables permitted

Figure 5.4: Development of Prosodic Words (Demuth 1996:41)

The stages presented in Figure (5.4) each represents both a lower and upper bound on the form that a child's words take at a particular stage of development. That is, the child's grammar seems to be prosodically 'constrained' to produce not more than one syllable at the first stage, a binary foot at the second stage (either a bisyllabic foot (CVCV) or monosyllabic bimoraic foot (CVC or CVV), and may only produce a single tone distinction instead of stress-feet at the third stage, which does not exist in Dagbanli phonology. In some cases, sub-minimal words occur when the prodigious pattern in the child's language indicates that he/she is at the development of the minimal word Stage II.

In order to account for this type of variability and identifying the developmental stages of a child prosodic word development, I provide evidence to show that children acquiring Dagbanli as a language strive concurrently at both segmental and prosodic levels of structure and their knowledge of the language are of potentially violable producing unmarked structures. Also, children parse segmental and prosodic information from the input form into their surface output forms based on their strength at a given stage of the development.

Finally, I provide examples of the types of variation found in the acquisition of prosodic words and postulate that chunk of the variation at Stage II can be accounted for in terms of competing requirements at segmental and prosodic levels of structure as noted by Demuth (1996) in English and Dutch.

5.3.1.1.1 Inter-speaker variation of prosodic word (ω) in Dagbanli

It is noted that children's speakers of Dagbanli at the first stage of prosodic word development commonly articulate CV structure, which is unusual, in that, in many languages, the minimal word structure requires units larger than this. These words at this stage additionally display some level of disparity in form. Fikkert (1994) observes that children do not control vowel length at this time. In other words, vowel length is not distinctive, and so variation occurs (see Demuth 1996). Olawsky (1999) notes that vowel length is a prosodic category which plays an important role for Dagbanli phonology and morphology. The length of a prosodic word in Dagbanli determines the realisation of certain noun suffix allomorphs and the absence or presence of nasal assimilation in certain cases.

(5.43) Stage I- Lack of Contrastive Vowel Length

	Adult Version (Target)	Child's Version	Gloss
a.	/mí:/ <mii>	[mí:], [mí]	'sour'
b.	/fè:/ <fee>	[fè:], [fè]	'scarce'
c.	/kpé:/ <kpee>	[pé:], [pé]	'boil'

The examples in (5.44) below, on the contrary, present the variation not only in vowel length, but also between the presence or nonexistence of a coda consonant in

the first syllable as well as the complete deletion of the suffix marker /-gá/ (the second syllable).

(5.44) Stage I - Lack of Contrastive Vowel Length

	Adult Version (Target)	Child's Version	Gloss
a.	/tá:ŋ-gá/ <taanga>	[tá], [tá:]	'shea tree'
b.	/só:ŋ-gá/ <soonga>	[só], [só:]	'rat'
c.	/dú:ŋ-gá/ <duunga>	[dú] [dú:]	'mosquito'

The child producing words at the first stage in (5.44) show evidence of progressing to the next stage of development where the concentration is on minimal words in the language. This is the stage where coda consonants (C) are introduced and some types of variation may occur due to a lack of contrastiveness, whereas other types of variation may be a result of a transition between different stages of development. In this case, a coda constraint may not be 'tied' with a constraint requiring Minimal Words, resulting in variation in surface form.

Regarding the structure of minimal words in Dagbanli, a simplex word consists of only one lexical root in CV or CVC in the infinitive form of verbs, which does not require an affix (e.g., /tì/ 'give') and can also be inflected for aspectual markers (e.g., /tì-já/ 'give-perf.') or followed by clitics (e.g. /zàŋ nà/ 'bring'). Some nouns and adjectives in Dagbanli consist of lexical roots in CVC root and number suffix markers (e.g., /gạ́ɾ-ó/ 'bed-sg.'; /pál-lí/ 'new-sg.'). In some cases, Dagbanli verbal roots do not strictly but as a tendency follow the minimality constraint as the verbs and nouns do not normally occur in isolation: in their citation form, they are accompanied by the bound prefix /n-/. This is very common in Nanunli dialect (e.g. n-bè 'smear').

It is observed that most children enter the Minimal Word stage, that is, the second stage without being able to articulate coda consonants. For such a child, CV.CV forms are usually found at Stage IIa ((C)VCV). Apropos to the structure of most nouns in Dagbanli, one realises that Dagbanli tends to have similar preferences: typical children rapidly move to produce coda consonants in simplex nouns, including those surfacing as CVN at Stage IIb as seen below'.

(5.45) Stage Ib ~ I - (C)VC~ CV

	Adult Version (Target)	Child's Version	Gloss
a.	/kpáŋ/ <kpaŋ>	[páŋ]	'axe'
b.	/kál[ɨ]/ <kal>	[kál]	'sweep'
c.	/fɛ̀b[ɨ]/ <fɛb>	[fɛ̀m]	'whip'
d.	/ŋʊ̀b[ɨ]/ <ŋʊb>	[ŋʊ̀m]	'chew'
e.	/ŋʊ̀b[ɨ]/ <ŋʊb>	[ŋù]	'chew'

Some children, however, still produce a sub-Minimal Word in as in (5.45e) despite the general use of coda consonants at Stage IIb. The argument is that the target coda consonant is the labial /b/, which the children are observed using two strategies in their articulation to deal with the tricky coda segment: In example (5.45c-d), they substitute the labial nasal /m/ for labial stop /b/ while in (5.45e), they articulate the word without coda which is avoided completely. Notice that in (5.45a) they pronounce the labio-velar /kp/ as [p] by avoiding the /k/ place of articulation. The children in choosing the single stop sound prefer the labial stops [p, b] to the velar stop [k, g] because the former is easier to articulate than the latter. This corroborates the reason children acquire labials [p, b, m] before velars [k, g, ŋ] in language acquisition (Demuth 1996). In example (5.45e), it is observed that since the vowel

is not bimoraic, the children articulation yields sub-minimal word. For such examples, Demuth (1996) notes that parsing segmental information into the output form may come at a 'cost' if that segment is not actually part of the input as well. This implies that [ŋòm] is costly because it has a segmental violation and [ŋù] is also costly because it has a prosodic violation as well as a segmental violation due the omission of the coda rather than its substitution.

Interestingly, a child goes through a stage where sonorant-final target forms are produced with a long vowel (5.46a-c) or vowel plus sonorant consonant (5.46d-f) but not both. These forms surface as CVV or CVN. In this case, the child begins to control vowel length though the forms produced are still maximally a Minimal Word.

(5.46) Stage IIb ~ IIc - (C)VCson. ~ (C)VV

	Adult Version (Target)	**Child's Version**	**Gloss**
a.	/náː-ɨ/ <naai>	[náː]	'finish'
b.	/dáː-ɨ/ <daai>	[dáː]	'push'
c.	/téː-ɨ/ <teei>	[téː]	'remember'
d.	/gbál/ <gbal>	[bál]	'leg'
e.	/sɨŋ-á/ <siŋ>	[sɨŋ]	'pot'
f.	/zòm/ <zom>	[zòm]	'blind'

Notice that the labio-velar /gb/ once more proves problematic as it surfaces initially as a labial [b] in (5.46d). Evidently, sonorant codas are not difficult at this stage and the coda /m/ target is realized in (5.46f) but the labio-velar onset is still difficult at this point. In addition, in all cases where the labial-velar is not produced, the form results in a Minimal Word rather than Sub-Minimal as in (5.46d). Thus, the prosodic word structure (CVV or CVN) is maintained at this stage, even though the segments used to realize it may not be part of the target itself.

Based on this evidence, I suggest that sub-Minimal Word forms disappear once vowel length is controlled at Stage IIc. The forms in (5.46) show that the child at Stage IIc is at the Minimal Word stage of developing prosodic words, with alternations between CVC (or CVN) and CVV forms.

Based on the evidence presented in (5.44 - 5.46), the examples illustrate two kinds of inter-speaker variation with respect to the makeup of prosodic words in Dagbanli: (i) nonexistence of contrast between short and long vowels at Stage I and (ii) problem of challenging segments and prosodic requirements like those found at Stage II. The two instances may create problems for the prosodic realization of early words in Dagbanli. In such cases children's variant forms may ideally satisfy either segmental/syllabic or prosodic requirements, but not both. Demuth (1996:47) states that "the approach to stages of prosodic development relies critically on looking at the shape of children's words as part of an entire phonological system."

5.3.1.2 The Phonotactic Role of the Prosodic Word (ω)

Chomsky and Halle (1968) deduce that "the phonotactics of a language may be accounted for through two mechanisms: (i) morpheme structure conditions (MSCs) and (ii) phonological rules." Booij (1999) assert that "morpheme structure conditions apply to underlying, lexical representations of morphemes, and phonological rules derive the surface form from the underlying form".

Hooper (1972) after the "syllable was reintroduced into phonology argues that the syllable is not only obligatory as one of the domains of application of phonological rules but also as a unit of phonotactic restrictions. Booij (1999:50)

notes that "the principles for the division of a word into syllables have a phonotactic impact which can be characterized as follows":

(5.47) "A word is phonotactically well-formed if it can be divided exhaustively into one or more well-formed syllables" (Booij 1999:50).

For instance, the string of segments (e.g.*[abkʔmaɾ]) is not an imaginable word in Dagbanli and any of its dialects because the string cannot be exhaustively divided into well-formed Dagbanli syllables and the sound combination does not have any semantic realisation as well.

Booij (1999) describes that the construction of well-formed syllables implies that the wellformedness of words is preferred to the wellformedness of morphemes in describing prosodic words. He used a Dutch data to support his claim by noting that "the language has a number of non-native morphemes that end in an obstruent-liquid cluster, and that are always followed by a vowel-initial suffix. That is, these morphemes do not occur as independent words".

(5.48). Morpheme-Final Obstruent-Liquid Clusters (Booij 1999:50)

a. penetr-eer 'to penetrate'
b. con-sacr-eer 'to consecrate'
c. celebr-eer 'to celebrate'
d. vibr-eer 'to vibrate'
e. emigr-eer 'to emigrate'
f. astr-eer 'to castrate'

The examples in (5.48) show that the morpheme-final obstruent-liquid clusters does not surface as codas. Therefore, the prosodic well-formedness of words with these morphemes is positive.

Dagbanli tends to have similar preferences: typical simplex nouns are subject to the prosodic minimality condition that they must be minimally bisyllabic. Dagbanli word usually end in a vowel which functions as a morphological ending. Thus, Dagbanli has lexical morphemes such as verb roots which are followed by the ending [-ɨ] together forming the words in (5.49). Hudu (2010) notes that "vowel epenthesis occurs in verbs, nominal and adjectival roots that underlyingly have only one vowel. In verb roots, the epenthetic vowel is observed in citation forms of roots with the structure CVC".

(5.49) Epenthesis in CVC verb roots

a. lìh[ɨ] 'look'
b. pɨl[ɨ] 'cover'
c. ŋɔ̀b[ɨ] 'chew'
d. fɛ̀b[ɨ] 'whip'
e. bɔ̀ʔ[ɨ] 'split'
f. tàɾ[ɨ] 'share'

Obviously, the CVC morphemes in (5.49) do not obey the prosodic minimality conditions of Dagbanli. This, however, is not a problem since the phonotactic constraints of Dagbanli do not refer to morphemes but to prosodic words as also observed by Booij (1999) using Italian data (e.g. pizz →.pizza).

In addition, this assertion can also be made on the basis of Dagbanli and its dialects where lexical morphemes consist of a sequence of consonants without intervening vowels. That is, these lexical morphemes are always unsyllabifiable. In this case, the non-concatenative morphology of the language takes care of the problem by inserting vowels in between the consonants as seen in (5.50). Consequently, there are no pronunciation problems.

(5.50) Epenthesis in CVCm or CVCC verb roots

CVCm roots		CVCC roots	
tìh[ì]m	'sneeze'	jíʔ[ɨ̂]s[ɨ̂]	'wake up'
bɨ̀l[ɨ̀]m	'roll	bɨ̀l[ɨ̂]s[ɨ̀]	'fondle with'
bɔ̀h[ɨ̀]m	'parasite'	bɔ̀ʔ[ɨ̂]s[ɨ̀]	'describe'
gbáɾ[ɨ́]m	'besmear'	tàb[ɨ̂]l[ɨ́]	'stick to'
bɔ̀h[ɨ́]m	'learn'	tɔ̀ʔ[ɨ̂]s[ɨ́]	'speak'
bɛ̀h[ɨ́]m	'doubt'	bìɛɾ[ɨ̂]g[ɨ́]	'over boiled

Booij (1999) notes that "wellformedness conditions on syllables do not suffice, however, for a complete account of the phonotactics of words. The prosodic word plays its own role, in at least the following ways":

(5.51)

a. "lexical word must be a minimal prosodic word"
b. "there are syllable contact laws and other linear co-occurrence constraints with the prosodic word as their domain"
c. "there are conditions on prosodic word edges."

In the next subsection, I will discuss (a) among the three kinds of conditions listed in (5.51).

5.3.1.2.1 Phonotactic Properties of Lexical Morphemes

Phonotactics is "a branch of phonology that studies the permissible strings of phonemes in a language. Its rules determine which sounds are allowed in each part of the syllable" (Inusah and Mahama 2019:282). Olawsky (1999) describes the syllable [dəm] 'bite' as a perfect syllable of Dagbanli, which occurs as a least frequent lexical vowel and functions as the root vowel in CVC and CV syllables

after different kinds of consonants. This claim may not be accurate in the language.

The fact is that in Dagbanli phonology, there is no evidence of lexical morphemes consisting of a schwa-syllable [ə] only because the sound /ə/ itself does not exist in the language. For this reason, schwa-syllable [ə] cannot project a foot, whereas the minimal prosodic word consists of a foot in any of the dialects. Hudu (2014c:153) observes that "any domain that has more than one mora is a prosodic foot." The observation is that in phonological word that has a foot, every vowel must be specified for [-ATR]. For instance, CVCVCV syllable would be parsed as (CV[CV)CV], with "()" and "[ ]" marking different foot boundaries.

I observed that since a prosodic word consists of at least one foot, [-ATR] vowels does not suffice for forming a CV lexical word. Thus, the basic point to be made here is that the prosodic word (ω) plays a central role in accounting for the phonotactic properties of lexical morphemes because lexical verb roots in Dagbanli occur as independent words, without any further affixation as in (5.52) and each represents a foot.

(5.52). Lexical verb roots in Dagbanli

a. bú‘ beat’
b. jú‘ love’
c. lù ‘fall’
d. be ‘pain’
e. pé ‘milk’
f. té ‘filter’
g. bò ‘seek’
h. tò ‘pound’
i. gò ‘travel’
j. tì ‘give’
k. dì ‘eat’

It is evidence in (5.52) that Dagbanli has independent words, without any further affixation and a [-ATR] cannot head a syllable in a CV root and hence not into a prosodic word, lexical morphemes, which have to be prosodic words, cannot have [-ATR] vowels as their only vowel.

A second observation about the lexical morphemes of Dagbanli is that they never begin with a vowel although word-initial onsetless syllables are possible as seen in (5.53). Consonantal onsets are obligatory in Dagbanli but most Dagbanli words which deviate from this begins in [a]. These words are derived from foreign words except some functional words (and two pronouns) and single loans from other languages.

(5.53) word-initial onsetless syllables

a.	a.da.ka	'box'
b.	a.na.bi	'prophet'
c.	a.lah.ɾi	'Sunday'
d.	al.kal.mi	'pen'
e.	aɾ.zi.ʧi	'treasure'

As presented in (5.53), the syllables which begin without a consonantal onset, the initial vowel is [a]. However, almost all words beginning with a vowel in Dagbanli are loans, most of which come from Arabic via Hausa.

The third observation with respect to the phonotactic properties of Dagbanli lexical morphemes is that they do not begin with a [-ATR]-headed syllable, and do not contain sequences of [-ATR]-headed syllables, this contradicts the claim by Olawsky (1999) that there are sequence of schwa-headed syllables (e.g. /vɪlɪm/→*[vələm] 'whistle') in Dagbanli. One may suggest here that the phonotactics of Dagbanli can be described in terms of properties of syllables and prosodic words.

5. 3.1.3 Prosodic Word (ω) Prediction

A prosodic word is composed of metrical feet (F), syllables (σ) and moras (μ) (Nespor & Vogel 1986). Crossdialectally, the prosodic word coincides with the morphological word in Dagbanli. The notion of the word as a prosodic unit facilitates the description of syllabification and tone marking. For instance, prosodic word functions as the domain where syllabification takes place. Syllabic and morphological structure does not necessarily coincide. The noun /pág-á/ <paɣa> 'woman', for instance, is syllabified as [pa.ga], but morphologically, it is structured into a CVC root /pag-/ and the suffix /-a/. Tone applies to syllables as units of the prosodic word, rather than to morphological structures. Other phonological regularities can be explained by the notion of the morphological word. Two examples illustrating this is vowel harmony and dissimilation through lateral deletion (see Hudu 2014b).

Dixon and Aikhenvald (2003:13) state that, "a phonological unit has at least one phonological defining property chosen from the following areas":

a. "segmental features - internal syllabic and segmental structure; phonetic realisations in terms of this; word boundary phenomena; pause phenomena."

b. "prosodic features - stress (or accent) and/or tone assignment; prosodic features such as nasalisation, retroflexion, vowel harmony."

c. "phonological rules - some rules apply only within a phonological word; others (external sandhi rules) apply specifically across a phonological word boundary." Dixon and Aikhenvald (2003:13)

It is observed that discussions of the phonological word in Dagbanli have touched on each of the three areas noted above. Olawsky (2002) notes that phonological word is usually composed of smaller prosodic units such as feet, syllables or

moras(which in turn are built from combinations of segments). Hudu (2014b) demonstrates how different phonological processes can be used to define the phonological word in Dagbanli and argues that the application of these phonological processes is conditioned by the morphological domains in which potential target sounds occur.

In this section, the discussion shows that the lexical features are more efficient in prosodic word prediction. Based on careful exploration on the mapping relationship and the difference between the lexical word and the prosodic word, I suggest word length as a method of predicting prosodic words using lexical word information in Dagbanli.

5.3.1.3.1 Prosodic word and lexical word relation

Generally, Prosodic word differs in some ways from the lexical word in Dagbanli; there is no evidence of one-to-one mapping between them in terms of length distribution. There are much more monomoraic lexical categories in Dagbanli lexical words than monomoraic prosodic words according to the data I have put together. This in a way to account for the fact that monosyllabic lexical words have the general tendency to build a prosodic word as in (5.54). "The prosodic word must contain at least two moras or syllables" (McCarthy and Prince 1996).

(5.54) $[CV]_{root}$ + $[CV(N)]_{cliticè}$

a.	bɔ́ + ri	→	bɔ́-ɾî	'beat-nom'
b.	pɛ̀ + ra	→	pɛ̀-ɾá	'milk-impf'
c.	bɔ́ + bʊ	→	bɔ́bô	'seek-nom'
d.	jʊ́ɾ + lɪ́m	→	jʊ́ɾɪ́lɪ́m	'love-nom'
e.	bɛ̀ + rɪ́m	→	bɛ̀-ɾɪ́m	'pain-nom'
f.	gɔ̀ + rɪ́m	→	gɔ̀-ɾɪ́m	'travel-nom'

It is noticed that the prosodic word in Dagbanli trend to consist of two syllables as in (5.54) and very few prosodic words appear to have more than three syllables as in (5.55). This is due to the bi-syllabic rhythm demand to build the prosodic foots in the phonology.

(5.55)

a. jíl-î jí-jâ ‘short house’
b. jíl tɨtá-lɨ́ ‘big house’
c. wàɾ-dɨ́bɨ́-gâ ‘stallion’
d. pó-kpáɾɨ́-bá ‘farmers’

The data in (5.55) mainly concerns the length of prosodic words, which is the important factor for prosodic word construction. This explains why the lexical words bundled to form the bi-syllabic prosodic words by assembling mono-syllabic lexical words and splitting the longer lexical words. For instance, in the utterance- [nàngbàn-jíní làhiŋ-gô]]] ‘unity organization’- the prosodic words are all from two lexical words. Thus, the prosodic word [nàngbàn-jíní] ‘unity’ is constructed by the lexical word [nàngbàn[ɨ́]] ‘mouth’ and [jini] ‘one’

Other works (e.g. Olawsky 1999) reveal that prosodic word in Dagbanli is more concerned with the lexical information and most times only relative to the two adjacent words. The lexical information seems to be the most important cue for predicting the prosodic word. This suggests that most prosodic words in Dagbanli are from one or two lexical words when they are constructed. The length of lexical word is a significant factor to influence the construction of prosodic word. Of all the lexical words, the mono-syllabic and bi-syllabic words are the most likely to be bundled. The process of mono-syllabic and bi-syllabic words should be the emphasis of prosodic words prediction.

In addition, the lexical word with more than three syllables as in (5.56) usually divides into several parts, which have two or three syllables. Almost every lexical word with length longer than three syllables will be divided into different parts.

(5.56) Parsing four syllable lexical words

a. /jíl-î jí-jâ/ 'short house' → {jíl-î}$_{ω}$ 'house' + {jí-jâ}$_{ω}$ 'short'
b. /jíl títá-lí/ 'big house' → {jílí}$_{ω}$ 'house' + {tɨ́tá-lɨ́}$_{ω}$ 'big'
c. /wàr díb-gâ/ 'stallion' → {wàhó}$_{ω}$ 'horse' + {díb-gâ}$_{ω}$ 'stick'
d. /pó-kpár-bá/ 'farmers' → {pú:ní}$_{ω}$ 'farm' + {kpárɨ́-bá}$_{ω}$ 'labourers'
e. /kpár[ɪ]-bá/ 'labourers' → *{kpár}$_{ω}$ *{bá}$_{ω,}$ {kpár-bá}$_{ω}$ 'farmers'

The examples in (5.56a-d) suggest that prosodic words are formed through assembling or splitting the lexical words. It shows that the mono-syllabic word is more likely to bundle with others while some bi-syllabic lexical words are also likely to be in a prosodic word with other lexical word as in (5.56e).

5.3.1.3.2 Approach to prosodic word prediction

The discussions in (5.3.1.3.1) suggest that the word length information is a crucial factor in determining prosodic words since the prosodic word prediction is based on the lexical word analysis (word segmentation). Considering the methods of prosodic word construction, there are two possible approaches to consider for prosodic word prediction:

(5.57) i. combining lexical words into a prosodic word.
ii. separating some lexical words into prosodic words

These two approaches are represented in the figure below:

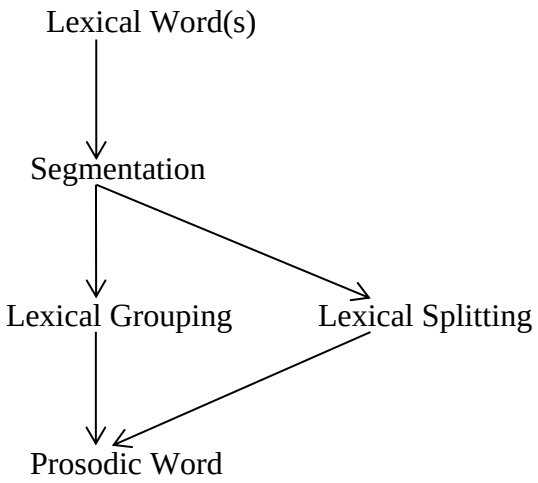


Figure 5.5: Approach to prosodic word prediction

Figure (5.5) shows that in (5.57i), two adjacent lexical words should be combined into a prosodic word; this is referred here to as lexical grouping. The forward parsing, which parses the text from left to right, is used when doing lexical grouping, For (5.57ii), it is discovered that the long lexical words are the most likely to be divided at the even position into bi-syllabic prosodic words. The lexical words longer than four syllables are divided using the lexical splitting as illustrated in (5.56). For this reason, I suggest that most of prosodic words in Dagbanli are formed by the lexical word grouping method; therefore, the first approach (5.57i) is the more relevant means of constructing a prosodic word.

The observation and analysis of the distribution of the prosodic word in real utterances, it is ascertained that the monosyllabic and disyllabic lexical words are the prominence to be processed to form a prosodic word and the bundling between lexical words is a main method to form prosodic words. Based on this, I put forward that the proficient method to predict the prosodic word is the word length.

5.4 Tone

Dagbanli is a tone language, which means that the meaning of a word in the language and its dialects depend not only on the vowels and consonants of which the word is constructed but also on the relative pitch on which each syllable of the word is pronounced. Although pitch functions in general to convey nonlinguistic information, for instance, about the speaker's emotional state, in a tone language, pitch is typically used to make linguistic distinctions:

i. intonation - distinctive pitch levels within a phrase or sentence,

ii. tone - distinctive pitch levels within a word.

"Tone and intonation are not mutually exclusive; tone languages show intonation of all types. This is possible since the tones are not absolute but relative pitches" (Hyman 2011). The goal in writing this section is twofold; First, I propose to cover some of the aforementioned contributions that tone has made at the level of word in Dagbanli. Second, I wish to show that there is much to learn from intonation which has received no attention during the past decades in Dagbanli.

5.4.1 Tone in Dagbanli

Dagbanli is a tonal language because it displays simple tones-H(high) and L(low). It is widely found in Dagbanli that there are some pairs of words in which tone is minimally contrastive, that is, the segmental structure of such words is identical, and the words differ from each other only in tone as in most African tone languages and the lexical differences are expressed by distinction of tone in a number of cases.

This is seen in the minimal pairs in (5.58) showing examples contrasting two tone heights.

(5.58) Tonal minimal pairs

a.	tì	'give'	L
	tí	'vomit'	H
b.	dì	'eat'	L
	dí	'win'	H
c.	kúlí	'funeral'	H H
	kúlì	'hoe'	H L
d.	gbál-lí	'grave	H-H
	gbàl-lí	'zana mat'	L H
e.	pál-lí	'road'	H H
	pál-lì	'new'	H L

The examples in (5.58) show that Dagbanli tone system basically distinguishes two tons of relative pitch level, ie, H and L. For certain contexts, H tone may be lowered to a downstepped high tone and combinations of high- and low-level tones appear as rising (L H) or falling (H L) contour tones.

Yip (1996) notes that "[A]frican languages typically contrast two, perhaps three level tones compare to East Asian languages, particularly Chinese languages, which frequently contrast four levels and several rising or falling (i.e., contour) tones". Dagbanli has two contrastive tones: H and L with L as the default tone. It is observed that the Nayahili and Nanunli dialects have "a contrastive falling tone that falls on unsuffixed CV roots" as in (5.59).

(5.59) Contrastive falling tone on CV roots in Nayahili

a.	bá	'ride'	H(high) tone
	bà	'river'	L(low) tone
	bâ	'father'	F (falling) tone
b.	dú	'climb'	H(high) tone
	dù	'high'	L(low) tone
	dôŋ	'enemity'	F (falling) tone

Notice that syllables that bear falling tones in Nayahili and Nanunli dialects bear a high tone in the Tomosili dialect (e.g., bâ → bá 'father'). The general issue here is whether contours should be treated as unitary tonal elements or a complex composed of two (or more) level tones.

Taking Dagbanli as a case in point, Dagbanli has rich inflectional and derivational morphology and its tonal system appears quite simple. It has just two basic level tones: H (high), indicated by an acute accent /á/ (e.g. má 'mother'), and L (low), indicated by a grave accent /à/ (e.g., wà 'dance') plus a F (falling) tone, indicated by a circumflex â (e.g., dôŋ 'enmity'). Long vowels are indicated by double letters (e.g., <mee> mí: 'sour') and tone is marked on both the first bowel and the suffix (e.g., dá-á 'market'). Dagbanli tone system is relatively simple and easy to comprehend and partly because the surface simplicity masks a range of interesting complexities. The focus here is on general tonological issues, drawing examples mostly from Dagbanli and its dialects.

5.4.1.1 Tone-bearing unit

Tone-bearing unit (TBU) is one of the fundamental problems in understanding tone. Goldsmith (1976) state that….

> …there has been some ambiguity in previous uses of the term tone-bearing unit. It is maintained here that tones are not directly associated with vowels or other segments, but rather with higher-level units ('tone-bearing unit') such as the syllable or syllable-final (rhyme), in which vowels typically function as peaks of prominence (1976:181).

Phonetically, vowels and nasals are the elements which bear tone, that is, a distinction of tones is relevant when occurring on such segments. Since segments are organised into larger units such as the syllable, foot, morpheme, and word; it is prudent to determine which larger unit functions as the TBU phonologically. In this, I discuss which elements can function as the TBU in Dagbanli.

The notion of the fact that vowel length in Dagbanli is distinctive makes the issue of TBUs easy to handle. I show here that in CV.V and CVN words, the assignment of tones to a TBU is one-to-one mapping and moras are the elements which bear the tones. In Dagbanli and its dialects, there are cases in which regular one-to-one mapping between TBU and syllable is not observed. The occurrences of CV.V and CVN syllable types in word-final position display regular behaviour regarding tone assignment as shown in (5.60).

(5.60) Tone on CV.V or CVN nouns

a.	H-H	[bá-á]	<baa>	'dog'
b.	L-H	[nà-á]	<naa>	'chief'
c.	H-L	[dú-ù]	<duu>	'room'
d.	H-H	[sɨ́ŋ́]	<siŋ>	'pot'
e.	L-H	[kɔ̀ŋ́]	< kɔŋ>	'leper'
f.	H-L	[lóŋ̀]	<luŋ>	'drum'

The data in (5.60) show that CV.V and CVN syllables in words, which consists of a lexical root and a number suffix as in (5.60a-c) and CVN syllable with a coda nasal as in (5.60d-f), can bear more than one tone. Notice that CVN syllables are analysed as two syllables and that nasals in this position are part of the second syllable and not the preceding CV. They nasal are, however, bear H or L tone independent of the tone on the preceding vowel as in (5.60d-f).

Yip (1996:385) notes that "in some African languages, contour tones appear only on long vowels or closed syllables. This suggests that the TBU is the mora, and tone association is strictly one-to-one". In Dagbanli and its dialects. I observe from the data (cf. 5.60) that sonorant-final syllable (vowel or nasal) may bear any tone while oral-final consonants (l, ɾ, b, ʔ, h) syllables may not bear tone. Such syllables are shorter than the sonorant-final syllables. These facts suggest that mora is the TBU and only sonorant codas are moraic and there is open-syllable and lengthening in Dagbanli.

To confirm this, it is attested in previous studies (Hudu and Nindow 2020:531) that "nasals are unique for being the only non-vocalic tone bearing units." This shows part of the evidence for positing the mora as the tone-bearing unit in Dagbanli and coda consonants as moraic. Nayahili and Zundusili (ED), coda nasals bear falling tone, like vowels, in word-final positions as presented below.

(5.61) Nasals with falling tones in ED (Hudu and Nindow 2020:531)

a. kpám̂: 'oil'
b. dám̂: 'alcoholic drink'
c. kɔ̀m̂: 'water'
d. táɾm̂ 'a non-royal'

Naya and Zun also show open-syllable and lengthening in as evidence of mora as TBU. This is attested in dorsal nasal [ŋ] lengthening which occurs to compensate for a lost vowel that would otherwise follow the nasal.

(5.62) /ŋ/ lengthening in ED (Hudu 2014a:15)

a.	/kɔ̀n.-gá/	[kɔ̀ŋá]	→	[kɔ̀ŋ́:]	'leper'
b.	/zɔ́n.-gá/	[zɔ́ŋá]	→	[zɔ́ŋ́:]	'leper'
c.	/bɔ̀n.-gá/	[bɔ̀ŋá]	→	[bɔ̀ŋ́:]	'donley'
d.	/sɔ̀m.-gá/	[sɔ̀ŋá]	→	[sɔ̀ŋ́:]	'good'
e.	/pɔ́m.-gá/	[pɔ́ŋá]	→	[pɔ́ŋ́]	'rooten'

Similar evidence is attested (Hudu 2018; Hudu and Nindow 2020) where verb-final labial nasal [m] optionally lengthens when followed by the pronominal clitics [a, o].

(5.63) /m/ lengthening in ED (Hudu 2018:217)

a.	/làʔm/	→	[là.ʔm̩:.ó]	'meet him/her'
b.	/sàʔm/	→	[sà.ʔm̩:.á]	'spoil you'
c.	/jɔ́hm/	→	[jɔ́.hḿ:.á]	'deceive you'
d.	/bɛ̀hm/	→	[bɛ̀.hm̩:.ó]	'doubt him/her'
e.	/ʧĩlm/	→	[ʧĩ.lḿ:.ó]	'delay him/her'

In terms of feature geometry, the question of what the TBU is, becomes what do tones link to? There is good evidence that tones link to the mora. In Dagbanli, verb stems are assigned H or L tone in word-initial position, depending on the semantic level of the verb. H or L is assigned to the first mora in the perfective form; a syllable with a long vowel is functionally equivalent to two syllables with short vowels (e.g. zó: 'fly' vs. zó.hí 'flies').

(5.64) H or L in word-initial position in

a.	[tí]$_{root}$ - [bû]$_{suffix}$	'giving'
b.	[tú]$_{root}$ - [bû]$_{suffix}$	'insulting'
c.	[kó]$_{root}$ - [bû]$_{suffix}$	'farming'
d.	[dí]$_{root}$ - [bû]$_{suffix}$	'eating'
e.	[mí]$_{root}$ - [bû]$_{suffix}$	'raining.'
f.	[zò]$_{root}$ - [bû]$_{suffix}$	'escaping'
g.	[tà]$_{root}$ - [bû]$_{suffix}$	'plastering'

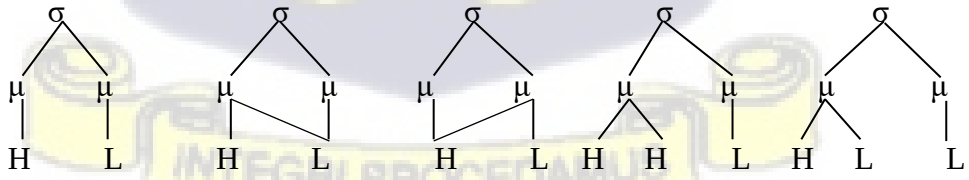
I suggests here that mora is the TBU in Dagbanli since the sonorant codas of word-internal CV.V and CVN syllables bear tones (cf.5.60), they syllables are bimoraic and bear contrastive tone, which makes a mora-based account possible in the language. This, contradicts Olawsky's (1999) argument that CVV and CVN syllables never bear contrastive tone and are not moras. As discussed (cf. 5.60), CV.V and CVN syllables are bimoraic and bear contrastive tone in Dagbanli and its dialects, which favour mora as relevant for syllabification and tone assignment. In example (6.65), regardless of how one counts, what is counted are vowel moras but not segments and not syllables. Stated in terms of a mora count, H or L is simply assigned to the first mora in the perfective forms and there is consistent locus of tone assignment if one counts mora.

(6.65)

			Segment	mora
a.	tí-bû	'giving'	4	2
b.	dí-bû	'eating'	4	2
c.	bɔ̀hɨ̀n-dɨ́	'learning'	7	3
d.	gàŋ-dɨ́	'discriminating'	5	2
e.	pàlɨ́g[ɨ́]-ɾá	'fading'	8	4

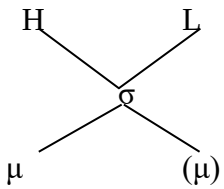
The mora count in (5.65) provides evidence of permitting the mora to be the TBU, in that Dagbanli has a bimoraic contour-toned syllable that may be represented as follows:

(5.66) bimoraic contour-toned syllable



Notice that (5.66) show how tones are linked to moras within the syllable but not to the syllables. This may be problematic if the tones (H L) are linked to a syllable as as shown below:

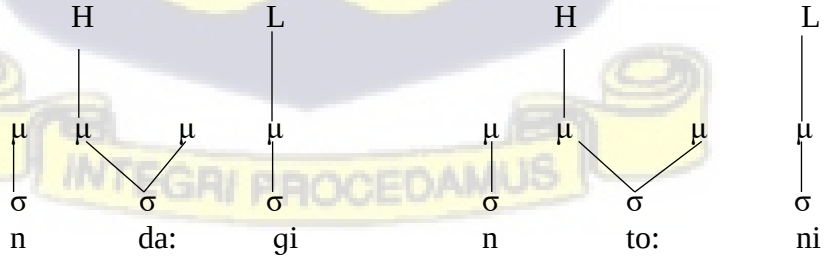
(5.67)



The observation here is that in (5.66) the syllabic tone theory, the whole syllable has a falling tone which is common in Nayahili and Nanunli. This is ruled out in languages which syllabic TBU theory holds the reason been that such languages may not count for "moras are handled in the syllable-based theory and may possibly not represent contour tones when one tone of a contour is phonologically unspecified" (Yip 1996:386).

In Zundusili, syllables display a contrast between rising and falling tones. As discussed in Odden (1990), L toned moras are represented phonologically with no tone, and surface L tone is assigned by a late rule of default tone assignment. The moraic theory easily represents the contrast between [ǹ dá:gì] 'to push' and [ǹ tó:nì] 'my front'

(5.68)



Note that since pre-nasal /n/ clitic may not show the L tone so the argument is that if tone is linked to syllables, then there is no way to represent the contrast in (5.68). This, therefore, support the fact that mora is the TBU in Dagbanli and its dialects.

5.4.1.2 Falling tone as H-L Sequence

From an early period, Hyman (1993); Olawsky (1999, 2002) and Hyman & Olawsky (2004) propose that "the falling tone be analyzed as a sequence of H(high) plus L(low) on a single syllable. This type of analysis has been posited more generally for African languages viewed typologically". Goldsmith (1990) observes that…

> …the possibility of many-to-one associations between one tier and another opens up the possibility of treating rising and falling tones as sequences of level tones-associated with a single vowel…Among African tone languages, it has been demonstrated in countless cases that these tonal patterns (falling and rising tone) are best treated as sequences of High-Low and Low-High respectively (1990:39).

Dagbanli has ample evidence for treating F (Falling) as H-L on a single syllable considering the following factor: (i) falling tones may only occur on heavy syllables, that is, those with two potential tone-bearing units (TBU) and (ii) simple H and L tone occur on light (short vowel) syllables as well as on heavy syllables. This is illustrated in below:

(5.69) Falling tone in Gbanjonsili

a.	F	nô:ŋ-gá	'bird'
		tê:ŋ-gá	'beared'
		dâ:ŋ-gá	'hearth'
		bâ:ŋ-gá	'singer'

b. H-L

pál-lì	'new'
kúlì	'hoe'
ná-à	'chief'
bà	'river'
té	'filter'

Additionally, other manifestations of falling tone in Dagbanli are described below following Newman (1996):

1. phonologically shortened words, an original L tone combines with an H to produce a Fall. This can be seen in coexistent variants as seen below:

(5.70) /lâŋ/ → [láŋ-à] <laŋa> 'net-sg'

2. F equals HL is particularly evident in paradigms that have a set H-L tone pattern

(5.71) /dâm/ → [dám-à] <dama> 'alcohol-pl'

3. The grounding of floating L tones, which are associated with certain morphemes, produces an F.

(5.72) /dátá:/ 'rival' + /nà-á/ 'chief'→ [data:ná:] <data naa > 'rivalry chief'

4. Disyllabic words with the tone pattern F-H fall into the same morphological class as comparable H-L-H verbs.

(5.73) /ʤâ:-ʃé:/ 'laurel' or / bâ:ŋ-gá/. 'singer', cf. pʲékàɾ-lɨ́ 'fat sheep'.

Words with a final F tone behave as if they had a final L in assigning tone to the stabilizer morpheme (<nyee> 'nose', <bee> 'shin'), whose tone is always polar to that of the preceding syllable.

5.4.1.3 Falling tone as a unit contour

The above evidence seems at first sight unarguable, however, there are other factors that point in another direction even if one were to agree that contour tones in Dagbanli are underlyingly nothing but sequences of level tones. Newman (1995) observes in Hausa that as one approaches the surface, these contours acquire a linguistic reality which sets them apart from the level tones. This reality manifests itself most prominently in the tendency to do away with contours by simplifying them to level.

It is a simple fact in Dagbanli that combinations of H and L level tones appear as rising (L-H) or falling (H-L) contour tones. Nayahili and Nununli dialects appears not to have a R(ising) tone. Across dialects, Dagbanli show evidence of many disyllabic H-L words and, as illustrated above, when, for any number of reasons, H-L becomes associated with a single syllable, the H-L surfaces an F. Since L-H is also a common disyllabic pattern in Nayahili and Nununli dialects, one would expect to find words where the L-H has become attached to a single syllable resulting in a surface Rise. So, what has happened to the missing Rise?

Generally, the absence of the R(ising) is due to a general rule, first mentioned by Parsons (1995), whereby R (LH) →H. This is illustrated in the examples in (5.74), the form on the left is dialectally or stylistically equivalent to and derived from the form on the right. (the circumflex on vowels indicates a Rising tone.).

(5.74) a. *dʷŭa (<duu>) → dŭ: 'room', cf. kɔ̀ḿ dú: 'water room'

b. *dăŋ (*dàŋ) → dáŋ̀ 'family' cf. bâŋ (H-L) pattern 'bracelet'

c. *dănà:(L-H-L pattern) →dánà: 'name of a person' cf. dàkɔ́l-ɔ̀ (typical 3-syllable L-H-L)'week-sg.'

Notice that the R→H change is not regular in Dagbanli, rather, it appears to be a conditioned rule that is sensitive to the preceding tones. If the R is preceded by L or is word initial, as in the examples above, then the rule does apply as postulated, presumably in an exceptionless manner. If, however, there is an immediately preceding H tone in the same word, i.e., one has an H-LH sequence, then the R simplifies to L, i.e., R (= LH) → L / H____. Thus H-LH results not in H-H, as predicted by the originally formulated unconditioned rule, but in H-L as in (61).

(5.75) * gă~~ŕ~~ŋ́-gà /gáŕŋ́-gà/ → [gáŕ-gà] 'type of snake'

*tă:ŋgà /tá:ŋ-gà/ → [tà:ŋ-gà] 'shea nut'

Rising tones are noted to have articulatory and perceptual weaknesses as compared with falling tones (Newman 1995; Sundberg 1979). In this case, there is a natural tendency for rising tones to simplify to level tones (especially high). This explains why among the languages of the world that have contour tones, rising tones appear to be less common than falling tones (Cheng 1973; Maddieson 1978).

In summary, although we can formally represent rising tones in Dagbanli as LH attached to a single syllable, a rule such as R → H talks much about the linguistic

factors involved in the tone change than does an LH → H rule. In contrast to Rising tones, which are totally absent in Nanunli dialect, falling tones are common.

A detailed analysis of the tonal system requires certain phonological principles which are useful for the description of tonal regularities. Odden (1996) states that there are two central questions about the geometry of tones:

(a) where do tones link in phonological representations, and

(b) what features define tones?

The first question leads to the analysis of what the tone-bearing unit (TBU) is in Dagbanli (cf. 5.4.1.1) and the second question triggers a discussion of tonal structure in detail, including the relationship between basic tones (cf. 5.4.1.4).

5.4.1.4 The relationship between basic tones

5.4.2 Intonation in Dagbanli

Intonation is the name given to the fluctuation of pitch in spoken utterances. It normally refers to the pitch patterns of a larger grammatical unit such as a phrase (e.g. [ḿ-bâ] 'my father'), clause or sentence (e.g. [ń kpì-já] 'I am dead'), though a sentence may consist of only a word, in which case intonation can apply to it. Intonation has three basic properties:

(5.81) a. It is language universal as there is no language which is spoken as a monotone.
b. It is functional as it is used in a language for a particular purpose and not merely for avoiding speech becoming monotonous.
c. It is systematic as different speakers use the same patterns for the same purposes though there may be dialectal differences.

The function of intonation can be grouped under four general headings. Intonation in a language serves to structure the information content of a sentence as to show which information is new. Second, to determine the speech function of a sentence, i.e. to indicate whether information in the sentence is intended as a statement, questions etc. Third, to convey connotational meanings of 'attitude' such surprise, annoyance, enthusiasm etc. and four, to charactise a particular style or variety of the language (stylistic function). For instance, telling a joke or guiding a party of tourists.

The concern of Dagbanli in this section is the first two (5.81a-b) of the four functions above. In this section, the general aim is to describe the intentional structure of Dagbanli and its dialects. Even though intonational patterns in Dagbanli have not been described, I confirm here that the dialects share similar patterns of prosodic groupings despite their tonal differences.

The data I examine here are from the native speakers of Dagbanli particularly Nayahili and Zundusili dialects. The following varieties of methods for recording intonational patterns in writing were studied.

(5.82) methods for recording intonational patterns

a. *The 'linear' method* introduced by Fries (1940) involving drawing a line around the sentence to show relative pitch heights

b. *The 'creasy letter' method*. This is a variant of the 'linear' method where the syllables are written at different heights across the page. Both 'creasy letter' method and the 'linear' method are referred to as expressive, in that they reflect the pitch movements directly.

c. *The 'levels' method*. A number of discrete levels of pitch are reorganized and the utterance is marked accordingly.

d. *The contour method*. This is favoured by most linguists. The basic difference between 'contours' and 'levels' is that 'contours' treat the pitch pattern of an utterance as a whole, instead of dividing it into sections each of which has its own level.

There current and ideal methods (e.g., the acoustic software 'Praat') which can be used to generate contours effectively. The current work did not consider any acoustic software for the data descriptions. The contour method was employed in soliciting the data for the intonational pattern using a question and a statement in Dagbanli:

(5.83) a. Q: ŋuni ŋʊbɨ kɔb-lɨ
who chew-perf bone-sg
'who chewed a bone?'

b. R: kɔn-sɨ ŋʊbɨ kɔb-lɨ
leper-pl chew-perf bone-sg
'Lepers chewed the bone'

The question and statement were selected because it was easy to solicit response from responded and easy to integrate into a natural conversation. The sentences were also suitable for the method employed since it treats the pitch pattern of an utterance as whole and not separate units and finally the intention was to track the intonational difference in sentences.

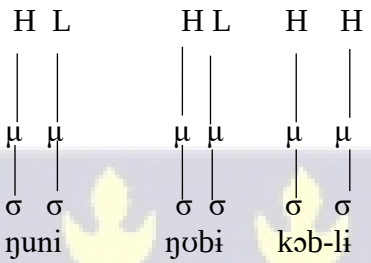
The WhatsApp medium was used to record the voice messages of thirty (30) native speakers of Dagbanli aged between 45-60 years by way of replying my messages. Ten (10) respondents were selected from each area. A written version of the sentences were sent to each respondent via WhatsApp message and they responded by doing a voice recording while reading each of the sentence after which the recorded version was sent back to me via WhatsApp. Tone markings in the data show the actual tones that vowels bear when embedded in the tonal phrase which may be different from their tone in isolation. I present the data and discussions following moraic phonology in which the prosodic tier is characterized

as moraic where a short vowel is underlyingly monomoraic while a long vowel is bimoraic.

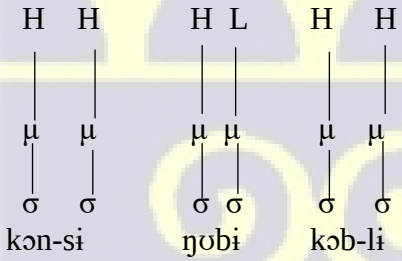
Tomosili

Tomosili is written as the standard dialect of Dagbanli. Ten (10) respondents aged 45 and 50 years were contacted to read the sentences. The data in (5.84) show 75% of the exact tone pattern of the consultants' voice reading while reading recording.

(5.84)a. Q. Who chewed a bone?



b. R: 'Lepers chewed the bone'

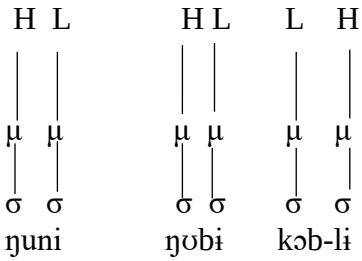


The pattern H-H is found on both the subject noun [kɔn-sɪ] and the object noun [kɔb-lɪ] but the verb [ŋʊbɪ] receives H-L which is realized on the [ŋʊb] plus the suffix [-ɪ]. The verb appears after the H tone subject noun [kɔn-sɪ], this H tone spreads onto the two syllables of [ŋʊbɪ], thereby creating H plus H-L falling sequence. Tomosili by this would have the intonational phrase of H-H-L or H-L-H in carrier phrase.

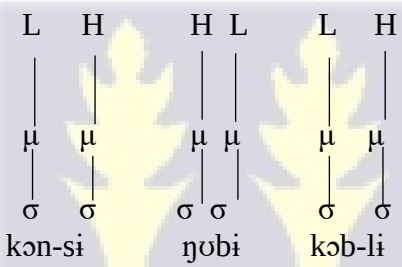
Nayahili dialect

Ten respondents aged 46 and 48 years were consulted from the traditional capital, Yendi. The data in (5.85) show 80% of the exact tone pattern of their voice reading and recording on WhatsApp.

(5.85)a. Q. Who chewed a bone?



b. R: 'Lepers chewed the bone'

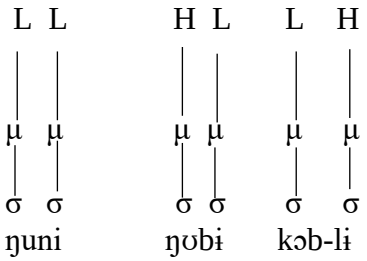


The constructions in the dialect describe a sequence of L-H noun subject [kɔn-sɨ], H-L verb [ŋʊbɨ] and L-H noun object [kɔb-lɨ].

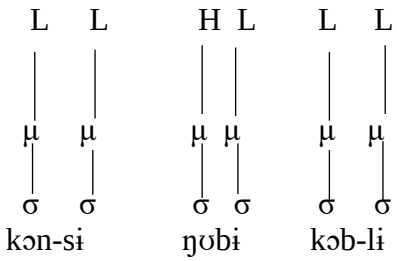
Nanuunli dialect

Ten respondents aged 45 and 60 years were consulted from the traditional capital, Bimbila. The data in (5.86) show 65% of the exact tone pattern of their voice reading and recording on WhatsApp.

(5.86)a. Q. Who chewed a bone?



b. R: 'Lepers chewed the bone'



The constructions in the dialect describe a sequence of L-L noun subject [kɔn-sɨ], H-L verb [ŋʊbɨ] and L-L noun object [kɔb-lɨ].

5.4.2.1 Intonational phrase in Tomosili

The structure of Tomosili intonation is hierarchical organized in such a way that an intonational phrase can have more than one tonal phrase, which in turn can have more than one word. As in many prosodic hierarchy models, the Intonational Phrase is exhaustively parsed into a sequence of tonal phrases conforming to the "Strict Layer Hypothesis" (Selkirk 1984; Nespor and Vogel 1986; Hayes 1989). In this case, the intonotional phrase contour includes tonal patterns of one or more tonal phrases. The last syllable of intonational phrase is shortened and optionally followed

by a pause. The tonal phrase has tonal pattern demarcating the beginning and the end of the phrase.

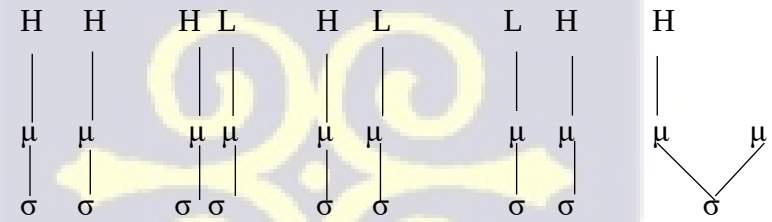
The tonal phrase has a phrase final rising pattern L-H, and the intonational phrase has several boundary tones such as L, H, H-L, L-H, H-H, H-L-H. However, when the syllable is final to the tonal phrase and at the same time is final to the Intonational Phrase, the final rising tone of the tonal phrase is preempted by the tones of the higher level, intonational boundary tone. For instance, the last syllable of the last tonal phrase can be realized with low tone when the utterance is a statement. The utterance in (5.87) is a pitch track of a sentence showing the tone patterns for the two levels based on the 'linear' method and (5.88) based on mora phonology.

(5.87)a.

kɔ́n-sɨ́	bɨ́hɨ̀	ŋʊ́bɨ	kɔ̀b-lɨ́	má:
leper-pl	small-pl	chew-perf	bone-sg	Det.

'Small Lepers chewed the bone'

(5.88)



'Small lepers chewed the bone'

There are two intonational phrases with the Low intonational phrase boumdary (L) before and after the main verb [ŋʊbɨ]. Here, each intonational phrase consists of two tonal phrases [kɔ́nsɨ̀ bɨ́hɨ̀] and [kɔ̀b-lɨ́ má:] marked by (F) with a sharp contour

corresponding to the last syllable of the phrase. The first tonal phrase [kɔ́nsɨ́ bíhɨ̀] has two lexical words, an adjective [bíhɨ̀] and a head noun [kɔ́n-sɨ́]. This is true for the other tonal phrase [kɔ̀b-lɨ́ má:].

The pattern of the intonational phrase final boundary tone is prudent because an utterance can have dialectal difference depending on the tonal pattern of the boundary tone such as H, L, H-L etc. For example, the low boundary tone of [ájì ʧáŋ] (ájì 'name' + ʧáŋ 'go') makes the utterance a statement, meaning 'Ayi went', while the high boundary tone (e.g. á-jí ʧáŋ) can make it a conditional sentence meaning, 'if you go.'

The pattern of the intonational phrase final boundary tone is prudent because an utterance can have different meanings depending on the tonal pattern of the boundary tone such as H, L, H-L etc. For example, the low (L) boundary tone makes the utterance a statement, while the high boundary tone can make a question.

(5.89)

	Statement		Question
a.	kɔ́n-sɨ̀ ŋʊ́bɨ̀	b.	kɔ́n-sɨ́ ŋʊ́bɨ́:
	'lepers ate'		'Lepers ate?'

The surface tonal pattern of Dagbanli tonal phrase differs depending on the number of syllables within the tonal phrase. In tonal phrases with one or two syllables, the observed melody is L-H but tonal phrases with three or more syllables the observed melody is L-H-L-H. The data in (5.90) show pitch track of sentence where the first phrase has a different number of syllables.

(5.90)

[dàkól-ô]	[dàb kóɾ-gò]	[bʊ̀ʔsɨ́]	[má]
week.sg	slave-old	describe.perf	me

'A week-old slave described me'

The tonal phrase in (5.90) shows the L-H pattern, thus the tonal pattern of the tonal phrase is realized as L-H-L-H when the phrase is longer than three or four syllables but becomes H-L contour when the phrase is short. In this case, the initial H is not as high as the final high tone. In a fast speech, the tonal phrase gets heavier in terms of the number of syllables.

5.4.3.2 Intonational pattern in Nayahili and Nanunli dialects

The intonational pattern of Nayahili and Nanunli dialects is hierarchical organized just as in Tomosili dialect. The constituent prosodic levels are from the highest to the lowest intonational phrase, tonal phrase and prosodic word. This prosodic structure conforms to the Strict Layer Hypothesis proposed by Selkirk (1984). The presence of H-L tone of a Tonal phrase triggers downstep of the following phrase just as in English in which the presence of the bitonal accent such as H*+L triggers downstep of the following accent.

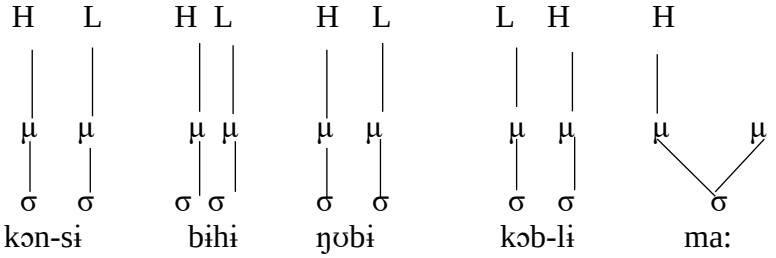
The tonal phrase in Nayahili dialect is similar to that of Nanunli in that it is a prosodic level higher than the prosodic word and lower than the intonational phrase. However, Nayahili and Nununli tonal pattern differ from Tomosili tonal pattern which I describe as follows. The utterance in (5.91) is a pitch track showing the tonal pattern for the tonal phrase within the Intonational phrase.

(5.91)

kɔ́n-sɨ	bíhɨ̀	ŋɔ́bɨ	kɔ̀b-lɨ	mà:
leper-pl	small-pl	chew-perf	bone-sg	Det.

'Small Lepers chewed the bone'

(5.92)

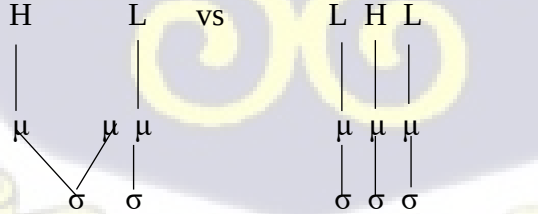


'Small lepers chewed the bone'

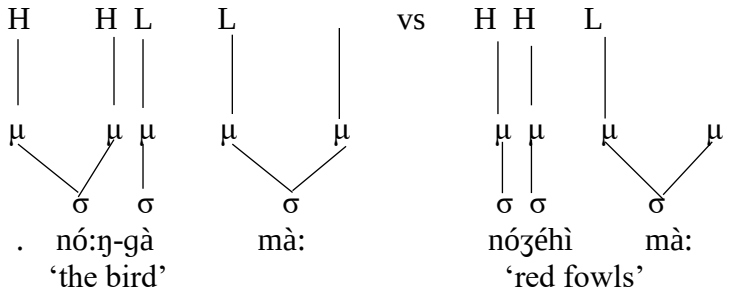
In the example [kɔn-sɨ bɨhɨ]H-L, [ŋʊbɨ], [kɔ̀b-Ì mà:] L are produced by both Nayahili and Nanunli speakers. The utterance has almost similar manifestation in both the dialects in free variation and the choice is speaker dependent though more prominent in Nanunli. The tonal pattern of Nayahili and Nanunli tonal phrase has two alternative forms: one is LHL and the other is HHL. This pattern is determined by the falling tone of the phrase final vowel.

Let us look at the tone realisation of Nanunli tonal phrase in a phrase longer than three moras. An example for the length contrast and tone pattern is illustrated in (5.93). The tones are not lexically linked to each mora but represent a surface tone pattern.

(5.93) .



((5.94)



For Nayahili and Nanunli tonal phrase, when there are more than three moras in tonal phrase, the tones are realized as L-H-L and H-H-L where each tone is mapped to each mora of the tonal phrase from left to right and the fourth and following mora are all realized as L tones. When there are two moras, the second mora has a falling tone (H-L) and the first mora has either H or L.

5.5 Summary of the Chapter

This chapter has demonstrated the studies of suprasegmental phonology of Dagbanli describing the prosodic units - the prosodic word (ω), the syllable (σ) and the mora (μ). Prosodic word in Dagbanli is discussed in the domain of prosodic word development following Demuth & Fee (1995) four major stages in the acquisition of prosodic words by children. It accounted for inter-speaker variation in Dagbanli at different stages in the development of prosodic words and showed that children work simultaneously at different levels of phonological structure and concluded that most children enter the Minimal Word stage (stage II) with difficulties in articulating coda consonants. For such children, CVCV forms are usually found at Stage IIa ((C)VCV).

With respect to phonotactic properties in Dagbanli, lexical morphemes do not have a [-ATR] vowel-headed syllable and do not contain sequences of [-ATR] vowels-headed syllables, which contradicts the claim by Olawsky (1999) that there are sequence of schwa-headed syllables in Dagbanli. There is evidence in the language that a prosodic word is a product of monosyllabic words (or clitics) which trend to bundle together and must contain at least two moras or syllables. This shows that lexical word grouping approach is a more relevant means of constructing a prosodic word as opposed by lexical splitting.

The chapter discussed the syllable structure of Dagbanli which are dominated by the sequence V, CV, CVC, CV: syllable shapes. The most basic syllable shape is CV structure being the prototypical syllable structure. Dagbanli also exhibits CVC closed syllable type with obligatory onset and coda but has a system that does not allow complex onsets (CCV) and codas (VCC). Dagbanli and its dialects also have a syllabic nasal which occurs rarely in the lexicon of the language. It showed that Dagbanli *counts* CV.V and CVC syllables as heavy while CV syllable is light and provided convincing examples to show moraic consistency, which supports Hudu (2014c) assertion that mora exists as an active unit in Dagbanli phonology. It is observed that recognising an active mora leads to the generalization that the distribution of the vowels [ɨ, ʊ] in Dagbanli is prosodically conditioned and occurs only in a constituent that is minimally bimoraic and restricted from a CV verb (sub-minimal because it has only one mora or syllable).

The studies of Dagbanli and its dialects in great depth, using a full array of synchronic (including dialectal) and comparative data allows one to come up with insights that provide a different perspective from the normally accepted analyses

and generalizations. I have presented new findings and interpretations about Dagbanli pitch system, which have implications for peoples' ideas about phonological theory and general phonological processes. (i) Dagbanli is a tone language with two contrastive tones H and L with the L tone as the default tone. Nayahili and Nanunli dialects have contrastive falling tone that falls on unsuffixed CV roots. (ii) With regard to TBU, the mora is described as the TBUs in Dagbanli and not the count of segments and syllables. CV.V and CVN syllables are bimoraic and bear contrastive tone in Dagbanli, which favour mora as relevant for syllabification and tone assignment. This makes mora-based accounting possible in the language and leads to the conclusion to regard mora as a significant prosodic unit for Dagbanli phonology. (iii) At some level, contour tones in Dagbanli have a linguistic reality and cannot be analyzed simply as a H-L sequence attached to a single syllable. This is consistent with the asymmetry of Rising vs. Falling tones and the ongoing tendency to simplify contours to level tones. (iv) The tonal pattern of Nayahili and Nanunli tonal phrase has two alternative forms: one is L-H-L and the other is H-H-L. This pattern is determined by the falling tone of the phrase final vowel.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

6.1 Introduction

The principal motivation for the present thesis was to do cross dialectal investigation of various topics in Dagbanli Phonology. The focus was to contribute to the understanding of segmental phonology and suprasegmental phonology discussed. The thesis provided response to three research questions, which are elaborated in chapters 3, 4 and 5. In this final chapter, I provide summary of the main issues of the various chapters, present what have been achieved and suggest areas for future research. The research was guided by Descriptive Method' (DM) in which data description was the primary analytical methodology for determining the content of a theory.

6.2 General Summary

This thesis provides detailed study of segmental and non-segmental phonology across dialects in Dagbanli. It introduced phonetic explanation for phonological processes that has taken up a more central status in the field of language education. The general discussions in this thesis could be broadly categorized into four chapters. Before these, chapter one provided the speakers of Dagbanli and their lineage as well as the predictability of its dialects and sub-dialects. In addition to Tomosili, Nayahili, and Nanunli as the major dialects of Dagbanli described in earlier studies, the present thesis discovered Gbanjonsili, Zundusili and Jimansili as the sub-dialects with some difference in linguistic forms.

The first general discussion was a review of related literature and theoretical explanation in chapter 2 where I presented conceptual issues by discussing theoretical concepts which have enduring importance in phonological study. I presented a quick survey of the concept of 'Theories of Data' (TODs), which analysis is based on collections of facts, 'Free-Standing Theories'(FSTs), which are sufficiently endowed with structure that many predictions and properties can be determined and 'Descriptive Method' (DM) where data description is essential for finding the structure of a theory's predictions possible. It showed that in the absence or failure of FSTs and TOD, it was necessary for the linguist to recede to 'Descriptive Method' (DM). However, I opted for DM because its analysis was ideally rigorous, comprehensive, rich, insightful and interesting (Hyman 2004). I discussed literature concerning segmental phenomena which is presented in chapter 3, looked at non-segmental phenomena which is the focus of chapter 5 and reviewed the external interfaces that deal with variation that fit easily into segmental and non-segmental phenomena.

The second broad discussions focused on the summary of the current status of segmental phonemes in Dagbanli across dialects in chapter 3. I showed that crossdialectally, Dagbanli has thirty-three (33) consonants and fourteen (14) vowels in its inventory. The velar fricative [ɣ] is proposed as a positional variant of the velar stop /g/ and it is restricted to only word-medial in Zundusili dialect of ED. Four reasons were outlined to provide evidence to support the behavior of the velar fricative /ɣ/ and concluded that the velar stop /g/ occurs before a vowel in an onset of a syllable (#___v) but crucially, [ɣ] never occur in that environment but instead it surfaces between vowels (v___v), which makes the distribution complementary;

thus [ɣ] is described as a positional variant of /g/. I confirmed that the flap /ɾ/ is a variant of the alveolar stop /d/ and the two sounds are in complementary distribution in Dagbanli and its dialects crossdialectally. The sound /ɾ/ is restricted to word-medial position between vowels across dialects and its predictability as a variant is possible in word-medial as it never surfaces in word- initial except in loan words. It is noted that in Gbanjonsili of the WD, the velar fricative /x/ is found intervocalically as the product of coalescence of the velar stop /g/ and alveolar fricative /s/ (e.g. /ɲag-sɨm/ → [ɲaxɨm] 'sweetness'). Gbanjonsili also show evidence of /s/ becoming [x] in a sequence of a lateral /l/ and an alveolar fricative in words before vowels (e.g. /wálsɨ/ → [walxɨ] 'labour'). I also discussed the variations in Dagbanli dialects based on realisational differences, systemic differences, selectional differences and distributional differences as various models for comparing the dialects suggesting that Dagbanli dialects are similar because they have the same set of phonemes crossdialectally. The vowel quality is discovered as the chief source of segmental variations in Dagbanli and its dialects though consonants also show differences but their role is generally much smaller. I argued that selectional differences are entirely random while distributional differences are regular or rule-governed.

In chapter four, I discussed the phonological processes that affect the surface realisations of Dagbanli segments across dialects. The focus was to synthesize and to elucidate the main contributions of assimilation systems and harmony systems among others as phonological processes. I have argued that place assimilation occurs between a stem and a suffix (e.g.$[siŋ]_{stem}$ + $[á]_{suffix/}$ → /siŋ-á/ 'pot') in Dagbanli except SD which exhibits places assimilation of stem and pre-nasal prefix in CV lexical verbs (e.g. $[m]_{prefix}$ + $[bá]_{stem}$ → / mbá/ 'ride.sg'), which in the other

dialects is a phrase structure (e.g. /m-bá/ 'my father'). I also show that place assimilation occurs before plural forms (e.g. [sɨŋ]$_{stem}$ + [sɨ́]$_{suffix/}$ → /sɨ́n-sɨ́/ 'pot.pl') across boundaries in Dagbanli across dialects.

I discussed the patterns of lenition and fortition as non-assimilation processes that show a straightforward relationship between sound changes and dialectal differences. Also, the harmonic features for height, rounding, backness and complete harmony were addressed as issues in phonological processes that sought to explain the domain for harmony system in the language. It showed that harmonic processes in Dagbanli and its dialects occur bi-directionally indicating evidence of both progressive and regressive processes. The progressive process spreads from stems to suffixes while the regressive process spreads from suffix to stems. It also discovered that the domain for harmony system in Dagbanli is the phonological word as well as some morphological processes. It concluded that crossdialectally, Dagbanli has both ATR and vowel harmony system.

Chapter 5 covered the studies of prosodic word (ω), syllable (σ) and mora (μ) as prosodic units. It discussed prosodic word development following Demuth & Fee (1995) four major stages and showed that lexical word grouping and lexical splitting are the approaches for constructing a prosodic word, however, the lexical word grouping approach is a more relevant means. I argued that in the development of prosodic words, children work simultaneously at different levels of phonological structure and concluded that most children enter the Minimal Word stage (stage II) with difficulties in articulating coda consonants. I showed that Dagbanli exhibits CVC closed syllable type with obligatory onset and coda but has a system that does not allow complex onsets (CCV) and codas (VCC). It showed that Dagbanli *counts*

CV.V and CVC syllables as heavy while CV syllable is light and provided analysis to show that mora exists as an active unit in Dagbanli phonology. I demonstrated that Dagbanli is a tone language with two contrastive tones H and L with the L tone as the default tone. Nayahili and Nanunli dialects have contrastive falling tone that falls on unsuffixed CV roots. The mora is described as the TBUs in Dagbanli and not the count of syllables and segments across dialects. Olawsky (1999) observes that there are fourteen (14) possible patterns for words and eleven patterns were attested, I showed that the unattested three: L-L, H-L-H and L-L-L occur in Nayahili and Nanunli dialects with evidence.

6.3. Contributions

This thesis has broadly offered new analysis of Dagbanli data. The thesis made some significant contributions to the knowledge of Dagbanli linguistics. First, in terms of contribution to the study of Dagbanli linguistics, the thesis is the first comprehensive account of Dagbanli dialects and sub-dialects that is more detailed than most existing work on the dialects of the language. It presented Tomosili, Nayahili and Nanunli as the major dialects of Dagbanli and identified Gbanjonsili, Zundusili and Jimansili as their sub-dialects. Each major dialect has a sub-dialect which is closed to it in linguistic forms. None of the dialects except Tomosili has literary status and the differences between the dialects exist more in the sound systems than grammar.

Second interesting contribution is the focus on phonology education, which does not require a specialist in linguistics to read and understand. The chapters presented discussions in non-technical language, a comprehensive discussion of the

sound systems of Dagbanli as a whole, pointing out the differences in the major dialects and sub-dialects. It is argued that many of the differences between the dialects are classed as selectional. For instance, Western Dialect prefers /a/ before voiced coronal consonants while Eastern Dialect and Southern Dialect pronounce /ɔ/ in the same linguistic environment (e.g. /báɾ-gɨ́/ 'lost' vs [bɔ́ɾ-gɨ́] 'lost'). For /a/ rather than /o/ in /sál-ó/ 'crowed' vs. [sól-ó] 'crowed'. The phonemes /a/ and /ɔ/ and /a/ and /o/ are found in all the dialects, therefore, there is no difference in the phoneme system as it is just a different choice of phonemes in certain words. It is discovered that [ɣ] surfaces as a variant of /g/ in intervocalic position in Zundusili and [x] exclusively occurs in word-medial in Gbanjonsili dialect

The thesis contributes to some fresh and on-going debates on phonological processes that affect the surface realisations of Dagbanli segments and tonal structure across dialects. It confirmed that stopping, gemination, devoicing, epenthesis, spirantization, debuccalization and degemination are some the observed phonological processes that affect Dagbanli segments and the understanding of Dagbanli phonology. It also presents lenition and fortition as phonological processes which are non-assimilatory in Dagbanli and its dialects.

6.4 Points for Future Research

One of the challenging outcomes of describing aspects of Dagbanli phonology was that some areas of the phonology were not exhaustively addressed for the purpose of achieving the focus of this thesis. The thesis could not discuss all the properties of the attested segments in detail. What the thesis has discovered is that Dagbanli and its dialects still need a lot of research attention. A formal theoretically based

phonological study of the segments and phonological patterns described in Chapter 3, 4 and 5 deserve attention in future research. A number of aspects come to mind as needing immediate attention.

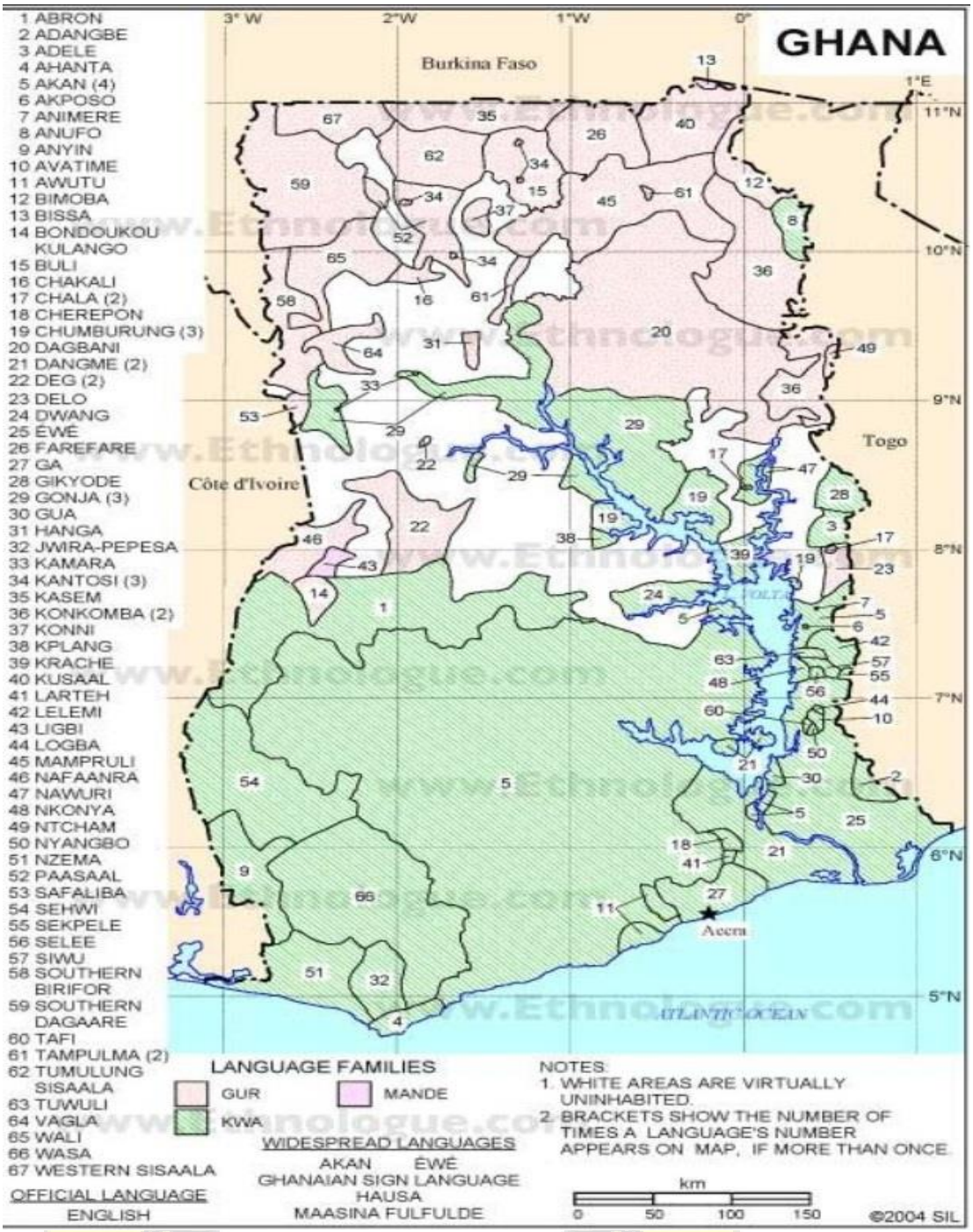
First, the behaviour of long vowels was not described, vowel epenthesis and compensatory lengthening across dialects. Some of the data show that they present interesting patterns which would need a formal account. An acoustic study of the vowels crossdialectally is also needed for a proper understanding of aspects of the vowel system such as surface realisations of the vowels in dialectal variations.

Secondly, for tone and intonation, though I presented some meaningful argument for basic understanding in Dagbanli phonology, the thesis could not give detail description about their properties. Recent methods such as an acoustic software (e.g. Praat) that can be used to generate contours shows that they have interesting formal properties so there is the need to know the full extent of the tonal contrast types and what their properties are between the dialects. The descriptions of the phonological and tonal processes that occur in the dialects and can contribute to variations are however left out in this thesis for future research.

Another line of research for the future is the effects of intonation in variation of Dagbanli dialects focusing on when tonal changes take place and how they bring about dialect variations. This present thesis would in no doubt urge other scholars interested in Dagbanli dialects to undertake further studies in the dialects of the language to ensure viability.

Appendix A

Map of Ghana, with Dagbanli speaking area signaled as 20



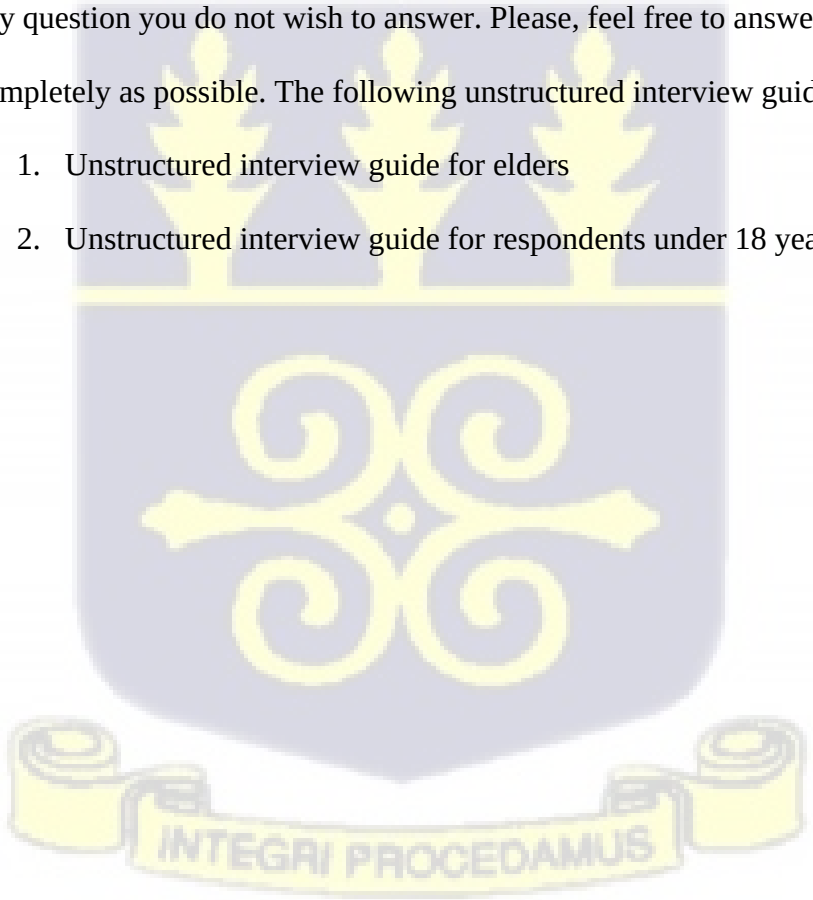
Source: www.Ethnologue.com.

Appendix B

This Appendix Contains the Unstructured Interview Guides Used during the Data Collection.

The following questions are designed to collect data for a Phonological study as part of the requirement towards the attainment of PhD in Linguistics. The information I will collect for this survey will be used only for academic purposes. The questions which include others based on the conversation will only take a few minutes. I will record your responses. The response you will give will be guarded by absolute confidentiality. I seek your informed consent to respond to the unstructured questions. You are not obligated to cooperate under this circumstance. You can skip any question you do not wish to answer. Please, feel free to answer the questions as completely as possible. The following unstructured interview guides are included:

1. Unstructured interview guide for elders
2. Unstructured interview guide for respondents under 18 years



Unstructured Interview Guide for Elders

1. I want to know a bit about your community; tell me about the people in this village.
2. Tell me about the leaders in this village.
3. What are the different leaders, what ethnicity are they, who is the chief?
4. Do the leaders at other villages have the same status, higher or lower?
5. What are the difference in the roles of men and women?
6. How was life when you were growing up as a young person in this village; do we have the same life style in the present day.
7. Do you remember some of the moon light stories of the past? Narrate the story that interests you the most if possible.
8. Where do you go to the big market? Which day is it on? How often is it?
9. From which villages do other people come to attend that market?
10. Is there a market in this village? Which days are the market days?
11. From which villages do people come to attend your market?
12. Do you hear the people who come to the market speak differently?
13. Are some of the speakers known for special skills: hunters, blacksmiths, truck pushers, singers etc?
14. Do the people of this village speak differently from those in the other villages? How different is the way they speak?
15. What annual celebrations do you have? (harvest, planting, funeral, birth, marriage) Where do you go to celebrate them?
16. From which villages do people come to attend these celebrations?
17. What do the people say about the way you speak Dagbanli?

Unstructured Interview Guide for Respondents under 10 Years

Respondent: _____

Age: _____

Name of Guardian present: _____

1. What is the name of the language you speak?
2. What are the names of the people in this house?
3. Do you play with your friends?
4. What time do you play with your friends?
5. Do you and your friends tell stories?
6. Tell me your best story.

Appendix C

Some transcribed data in Dagbanli sub-dialects

S/N	Gloss	Gbanjonsili	Zundusili	Jimansili
1.	zinc	ʧémsí	táɣá	táhá
2.	cup	kɔ́pʊ	kápʊ́	kápʊ́
3.	vagina	páníɨ	páníɨ	páníɨ
4.	thigh	gbàl-píníɨ	gbàl-píníɨ	gbàl-píníɨ
5.	leg	gbàlìɨ	gbàlìɨ	gbàlìɨ
6.	fish	záʔím	záɣím	ʤáhím
7.	oil	kpàm	kpàm	kpà:m
8.	wine	dàm	dàm	dà:m
9.	cassava	bàntʃíɨ	bántʃíɨ	bántʃíɨ
10.	how	kàwʊ̀là	kàwʊ̀là	kàwʊ̀là
11.	millet	zà	zà	ʤà
12.	stand.imperf	zànìɨ	ʒànìɨ	ʤànìɨ
13.	strange	làzíbsìɨ	làʒíb-sìɨ	làʤíb-sìɨ
14.	maize	kàr-wáná	kàl-wáná	kàl-wáná
15.	pepper	nán-zʊ́wá	nán-zúú	ná:-ʤú:
16.	okra-pl	máná	mánà	mànà
17.	leaf	vɔ́ʔ-ʊ́	váɣʊ́	váʔ-ʊ́
18.	stick	dɔ́ʔ-ʊ́	dáɣʊ́	dáʔ-ʊ́
19.	stick-pl	dá-ɾíɨ	dá-ɾíɨ	dá-ɾíɨ
20.	ʧarcoal	sàlà	ʃàlà	sàlà
21.	ashes	tàm-pílím	tàm-pɛ́lím	tàm-pílím
22.	calabash	ŋmá-níɨ	ŋmá-níɨ	ŋmá:-níɨ
23.	grind.v	báʔ[ɪ́]síɨ	báɣɪ́-síɨ	báʔ[ɪ́]síɨ
24.	axe	kpàŋ	kpàŋ	kpàŋ
25.	spear(war)	kpáníɨ	kpáníɨ	kpáníɨ
26.	bag	bá:-gíɨ	bá:-ʤíɨ	bá:ʤíɨ
27.	rope	mí-já	mí-já	mí-já
28.	thread	gálìɨ	gàlìɨ	gàlìɨ
29.	sandal	námdà	nàmdà	nàmdà
30.	money	líʔ-ɾíɨ	làɣí-ɾíɨ	làʔ-ɾíɨ
31.	rubbish heap	tàm-pólíɨ	tàm-pólíɨ	tàm-pólíɨ
32.	road	pál-líɨ	pál-líɨ	pál-líɨ
33.	market	dá-á	dá-á	dá-á
34.	dog	bá-á	bá-á	bá-á
35.	canoe	ŋàrɪ̀m	ŋàrɪ̀m	ŋàrɪ̀m
36.	sand	táŋ-kpáʔʊ́	táŋ-kpáɣʊ́	táŋ-kpáhʊ́
37.	mud	bàjàtìɨ	bàjàtìɨ	bàjàtìɨ
38.	dust	táŋ-kpà-gʊ́l-gʊ́	táŋ-kpà-gʊ́l-gʊ́	táŋ-kpà-gʊ́l-gʊ́
39.	rain	sáá	sáá	sáá
40.	star	sà-ŋmáɾ-gá	ŋmáɾ-gá	ŋmáɾ--gá
41.	darkness	zím-sím	zíb-sím	ʤíb-sím

42.	fear	dábʲém	dábʲém	dábʲém
43.	rainy season	sáʔ-ó	ʃáɣó	ʃáhó
44.	story	sál-má	sálɨmá	sálɨmá
45.	word	bátʃɨ	bátʃɨ	bátʃɨ
46.	cow	náhó	náhó	náhó
47.	horse	wáʔó	wáɣó	wáhó
48.	Thursday	àlámɨsɨ	àlámɨʃɨ	àlámɨʃɨ
49.	monkey	jáŋá	ŋmá:ŋ-gá	ŋmá:ŋ-gá
50.	tortoise	kpákplɨ	kpákplɨ	kpákplɨ
51.	lizard	bànlɨ	bàkóó-sáb[ɨ]-lɨ	bàndɔ́gó
52.	guinea fowl	kpáŋ	kpáŋ	kpáŋ
53.	woman	páʔ-á	páɣá	páhá
54.	father	bá	bá	bá
55.	mother	má	má	má
56.	guest	sáná	sáná	sáná
57.	worior	sàpàʃɨnɨ	sàpàʃɨnɨ	sàpàʃɨnɨ
58.	ʧief	nà-à	nà-à	nà-à
59.	thief	nàjɨ́ʔà	tàjɨ́ʔ-à	tàjɨ́ʔ-à
60.	long	wàhɨn-lɨ	wàhɨn-lɨ	wàhɨn-lɨ
61.	new	pàlɨ	pàlɨ	pàlɨ
62.	sweet	ɲáxɨm	ɲág-sɨm	nág-sɨm
63.	strong	já-á	já-á	já-á
64.	swallow	válɨ	válɨ	válɨ
65.	stand here	zánɨ kpé	ʒánɨ kpé	ʤán kpé
66.	kneel	gbán	gbán	gbán
67.	dream	zàhɨndɨ	zàhɨnlɨ	zàhɨnlɨ
68.	go	ʧàmà	ʧàmà	ʧàmà
69.	come	kàm[ɨ]nà	Kàm[ɨ]nà	dòŋ-nà
70.	return	làb[ɨ]	làb[ɨ]	làb[ɨ]
71.	walk	ʧáŋ	ʧáŋ	dòŋ
72.	pass	gárɨ	gárɨ	gá:ɾɨ
73.	turn	ŋmál-gɨ	ŋmál[ɨ]gɨ	ŋmál-gɨ
74.	forget	tám	tám	tám
75.	laugh	là	là	là
76.	dance	wà	wà	wà
77.	abuse	nàhɨm	nàhɨm	nàhɨm
78.	fight	záb[ɨ]	záb[ɨ]	ʤáb[ɨ]
79.	reply	láb-sɨ	lɔb-sɨ	láb-sɨ
80.	refuse	záʔ-sɨ	záʔ-sɨ	ʤáh-sɨ
81.	buy	dá	dá	dá
82.	count	kál[ɨ]	kál[ɨ]	kál[ɨ]
83.	finish	ná:í	ná:-gí	ná:-gí
84.	catch	gbá:í	gbá:-gí	gbá:-gí
85.	pour	kpá:-gí	kpá:-gí	kpá:-gí
86.	throw	láb	lɔ́b	lɔ́b
87.	plait (hair)	ló	ló	ló
88.	bed	gáró	góró	góró

89.	wash	páʔɨ́	páɣɨ́	páhɨ́
90.	push	dáà-í	dáà-í	dá:-gí
91.	break (pot)	ŋmà	ŋmà	ŋmà
92.	break(stick)	kàb-gɨ̀	kàb-gɨ̀	kàb-gɨ̀
93.	make	màlɨ́	màlɨ́	màlɨ́
94.	lock	kpáɾɨ́	kpáɾɨ́	kpáɾɨ́
95.	arm	bɔ́ʔ-ó	bɔ́ɣó	bɔ́hó
96.	panis	jɔ́lɨ́	jɔ́lɨ́	jɔ́lɨ́
97.	banana	kɔ́dó	kɔ́dó	kɔ́dó
98.	wind	pɔ́ʔɨ́m	pɔ́ɣɨ́m	pɔ́hɨ́m
99.	frog	pɔ́lɔ́lɨ́	pɔ́lɔ́lɨ́	pɔ́lɔ́lɨ́
100.	give birth	dɔ̀ʔɨ́	dɔ̀ɣɨ́	dɔ̀hɨ́
101.	learn	bɔ̀hɨ́m	báhɨ́m	báhɨ́m
102.	like	bɔ́ɾɨ́	bɔ́ɾɨ́	bɔ́ɾɨ́
103.	lose something	kɔ́ŋ̀	kɔ́ŋ̀	kɔ́ŋ̀
104.	sell	kɔ̀ʔ-ɨ̀	kɔ̀hɨ̀	kɔ̀ʔɨ̀
105.	pay	jó	jó	jó
106.	roast	ŋó	ŋó	ŋó
107.	pierce	ʧɔ́ʔɨ́	ʧɔ́ʔɨ́	ʧɔ́hɨ́
108.	bury	sɔ́ʔɨ́	sɔ́ʔɨ́	sɔ́hɨ́
109.	swear	pò	pò	pò
110.	pestle	tɨ́lgà	tólgà	tólgà
111.	up	sá:- zóʔó	zóɣó-sá:	ʤóhó-sá:
112.	nail	kpá:	kú:sá	kú:sá
113.	head	zóʔ-ó	zóɣó	ʤóhó
114.	heart	sóhɨ́	sóhó	sóhó
115.	belly	pógbáná	pógbáná	pógbáná
116.	stomach	pólɨ́	pólɨ́	pólɨ́
117.	navel	ɲóʔó	ɲóɣó	ɲóhó
118.	hand	nú-ú	nú-ú	nú-á
119.	urine	dòlɨ́m	dòlɨ́m	dòlɨ́m
120.	yam	ɲú:lí	ɲólɨ́	ɲólɨ́
121.	beans	tójá	tójá	tójá
122.	root	wól-lɨ́	wól-lɨ́	wól-lɨ́
123.	fire	bóʔɨ́m	bóɣɨ́m	bóhɨ́m
124.	knife	sú-ú	sú-ú	sú-á
125.	hoe	kólɨ́	kólɨ́	kólɨ́
126.	hat	zɨpl[ɨ́]-gó	zòpl[ɨ́]-gó	ʤòpl[ɨ́]-gó
127.	door	dónɔ́lɨ́	záŋ-gáɾɨ́	dóndɔ́lɨ́
128.	room	dú-ú	dú-ú	dú-á
129.	compound	dóŋ-dóŋ	dóŋ-dóŋ	dóŋ-dóŋ
130.	farm	pú-ú	pú-ú	pú-á
131.	stone	kòʔ-lɨ̀	kòʔ-lɨ̀	kòʔ-lɨ̀
132.	sun	wóntáŋá	wóntáŋá	wóntáŋá
133.	night	jòŋ̀	jòŋ̀	jòŋ̀
134.	year	jú:nɨ́	jú:nɨ́	jú:nɨ́
135.	dry season	wú:nɨ́	wú:nɨ́	wú:nɨ́

136.	goat	bú-á	bú-á	bú-á
137.	he-goat	bó-lá:	bó-lá:	bó-lá:
138.	donkey	bɔ́ŋ-á	bɔ́ŋ-á	bɔ́ŋ-á
139.	tail	zúlí	zúlí	ʤòlɨ̀
140.	mosquito	dú:ŋ-gá	dú:ŋ-gá	dú:n-gá
141.	vulture	jó?-ó	jóɣó	jóhó
142.	hawk	sǒl-gá	sǒl-gó	sól-gó
143.	bat	zɔ́ŋá	zɔ́ŋá	ʤɔ́ŋá
144.	name	júlí	júlí	júlí
145.	old	kóɾ-lɨ́	kóɾ-lɨ́	kóɾ-lɨ́
146.	dry	kú:-í	kú:-gí	kú:-í
147.	hot	tól-á	tól-á	tól-á
148.	left	nó-zá:	nó-zá:	nó-zá:
149.	drink	ɲù	ɲù	ɲù
150.	climb	dù	dù	dù
151.	fall	lù	lù	lù
152.	run	gù:-gí	gù:-gí	gù:-gí
153.	hear	wóm	wóm	wóm
154.	greet	pó?ɨ́	pó?ɨ́	pó?ɨ́
155.	like	jú	jú	jú
156.	cry	kǒm	kóm	kóm
157.	left hand	gɔ́bgá	gɔ́bgá	gɔ́bgá
158.	berg	sùhí	sùhí	sùhí
159.	steal	zù	zù	zù
160.	kill	kù	kù	kù
161.	cook	dó?ɨ́	dó?ɨ́	dó?ɨ́
162.	weave	wúhí	wúhí	wúhí
163.	beat	bú	bú	bú
164.	hoe	kòlɨ̀	ɲáŋá	tàpàɾ-ɲá
165.	blow air	pɔ́b-sɨ́	pɔ́b-sɨ́	pɔ́b-sɨ́
166.	eye	níní	níní	níní
167.	ear	tɨ́b-lɨ́	tɨ́b-lɨ́	tɨ́b-lɨ́
168.	tooth	ɲíní	ɲíní	níní
169.	guinea fowls	kpɨ́ní	kpɨ́ná	kpɨ́ná
170.	tongue	zɨ́l-lɨ́	zòl-lɨ	zòl-lɨ
171.	jaw	ʤɨ́ɾ[ɨ́]-lɨ́	jánó	ʤɨ́ɾ[ɨ́]-lɨ́
172.	neck	ɲɨ́ŋ-gɔ̀lɨ́	ɲɨ́ngɔ̀lɨ́	nɨ́ngɔ̀lɨ́
173.	breast	bɨ́h-lɨ́	bɨ́h-lɨ́	bɨ́h-lɨ́
174.	finger nail	ɲɨ́n-ɲá?ó	ɲɨ́n-ɲá?ó	ɲɨ́n-ɲáhó
175.	body	nɨ́ŋ-gbɨ́ná	nɨ̀ŋ-gbɨ́nó	nɨ́ŋ-gbɨ́nó
176.	skin	ɲ́ŋ-gbɨ́ŋ	nɨ̀ŋ-gbɨ́ŋ	nɨ̀ŋ-gbɨ̀ŋ
177.	saliva	nɨ́n-tɔ́ɾɨ́	nɨ́n-tɔ́ɾɨ́	nɨ́n-tɔ́ɾɨ́
178.	faeces	bɨ̀n-dɨ́	bɨ́n-dɨ́	bɨ́n-dɨ́
179.	food	bɨ́n-dɨ́ɾ-gó	bɨ́n-dɨ́ɾ-gó	bɨ́n-dɨ́ɾ-gó
180.	meat	nɨ̀m-dɨ̀	nɨ̀m-dɨ̀	nɨ̀m-dɨ̀
181.	guinea corn	ʧĩ	ʧĩ	ʧĩ
182.	groundnut	sɨ́m-á	sɨ́m-á	sɨ́m-á

183.	seed	bín-bɪ́rá	bón-bɪ́rá	bòn-bɪ́rà
184.	tree	tí-á	tí-á	tí-á
185.	bark (of tree)	tɪ́pàʔ-ó	tɪ́pɔ́ɣó	tɪ́pɔ́hó
186.	cloth	ɣ̄ɪ̄n-ɣ̄ɪ̄nɪ́	ɣ̄ɪ̄n-ɣ̄ɪ̄nɪ́	ɣ̄ɪ̄n-ɣ̄ɪ̄nɪ́
187.	gown	bín-jɛ́ɾ-gó	bòn-jɛ́ɾ-gó	bòn-jɛ́ɾ-gó
188.	smock	bíŋ-gmá:	bóŋ-ŋmá:	bóŋ-ŋmá:
189.	wall	ɣ̄ɪ̄kpínɪ́	tɪ́kpínɪ́	kʊ̀kpínɪ́
190.	house	jílí	jílí	jílí
191.	blood	ʒɪ́m	ʒɪ́m	ʒɪ́m
192.	village	tɪ́ŋ-kpáŋá	tɪ́ŋ-kpáŋá	tɪ́ŋ-kpáŋá
193.	ground	tɪŋ-gbáŋ	tɪŋ-gbáŋ	tɪŋ-gbáŋ
194.	earth	tándɪ́	tándɪ́	tàndɪ́
195.	song	jɪ́lá	jʊ̀lá	jʊ̀lá
196.	lie	ʒɪ́ɾɪ	ʒɪ́ɾɪ	ʒɪ́ɾɪ
197.	thing	bín-saʔó	bòn-ʃáɣó	bòn-ʃáʔó
198.	animal	bíŋ-kɔ́b-gó	bòŋ-kɔ́b-gó	bòŋ-kɔ́b-gó
199.	horn	jɪ́l-gó	jʊ́l-gó	jɪ́l-gó
200.	bee	sí-á	ʃɪ̄-á	ʃɪ̄-á
201.	louse	kpɪb-gá	kpɪb-gá	kpɪb-gá
202.	person	nín-sálá	nín-sálá	nɪ̀n-sálá
203.	husband	jɪ́dáná	jɪ́dáná	jɪ́dáná
204.	child	bí-á	bí-á	bí-á
205.	children	bíhí	bíhí	bíhí
206.	boy	bídɪ́b-gá	bʊ̀dɪ́b-gá	bídɪ́b-gá
207.	daughter	bí-póhɪŋ-gá	bʊ̀-póhɪ́ŋ-gá	bí-póhɪ́ŋ-gá
208.	brother	tízó-dó:	tùzó-dó:	tùzó-dó:
209.	sister	tízó-paʔ-á	tùzó-páɣá	tùzó-páhá
210.	medicine	tím	tím	tím
211.	corpse	kpɪ́m	kpɪ́m	kpɪ́m
212.	one	jíní	jíní	jinni
213.	ten	pí-á	pí-á	pí-á
214.	eleven	pɪ́n-jɪ́nɪ́	pɪ́n-jɪ́nɪ́	pɪ́n-jɪ́nɪ́
215.	twelve	pɪ́ná:jɪ́	pɪ́ná:jɪ́	pɪ́ná:jɪ́
216.	twenty	písí	píʃɪ̄	píʃɪ̄
217.	small	bɪ́lá	bɪ́lá	bɪ́lá
218.	short	jí-já	jí-já	jí-já
219.	good	sóŋ	sóŋ	sóŋ
220.	bad	bʲɛ́hó	bʲɛ́hó	bʲɛ́hó
221.	heavy	tɪ́b-sá	tʊ́bsá	tʊ̀b-sá
222.	eat	dí	dí	dí
223.	bite	dɪ́m	dɪ́m	dɪ́m
224.	vomit	tí	tí	tí
225.	die	kpí	kpí	kpí
226.	sit	ʒɪ́nɪ́	ʒɪ́nɪ́	ʒɪ́nɪ́
227.	fly	jɪʔɪ́	jɪɣɪ́	jɪʔɪ́
228.	know	mí	mí	mí
229.	look	líhí	jù-lí	jù-lí

230.	send	tɨ́m	tóm	tóm
231.	give	tì	tì	tì
232.	choose	pí:	pí:	pí:
233.	fry	ɣʃɨm	ɣʃɨm	ɣʃɨm
234.	extinguish	kpɨ́ʔ[ɨ]m	kpɨ́ɣɨ́m	kpɨ́h[ɨ]m
235.	dig	gbí	gbí	gbí
236.	sow	bɨ́ɾɨ́	bɔ̀ɾɨ́	bɔ̀ɾɨ́
237.	hold	gbɨb[ɨ]	gbɨb[ɨ]	kɔ̀b[ɨ]
238.	stink	fɨ́h-ɨ	fɨ́ɣɨ́	fɨ́h-ɨ́
239.	hair	zɔ́b-ɾɨ́	zɔ́b-ɾɨ́	ʤɔ́b-ɾɨ́
240.	mouth	nɔ́lɨ́	nɔ́lɨ́	nɔ́lɨ́
241.	bone	kɔ́b-lɨ́	kɔ́b-lɨ̀	kɔ́b-lɨ̀
242.	water	kóm	kóm	kʷám
243.	torn	gó:	gó:	gʷá:
244.	smoke	ɲɔ́ʔɨ́	ɲɔ́ɣɨ́	ɲɔ́hɨ́
245.	water pot	lɔ́ʔɔ́	lɔ́ɣɔ́	lɔ́ʔɔ́
246.	mortar	tɔ́lɨ́	tɔ́lɨ́	tɔ́lɨ́
247.	town	fɔ́ŋ	fɔ́ŋ	fɔ́ŋ
248.	well	kɔ́bɨ́l-gá	kɔ́bɨ́l-gá	kɔ́bɨ́l-gá
249.	road	sɔ́l-lɨ́	sɔ́l-lɨ́	sɔ́l-lɨ́
250.	bush	mɔ́ʔ-ɔ́	mɔ́ɣɔ́	mɔ́hɔ́
251.	mountain	zɔ́l-lɨ́	zɔ́l-lɨ́	zɔ́l-lɨ́
252.	moon	gɔ́l-lɨ́	gɔ́l-lɨ́	gɔ́l-lɨ́
253.	sleep	góm	gɔ́m	gʷám
254.	war	tɔ́b	tɔ̀b	tɔb
255.	thirst	kɔ́-ɲɔ́-ɾɨ́	kɔ́-ɲɔ́-ɾɨ́	kɔ́-ɲɔ́-ɾɨ́
256.	cock	nɔ́-lɔ̀ʔ-ɔ́	nɔ́-lɔ́ɣɔ́	nɔ́-lɔ̀ʔ-ɔ̀
257.	feather	kɔ́b-ɾɨ́	kɔ́b-ɾɨ́	kɔ́b-ɾɨ́
258.	fowl	nɔ́-ɔ́	nɔ́-ɔ́	nɔ́-ɔ́
259.	rabbit	sáb-lɨ́	sɔ́b-lɨ́	sɔ́b-lɨ́
260.	buffalo	jɔ́-náʔ-ɔ́	jɔ̀-náɣɔ́	jɔ̀-náhɔ̀
261.	housefly	zɔ́-ɔ́	zɔ́-ɔ́	zɔ́-ɔ́
262.	bird	nɔ́:ŋ-gá	nɔ́:ŋ-gá	nɔ́:ŋ-gá
263.	man	dɔ́-ɔ́	dɔ́-ɔ́	dɔ́-ɔ́
264.	hunter	tɔ́ʔá	tɔ́ɣá	tɔ́há
265.	witch	sɔ́n-já	sɔ́n-já	sɔ̀n-já
266.	hundred	kɔ́wá	kɔ̀b-gá	kɔ̀b-gá
267.	follow	dɔ́lɨ́	dɔ́lɨ́	dɔ́lɨ́
268.	pound	tò	tò	tò
269.	pull	vó:-gí	vó:-gí	vó:-gí
270.	tie	lò	lò	lò
271.	nose	ɲé-é	ɲé-é	né-é
272.	chin	té:ŋ-gá	té:ŋ-gá	té:ŋ-gá
273.	beard	té:ŋ-kób[ɨ]-ɾɨ́	té:ŋ-kɔ̀b[ɨ]-ɾɨ́	té:ŋ-kɔ̀b[ɨ]-ɾɨ́
274.	soup	ʒéɾí	ʒáɾí	ʒé:-ɾí
275.	orange	lé:mó	lé:mó	lé:mó
276.	cooking pot	ʒé-dóʔ-ó	ʒá-dóɣó	ʒé-dóhó

277.	bow(weapon)	pʲám	pɛ́m	pém
278.	arrow	pʲámɔ́l-lɨ́	pɛ́mɔ́l-lɨ́	pémɔ́l-lɨ́
279.	basket	pʲáʔ-ó	pɛ́ɣ́	péhó
280.	needle	sɛ́ɾ-gà	ʃɛ́ɾ-gà	ʃɛ̀ɾ-gà
281.	river	mɔ̀ʔ[ɨ]-lɨ̀	mɔ̀ɣɨ̀-lɨ̀	mɔ̀hɨ̀-lɨ̀
282.	down	békà:-lí	békààlɨ̀	békààlɨ̀
283.	sheep	pʲáʔ-ó	pɛ́ɣ́	péhó
284.	cat	ʤɛ́ŋ-kɔ́n-ó	ʤɛ́-ŋkɔ́n-ó	ʤɛ́ŋ-kɔ́n-ó
285.	leopard	ʤɛ́ŋ-gbɨ́nɨ́	ʤɛ́ŋ-gbɨ́nɨ́	ʤɛ́ŋ-gbɨ́nɨ́
286.	older	kpʲámà	kpɛ̀mà	kpèmà
287.	in-law	dé:m-bá	dé:m-bá	dé:m-bá
288.	red	ʒé:	ʒé:	ʒé:
289.	nice	vʲál-lɨ̀	vʲél-lɨ̀	vʲél-lɨ̀
290.	bad	bé	bé	bé
291.	lick	lɛ́lɨ̀	lɛ́lɨ̀	lèlɨ̀
292.	taste	lám	lám	lám
293.	defecate	ɲɛ̀	ɲɛ̀	nè
294.	eye someone	gbɛ̀l-lɨ̀	gbɛ̀l-lɨ̀	gbélɨ̀
295.	enter	kpé	kpé	kpé
296.	descend	sé:-gí	ʃé:-gí	ʃé:-gí
297.	see	ɲá	ɲá	ná
298.	remember	té:	té:	té:
299.	think	tɛ́ʔɨ́	tɛ́ʔɨ́	tɛ́hɨ́
300.	play	dʲám	dɛ́m	dɛ́m
301.	get	ʧé:	dé:	dé
302.	shoot	ŋmɛ̀	ŋmɛ̀	ŋmè
303.	sew	sé	ʃé	ʃé
304.	take off (cloth)	jé:í	jé:í	jé:í
305.	put (on cloth)	jé	jé	jé
306.	tear	ʧé:	ʧé:	ʧé:
307.	build	mɛ̀	mɛ̀	mè
308.	carve	kpɛ̀	kpɛ̀	kpè
309.	rice	síŋ-ká:fá	ʃɨ́ŋ-káfá	ʃɨ́ŋ-káfá
310.	salt	jɛ̀lɨ̀m	jɛ̀lɨ̀m	jèlɨ̀m
311.	take	záŋ́	záŋ́	záŋ́
312.	cold	wɔ́rɨ́	wɔ́rɨ́	wɔ́rɨ́
313.	god	wɔ́nɨ́	wɔ́nɨ́	wɔ́nɨ́
314.	farmer	pɔ́-kpáɾá	pɔ́-kpáɾá	pɔ́-kpáɾá

References

Abu-Bakari, Bawa. 1977. *The sound system of Dagbanli* .Diploma Essay:Language Center, University Ghana.

Acharya, J. 1991. *A Descriptive Grammar of Nepali and an Analyzed Corpus*. Washington, D.C.: Georgetown University Press.

Aikhenvald, Alexandra Y. 2007. Typological distinctions in word-formation. In T. Shopen (ed.), *Language typology and syntactic description Vol. III*: Grammatical categories and the lexicon (1-65). Cambridge: Cambridge University Press.

Akanlig-Pare, George. 2005. *Buli Tonology: A Non-Linear Approach*. PHD thesis, University of Ghana.

Akinlabi, Akinbiyi.1985. *Tonal Underspecifi cation and Yorùbá Tone*. University of Ibadan dissertation.

Appah, Clement Kwamina Insaidoo 2013. *Construction morphology*: *Issues in Akan complex nominal morphology*. PhD dissertation Lancaster: Lancaster University dissertation.

Anderson, Stephen R. 1985. *Phonology in the Twentieth Century: Theories of Rules and Theories of Representations*. Chicago: University of Chicago Press.

Anttila, Arto. 2007. Variation, typology, universals. Class handout. Retrieved December 27, 2007 from http://www.stanford.edu/antilla/ teaching/lsa - 2007/variation.html.

Anttila, Arto and Adams Bodomo.1996. Stress and tone in Dagaare. *ROA*169.

Archangeli, Diana and Pulleyblank, Douglas. 2007. Harmony. de Lacy (eds*) The Cambridge Handbook of Phonology.* New York, Cambridge University Press.

Archangeli, Diana, and Pulleyblank, Douglas. 1994. *Grounded phonology*. Cambridge MA: MIT Press.

Bakovic, Eric. 2003. *Vowel harmony and stem identity*. ROA-540, Rutgers Optimality Archive, http:// roa.rutgers.edu/

Bakovic, Eric. 2007. Local assimilation and constraint interaction. de Lacy (eds*) The Cambridge Handbook of Phonology*. New York, Cambridge University Press.

Backman, Mary E. and Venditti, Jennifer J. 2011. Intonation *The Handbook of Phonological Theory*, Second Edition. Edited by John Goldsmith, Jason Riggle, and Alan C. L. Yu. Blackwell Publishing Ltd.

Bauer, Laurie. 1988. What is lenition? *Journal of Linguistics* 24: 381-92.

Bauer, Laurie. (2003) *Introducing Linguistic Morphology*. Washington, DC: Georgetown University Press, 2nd edition.

Bell, Alan. 1978. Syllabic consonants, in *Universals of Human Language*, ed. by Joseph Greenberg, volume 2: *Phonology*, 153 – 202, Stanford, CA: Stanford University Press.

Bendor-Samuel, John T. & Wilson, W.A.A. 1969. The phonology of the nominal in Dagbanli . *Linguistics 52*, 56-82.

Blevins, Juliette. 1996. Mokilese reduplication. *LI* 27: 523–530.

Blench, Roger. 2006. *Dagomba plant names*: Circulation version, Cambridge: Cambridge Press.

Blench, Roger. 2004. *Dagbanli -English dictionary*. With contributions from Harold Blair Tamakloe, Harold Lehmann, Lee Shin Chul, André Wilson, Maurice Pageault, Knut Olawski and Tony Naden. Tamale.

Bodua-Mango, Ruth Karehina. 2015. *The phonology of a three-year-old Safaliba-speaking child*. MPhil Thesis, University of Ghana, Legon.

Booij, Geert. 1999. The role of the prosodic word in phonotactic generalizations. In T. Alan Hall and Ursula Kleinhen (eds). *Studies on the Phonological Word* John Benjamins Publishing Company Amsterdam/Philadelphia. Vol. 174:47-74.

Booij, Geert. 1995. *The Phonology of Dutch*. Oxford: Clarendon Press.

Booij, Geert 1985. Coordination reduction in complex words, a Case for Prosodic Phonology. *Advances in Non-linear Phonology* ed. by Harry van der Hulst & Norval Smith, 143-160. Dordrecht: Fons.

Booij, Geert. 1984. Coordination reduction in complex words: A case for prosodic phonology, in *Advances in Non-linear Phonology*, ed. by Harry van der Hulst and Norval Smith, 143 – 160, Dordrecht:Foris.

Botha Wernnar. 2011. *Dimensions in variationist sociolinguistics: A ociolinguistic investigation of language variation in Macau*. MA Thesis, University of South Africa

Broselow, Ellen. 1995. Skeletal positions and moras. In John Goldsmith (ed.) The handbook of phonological theory. Cambridge, MA., Blackwell, pp.175–205.

Buckley, Eugene. 1994. *Theoretical aspects of Kashaya phonology and morphology*. Stanford, CA: CSLI Publications

Bussmann, Hadumod. 1996. *Routledge dictionary of language and linguistics*. London and New York: Routledge.

Bye, Patrik and de Lacy, Paul. 2008. Metrical influences on fortion and lenition.In Joaquim de Carvalho, Tobias Scheer, and Philippe Ségéral (eds.) *Lenition and Fortition*. Studies in Generative Grammar. Berlin: Mouton de Gruyter. 1-36.

Cahill, Mike. 2007. *More universals of tone*. SIL Electronic Working Papers.

Chambers, Jack. & Trudgill, Peter. 1998. *Dialectology: second edition.*Cambridge: Cambridge University Press.

Cheng, Chin-Chuan and William S-Y. Wang 1973. Tone change in Chaozhou Chinese: A study in lexical diffusion. In Braj B. Kachru, Robert B. Lees, Yakov Malkiel, Angelina Pietrangeli and Sol Saporta (eds.) *Issues in linguistics:* Papers in honor of Henry and Rene´e Kahane. Urbana, University of Illinois Press, pp.99–113.

Chomsky, Noam & Halle, Morris. 1968. *The sound pattern of English*. New York: Harper & Row.

Corder, S. Pit. 1993. *Introducing applied linguistics*. London: Penguin Books.

Clements, George. N. 1984. 'Vowel harmony in Akan: a consideration of Stewart's Word Structure Conditions. *Studies in African Linguistics*; 15(3), 321-337

Clements, George & Hume, Elizabeth. 1996. The internal organisation of speech sounds. In Goldsmith, J. (ed.), *The handbook of phonological theory*. Oxford: Blackwell. 245-306.

Clements, George. N. and Samuel J. Keyser. 1983. *CV Phonology: A Generative Theory of the Syllable*. Cambridge, MA: MIT Press.

Clements, George N. 1979. The description of terraced-level tone languages. *Language* 55, 536 – 558.

Connell, Bruce. 2000. The perception of lexical tone in Mambila. *Language and Speech* 43.2: 163–182.

Crystal, David. 1997. *The Cambridge Encylopedia of Language*. Cambridge: Cambridge University Press.

Crystal, David. 1969. *Prosodic systems and intonation in English*. Cambridge, UK, CUP.

Crystal, David. 1967. English. *Lingua*, 17: 24-56.

Crystal, David. 1967. English. *Lingua*, 17: 24-56.

Dakubu, Mary Esther Kropp. 1997. Oti-Volta harmony and Dagbanli . *Gur Papers/Cashier Voltaiques*, 2. 81-88.

Dakubu, Mary Esther Kropp. 1996. *A grammar of Gurune*. Legon:Language Centre, University of Ghana.

Dakubu, Mary Esther Kropp. 1988. The languages of Ghana. *Africa*. London, KPI Limited.

Davis, Stuart. 2011. Quantity. *The Handbook of Phonological Theory, Second Edition*. UK, Blackwell Publishing Ltd. 103-140.

Demuth, Katherine. 1996. Stages in the acquisition of prosodic structure. In E. Clark (ed.), *Proceedings of the 27th Child Language Research Forum*, pp. 39-48. Stanford University: CSLI.

Demuth, Katherine. 1995. Markedness and the development of prosodic structure, in *Proceedings of the 25th Annual Meeting of the North East Linguistic Society*. 13–26, Amherst, MA: GLSA, University of Massachusetts.

Demuth, Katherine, & Fee, E. Jane. 1995. Minimal Words in Early Phonological Development. Ms.Brown University and Dalhousie University.

Dixon, Robert Malcolm Ward, and Alexandra Y. Aikhenvald, 2002. Word: a typological framework. In *Word: a cross-linguistic typology*, ed. Robert Malcolm Ward Dixon and Alexandra Y. Aikhenvald, chapter 1: 1-41. Cambridge: Cambridge University Press.

Dolphyne, Florence Abena. 2006. *The Akan (Twi-Fante) language: its sound systems and tonal structure*. Accra: Woeli Publishing Services.

Dolphyne, Florence Abena. 1988. *The Akan Twi-Fante language: its sound systems and\tonal structure*. Accra: Ghana Universities Press.

Donegan, P..J. & Stampe, D. 1979. The Study of natural phonology, In Dinnsen Ced.s, *Current Approaches to Phonological Theory*, Bloomington, Indiana University Press. 126-173.

Dobrovolsky, Michael. 1997. Phonetics: the sounds of language. *Contemporary Linguistics: An Introduction*.(eds.). Longman. Paper, 776 pp

Dutta, Hemanga. 2012. *Spirantization and the notion of phonological strength relations in Assamese: An Optimality Theoretic Account*. Department of Linguistics and Contemporary English, The English and Foreign Language University (EFLU), Hyderabad-500605, India.

Everett, Daniel and Everett, Keren. 1984. On the relevance of syllable onsets to stress placement. *Linguistic Inquiry* 15, 705 – 711.

Fee, E. Jane. 1996. Syllable structure and minimal words. In Barbara Bernhardt, John Gilbert and David Ingram (eds.) *Proceedings of the UBC International Conference on Phonological Acquisition*. Somerville, MA, Cascadilla Press, pp.85–98.

Fee, E. Jane. 1992. Exploring the Minimal Word in Early Phonological Acquisition. *Proceedings of the 1992 Annual Conference of the Canadian Linguistics Association*.

Fikkert, Paula. 1994. *On the Acquisition of Prosodic Structure*. Rijksuniversiteit te Leiden dissertation.

Fine, C. 2003. *Extendibility in Bouyei orthography design: A multilectal approach*. Dallas, Graduate Institute of Applied Linguistics.

Fries, C. C. 1940. *American English Grammar*. New York: Appleton Cantury.

Fromkin, Victoria., Rodman, Robert., Hyam, Nina. 2014. *An introduction to language, tenth edition*. Boston, MA: Blackwell Publishing.

Fromkin, Victoria., Rodman, Robert., Hyam, Nina. 2010. *Linguistics: an introduction to linguistic theory*. Malden, MA:Blackwell Publishing.

Fujimura, Osamu. 1992. Phonology and phonetics – a syllable-based model of articulatory organization. *Journal of the Acoustical Society of Japan* 13, 39 – 48.

Goad, Heather. 1997. Consonant harmony in child language: An Optimality-Theoretic account, in *Focus on Phonological Acquisition*, ed. By S. J. Hannahs and M. Young-Scholten, 113 – 142, Amsterdam: Benjamins.

Goad, Heather 1988. Tone in the Dagbanli noun phrase. Unpublished manuscript, University of Southern California, Los Angeles.

Goldsmith, John A. 2011. The syllable. *The handbook of phonological theory*, second edition (eds). Blackwell Publishing Ltd.

Goldsmith, John A. 1990. *Autosegmenta and Metrical Phonology*. Oxford: Blackwell.

Goldsmith, John A. 1978. English as a tone language. *Communication and Cognition* 11, 453 – 476.

Goldsmith, John A. 1976. An overview of autosegmental phonology. *Linguistic Analysis* 2, 23 – 68.

Goman, Roderick David, 1979. *Consonants in Natural Phonology*. PhD. dissertation, the Ohio State University.

Gumperz, John. 1982. Social network and language shift. In J.J. Gumpez (ed.), *Discourse strategies*, Cambridge and New York: COP. 38-58.

Gurevich, Olga I. 2006. *Constructional Morphology: The Georgian version*. Berkeley: University of Carlifornia, Berkeley Dissertation.

Gussenhoven, Carlos. 2007. Intonation, in *The Cambridge Handbook of Phonology*, ed. by Paul de Lacy, 253 – 280, Cambridge: Cambridge University Press.

Hall, Tracy Alan. 2007. Segmental features. In de Lacy (eds*) The Cambridge Handbook of Phonology.* New York, Cambridge University Press.

Hall, Tracy. Alan. 1997. *The Phonology of Coronals*. Amsterdam: Benjamins.

Halle, Morris. 1995. Feature geometry and feature spreading. *LI* 26: 1–46.

Halliday, Michael A. K. 1970. *A course in spoken English: Intonation*. London, UK, OUP.

Halliday, Michael. A. K. 1967. *Intonation and Grammar in British English*. The Hague: Mouton.

Harris, J. 1986. Epenthesis Processes in Spanish. In: C. Neidle and R. Nuñez Cedeño (eds.) *Studies in Romance Languages*. Dordrecht: Foris, 107-122.

Harris, J. 1983. *Syllable Structure and Stress in Spanish: A Nonlinear Analysis*. Cambridge, MA: MIT Press.

Harris, Zellig S. 1951. *Methods in Structural Linguistics*. Chicago: University of Chicago Press.

Haugen, Einer. 1966. Dialect, Language, Nation. *American Anthropologist*, 68, 922-935.

Hawkins, Peter 1993. *Introducing phonology*. London Routledge.

Hayes, Bruce. 2009. *Introductory Phonology*. Blackwell Textbooks in Linguistics: Wiley-Blackwell.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: University of Chicago Press.

Hayes, Bruce, 1989. The Prosodic Hierarchy in Meter. In: P. Kiparsky and G. Youmans (eds.) *Rhythm and Meter*. New York: Academic Press, 201-260.

Hasselbring, Sue Ann. 2006. *Cross-dialectal acceptance of written standards:* PHD Thesis: University of South Africa.

Hickey, Raymond. 1996. Lenition in Irish English. In: Alison Henry, Martin Ball and Margaret MacAliskey (eds) *Papers from the International Conference on Language in Ireland.* Belfast Working Papers in Language and Linguistics, 13. Belfast: University of Ulster, 173-93.

Hock, Hans. 1991. *Principles of historical linguistics*. Mouton de Gruyter, 2nd edition.

Hockett, Charles F. 1954. Two Models of Grammatical Description. *Word*, 10: 210-231.

Hoberman, Robert. 1988. Emphasis harmony in a Modern Aramaic dialect. *Language* 64, 1–26.

Honeybone, Patrick 2009. Distinctive features. In Chapman, S. & Routledge, P. (eds) *Key ideas in linguistics and the philosophy of language*. Edinburgh: Edinburgh University Press.

Honeybone, Patrick 2001. Lenition inhibition in Liverpool English. *English Language and Linguistics*, 5.2: 213-249. UK, Cambridge University Press.

Hooper, Joan B. 1972. The syllable in phonological theory. *Language* 48. 525-540.

Huang, James C.-T. 1980. The metrical structure of terraced level tones. Cahiers Linguistiques d'Ottawa 9: 257–270.

Hudson, R. A. 1980. *Sociolinguistics*, Cambridge, University Press.

Hudu, Fusheini. 2005. *Number marking in Dagbanli* . Msc. thesis, University of Alberta.

Hudu, Fusheini. 2007. *An ultrasound study of ATR in the Dagbanli vowel system*. PhD qualifying paper. University of British Columbia.

Hudu,Fusheini, Amanda Miller & Douglas Pulleyblank. 2009. Ultrasound imaging and theories of tongue root phenomena in African languages. In Peter K. Austin, Oliver Bond, Monik Charette, David Nathan & Peter Sells (eds.), *Proceedings of Conference on Language Documentation and Linguistic Theory 2*, School of Oriental and African Studies, London 153–163.

Hudu, Fusheini. 2010. *Dagbanli Tongue-root Harmony: a formal account with ultrasound investigation*. PHD Thesis: The University of BritishColumbia.

Hudu, Fusheini. 2013. Dagbanli tongue-root harmony: triggers, targets and blockers. *Journal of African Languages and Linguistics* 34: 47-73.

Hudu, Fusheini, 2014a. [ATR] feature involves a distinct tongue root articulation: Evidence from ultrasound imaging. *Lingua* 143: 36-51.

Hudu, Fusheini, 2014b. What is the phonological word in Dagbanli ? A positional

faithfulness account: *Ghana Journal of Linguistics* 3.1: 1-44.

Hudu, Fusheini. 2014c. Dagbanli vowel phonology: competition between constraint hierarchies. In Kwesi Yankah, Kofi Saah & Nana Aba Amfo (eds.) A Legon reader in Ghanaian linguistics, 136–161. Oxfordshire: Ayebia Clarke Publishing.

Hudu, Fusheini, 2016. Vowel neutralisation and the vowel inventory of Dagbanli : phonology, acoustics, perception. *Journal of African Languages and Linguistics*, 37(1), 59-89.

Hudu, Fusheini, 2018. Asymmetries in the phonological behaviour of Dagbanli place features: Implications for markedness. *Legon Journal of the Humanities* 29.2

Hudu, Fusheini & Nindow, Mohammed Osman. 2020. Nasality in Dagbanli prosody. *Folia Linguistica:* 54(3): 527–550

Hualde, J. W. 2005. Spanish phonology. Cambridge: MIT Press.

Hulst, Harry van der and Norval Smith.1988. *Features, segmental structure, and harmony processes*, Vols. I & II. Dordrecht, Foris.

Hyman, Larry M. 1985. *A Theory of Phonological Weight*. Dordrecht: Foris

Hyman, Larry M. 1988. Underspecification and vowel height transfer in Esimbi. *Phonology* (5). 255 -273.

Hyman, Larry M. 1993. Structure preservation and postlexical tonology in Dagbanli . *Phonetics and Phonology* 4. 235–54.

Hyman, Larry. 2004. Why describe African languages? In Akinbiyi Akinlabi and Oluseye Adesola (eds.) *Proceedings of the 4th World Conference of African Linguistics*. Ko¨ln, Ru¨diger Ko¨ppe Verlag, pp.21–41.

Hyman, Larry M. 2006. Word-prosodic typology. *Phonology* 23, 225 – 257.

Hyman, Larry M. 2011. Tone: is it different? In John A. Goldsmith et.al (eds), *The handbook of phonological theory,* second edition (eds). Blackwell Publishing Ltd. 197-237.

Hyman, Larry M. and E. Byarushengo. 1984. A model of Haya tonology, in *Autosegmental Studies in Bantu Tone.*, ed. by G. N. Clements and John A. Goldsmith, 53 – 103, Dordrecht: Foris.

Hyman, Larry M. & Knut, J. Olawsky. 2004. Dagbanli verb tonology. In Chege Githiora,Heather Littlefield & Victor Manfredi (eds.), Kiny˜ıra nj˜ıra!: Step firmly on the pathway vol. 5 *Trends in African Linguistics*, 97–108.

Hymes, Dell. 1972. On Communicative Competence. In J.B. Pride & J. Holmes (eds.), *Sociolinguistics* (pp. 269-293), Harmondsworth: Penguin.

Illiasu, A. Asaana.1965. *The origins of the Mossi-Dagomba States*.History Department, University of Ghana, Legon

Inusah, Abdul-Razak & Appah, Clement Kwamina Insaidoo. 2021. *Issues in Dagbanli Compounding. Ghana Journal of Linguistics*, forthcoming.

Inusah, Abdul-Razak 2020 Elaboration of Segmental Phonemes of Dagbanli Dialects. *International Journal of Language, Literature and Culture.* Vol. 7, No., pp. 1-13.

Inusah, Abdul -Razak. 2019. Segmental phonology of Dagbanli Dialects *International Journal Advances in Social Science and Humanities*. 7(1) 15-30

Inusah, Abdul-Razak & Edward Salifu Mahama 2019. The phonological structure of English borrowed words in Dagbanli , *South African Journal of African Languages*, 39:3, 281-290.

Inusah, Abdul-Razak. 2017. Patterns of relative clauses in Dagbanli. *SAGE Open*: 7(1) 1-9

Inusah, Abdul-Razak, Eversherd K. Amuzu and George Akanlig-Pare 2017. Sociolinguistics variation of [ɾ] in Dagbanli . *Sociology International Journal.* 1(3), 2-13

Inusah, Abdul-Razak & Edward, Salifu Mahama. 2016. Marking Exhaustivity in Dagbanli . *Ghana Journal of Linguistics*, 8(1):23-41.

Inusah, Abdul –Razak. 2016a. *Dialectal variation in Dagbanli phonology*. Mphil Thesis: University of Ghana.

Inusah, Abdul-Razak. 2016b. Using phonics as a method of teaching reading in basic schools. *Journal of Educational Development and Practice*. University of Cape Coast. 7(2) 28-54

Inusah, Abdul-Razak. 2015. The structure of noun phrase in Safaliba. *Journal of Research on Humanities and Social Sciences- IISTE, 5*(14), 78–91.

Issah, Samuel Alhassan. 2013. The structure of the Dagbanli simple noun phrase. *South African Journal of African Languages*, 37–41.

Itô, Junko. 1989. A prosodic theory of epenthesis. *Natural Language and*

Linguistic Theory 7, 217 – 259.

Jakobson, Roman. 1962. Typological studies. *Selected writings 1: Phonological studies*. The Hague, Mouton & Co., pp.523–532.

Johnson, C. Douglas. 1972. *Formal Aspects of Phonological Description*. The Hague: Mouton.

Jones, D. 1956. *An outline of English phonetics, 9th edition*. Cambridge: Heffer.

Joseph, J. E. 1987. *Eloquence and Power: The rise of language standards and standard languages*, London, Frances Pinter.

Kahn, Daniel. 1976. *Syllable-Based, Generalizations in English Phonology*. MIT dissertation.

Kang, Yoonjung.2000. *The phonetics and phonology of coronal markedness and unmarkedness*. PHD Thesis: Massachusetts Institute of Technology.

Katamba, Francis. 1989. *An introduction to phonology*. New York: Longman

Kaun, Abigail 1995. *The typology of rounding harmony*: An Optimality heoretic approach. Doctoral dissertation, UCLA.

Kelz, H., 1971. *Phonologische analyse des pennsylvaniadeutschen*. Hamburg: Helmut Buske Verlag.

Kenstowicz, Michael. 1994. *Phonology in generative grammar*. Oxford:Blackwell Publishers.

Kenstowicz, Michael, and Charles Kisseberth. 1979. *Generative phonology: description and theory*. New York: Academic Press.

Kenstowicz, Michael and Charles W. Kisseberth. 1990. Chizigula tonology: The word and beyond, in *The Phonology- Syntax Connection*, ed. by Sharon Inkelas and Draga Zec, Chicago: University of Chicago Press.

Kientz, Albert. 1979. Dieu et les ge´nies. Re´cits e´tiologiques senoufo (Coˆte-d'Ivoire), Centre national de la recherche´ scientifique, Paris

Kirchner, Robert. 1998. "An effort-based approach to consonant lenition", *PhD dissertation*, UCLA.

Kubozono, Haruo.1989. The mora and syllable structure in Japanese: Evidence from speech errors. *Language and Speech* 32, 249 – 278.

Kraft, C-. & Kraft, M. 1973. *Introductory Hausa*. Berkeley: UC Press.

Laalo, Klaus.1988. Imperfektimuotojen ti_si-vaihtelu suomen kielessa [The past tense ti_si alternation in Finnish]. Suomalaisen Kirjallisuuden Seura 483. Helsinki, SKS.

Labov, William. 1997. Resyllabification, in *Variation, Change, and Phonological Theory*, ed. by Frans Hinskens, Roeland van Hout, and Leo Wetzels, 145 – 179, Amsterdam: Benjamins.

Ladefoged, Peter. 1993. *A Course in Phonetics*. Fort Worth, TX: Harcourt Brace Jovanovich, 3rd edition.

Lavoie, Lisa. 2001. *Consonant Strength: Phonological Patterns and Phonetic Manifestations.* New York: Garland Press.

Luschutzky, Hans Christian. 2001. "Sixteen possible types of natural phonological processes", in: *Charles W. Kreidler* (ed.), 506-524.

Maddieson, Ian.1978. Universals of tone. In Joseph H. Greenberg, Charles A. Ferguson and Edith A. Moravscik (eds.) *Universals of human language*. Vol.2: Phonology. Stanford, Calif., Stanford University Press, pp.335–366.

Mahama, Ibrahim. 2003. *Dagbanli -English dictionary*. Tamale: School for Life.

Mester, R. Armin 1990. Patterns of truncation. LI 21.3: 478–485.

McCarthy, John J. 1979. On stress and syllabifi cation. *Linguistic Inquiry* 10, 443 – 466.

McCarthy,John J. and Prince Alan. 1986. Prosodic morphology. Rutgers Technical Report TR -32.

McCarthy, John J. and Prince Alan. 1990. Foot and word in prosodic morphology: The Arabic broken plural. NLLT 8: 209–282.

McCarthy, John J. 2007. Derivations and levels of representation, in *The ambridge Handbook of Phonology*, ed. by Paul De Lacy, 99 – 117, Cambridge:Cambridge University Press.

McCawley, James D. 1968. *The Phonological Component of a Grammar of Japanese.* The Hague: Mouton.

Martinez, Silvia 2011. *Dialectal variations in Spanish phonology: a literature review*, EdD, CAS,CCCSLP Howard University, Washington, DC

Milliken, M. E. & Milliken, S. R. 1996. System relationships in assessing dialect intelligibility. *Notes on Linguistics*, 72, 15-31.

Mobaraki, Mahmoud. 2013. Fortition in Persian phonological *system Journal of Education and Practice. T*he International Institute for Science, Technology and Education (IISTE). www.iiste.org Vol.4, No.23.

Mous, Maarten. 1993. *A grammar of Iraqw*. Hamburg: Helmut Buske Verlag.

Murray, R. W. 1997. Historical linguistics: the study of language change. In Myers, Scott. 1987. Vowel shortening in English. *NLLT* (5): 485 518.

Nespor, Marina & Irene Vogel 1986. *Prosodic Phonology*. Dordrecht: Foris.

Newman, Paul. 1972. Syllable weight as a phonological variable. *Studies in African Linguistics* 3, 301 – 323.

Newman, Paul. 1996. Hausa tonology: Complexities in an 'easy' tone language. In John Goldsmith (ed.) *The handbook of phonological theory*. Cambridge, MA, Basil Blackwell, pp.762–781.

O'Brien, Jeremy.2012. *An experimental approach to debuccalization and supplementary gestures*. PHD dissertation. University Of California Santa Cruz.

O'Connor, J. D., and Arnold G.F. 1961. *Intonation of Colloquial English*. London: Longmans.

Odden, David 1994. Adjacency parameters in phonology. *Language* 70, 289–330.

Odden, David. 1996. Tone: African languages. In John Goldsmith (ed.) The handbook of phonological theory. Oxford, Basil Blackwell, pp.444-475.

Odden, David. 1996. *The phonology and morphology of Kimatuumbi*. Oxford: Clarendon Press.

Olawsky, Knut J. 1996. An Introduction to Dagbanli Phonology. Theorie des Lexikons, Arbeiten des Sonderforschungsbereich 282(76). Düsseldorf: Heinrich-Heine-Universität.

Olawsky, Knut J. 1999. *Aspects of Dagbanli grammar: with special emphasis on phonology and morphology*. Muenchen, LINCOM Europa.

Olawsky, Knut J. 2002. What is a word in Dagbanli ? In R.M.W. Dixon & Alexandra Aikhenvald (eds.), Word: a cross-linguistic typology, 205–226. Cambridge: Cambridge University Press.

Paradis, Carole and Jean-Franc¸ois Prunet.1989. On coronal transparency. *Ph* 6: 317–348.

Paul, de Lacy 2007. *The Cambridge handbook of phonology*. Cambridge, University Press.

Peperkamp, Sharon. 1999. Prosodic words. *GLOT International* 4.4, 15-16.

Pierrehumbert, Janet B. 1980. *The Phonology and Phonetics of English Intonation*. MIT dissertation.

Pike, Kenneth. L. 1947. *Phonemics:a technique for reducing languages to writing*, Ann Arbor, Universiy of Michigan Press.

Pike, Kenneth L. 1948. *Tone Languages: A Technique for Determining the Number and Type of Pitch Contrasts in a Language.* Ann Arbor, MI: University of Michigan Press.

Postal, Paul M. 1968. *Aspects of Phonological Theory*. New York: Harper and Row.

Prince, Alan 1980. A metrical theory for Estonian quantity. LI 11.3: 511–562.

Prince, Alan 2007. The pursuit of theory. In de Lacy (eds*) The Cambridge Handbook of Phonology.* New York, Cambridge University Press.

Prince, Alan and Paul Smolensky. 2004. *Optimality Theory:Constraint Interaction in Generative Grammar*. Oxford: Blackwell.

Pulleyblank, Douglas. 1986. *Tone in Lexical Phonology*. MIT dissertation. Published by D. Reidel, Dordrecht.

Roach, Peter. 2000. *English Phonetics and Phonology*, third edition, Cambridge: CUP

Rose, Sharon.1996. Variable laryngeals and vowel lowering. *Ph* 13.1: 73–117.

Rose, Sharon and Rachel Walker. 2011. Harmony systems. The *Hand book of Phonological Theory second edition.* Goldsmith (eds). Oxford, Blackwell Publishing.

Schafer, Robin. 1995. Headedness and the representation of affricates. *The Linguistic Review* 12: 61–87.

Selkirk, Elisabeth O. 1978. On prosodic structure and its relation to syntactic structure, Indiana University Linguistics Club (IULC).

Selkirk, Elisabeth O. 1980. Prosodic domains in phonology: Sanskrit revisited, in *Juncture*, ed. by Mark Aronoff and Mary-Louise Kean, Saratoga: Anma Libri.

Sagey, Elizabeth. 1986. *The representation of features and relations in nonlinear phonology*. London: Garland.

Selkirk, Elisabeth O. 1996. Sentence prosody: Intonation, stress and phrasing, in *The Handbook of Phonological Theory*, ed. by John A. Goldsmith, 550 – 569, Oxford: Blackwell.

Selkirk, Elisabeth O. 2011. The syntax-phonology interface. In Goldsmith, John A et.al. *The handbook of phonological theory*, second edition (eds). Blackwell Publishing Ltd. 435-484.

SIL INTERNATIONAL. 2002. LinguaLinks Library: Integrated electronic references, helps, advice, and training for language field work. Dallas, SIL International.

Spolsky, Bernard. 1978. *Educational Linguistics*. Rowley, Massachusetts: Newbury House Publishers Inc.

Steriade, Donca 1987. Locality conditions and feature geometry. In Joyce McDonough and B. Plunkett (eds.) NELS 17. Somerville, MA, Cascadilla,

Steriade, Donca 1999. Phonetics in phonology: The case of laryngeal neutralization. In Matthew Gordon (ed.) *Papers in Phonology 3. UCLA Working Papers in Linguistics 2*. UCLA, UCLA linguistics department, pp.25–146. [Also, at http://web.mit.edu/linguistics/www/bibliography/steriade.html]. pp.595–617.

Steriade, Donca. 2009. The phonology of perceptibility effects: The P-map and its consequences for constraint organization, in *The Nature of the Word: Studies in Honor of Paul Kiparsky*, ed. By Kristin Hanson and Sharon Inkelas, 151 – 179, Cambridge, MA: MIT Press.

Storkel, H. L. 2001. Learning new words: Phonotactic probability in language development. *Journal Speech, Language, and Hearing Research.* 44. 1321-1337.

Stubbs, M. 1980. *Language and literacy*: *The sociolinguistics of reading and writing*, London, Routledge & Kegan Paul.

Sundberg, Johan. 1979. Maximum speed of pitch changes in singers and untrained subjects. *JP* (7) :71-79.

Taff, Alice.1999. *Phonetics and phonology of Unangan (Eastern Aleut) intonation*. Doctoral dissertation, University of Washington.

Thornton, Anna M. 1996. On some phenomena of prosodic morphology in Italian: Accorciamenti, hypoconstics and prosodic delimitation. *Probus* 6. 81-112.

Trask, Robert Lawrence. 1996. *A Dictionary of Phonetics and Phonology*. London & New York: Routledge

Trubetzkoy, Nikolai S. 1939. *Grundzüge der Phonologie*. (Pagination refers to 1958 German edition.) Prague: Travaux du cercle linguistique de Prague.

Truckenbrodt, Hubert. 2005. A short report on intonation phrase boundaries in German. *Linguistische Berichte* 203, 273 – 296.

Tsujimura, Natsuko. 2007. *An Introduction to Japanese linguistics*. Oxford: Wiley-Blackwell, 2nd edition.

Tucker, A. N. 1962. The syllable in Luganda: A prosodic approach. *JAL* (1): 122 166.

Wardhaugh, R. 2002. *An introduction to sociolinguistics*, Oxford, Blackwell.

Wedekind, Klaus.1983. A six-tone language of Ethiopia. *Journal of Ethiopian studies* 16: 129–156.

Welmers, William E. 1959. Tonemics, morphotonemics, and tonal morphemes. *General Linguistics* 4, 1 – 9.

Welmers, William E. 1973. *African Language Structures*. Berkeley and Los Angeles: University of California Press.

Wheeler, Deirdre. 1980. A metrical analysis of stress and related processes in Southern Paiute and Tubatulabal. In J. Lowenstamm (ed.), *University of Massachusetts Occasional Papers in Linguistics* 5 (pp. 145 175). Amherst, MA: University of Massachusetts.

.

Wiese, Richard 1996. *The phonology of German.* Oxford: Clarendon Press.

Yi, Kwangoh. 1999. The internal structure of Korean syllables: Rhyme or body? *Korean Journal of Experimental and Cognitive Psychology* 10, 67 – 83.

Yip, Moira. 1989. Contour tones. *Phonology* 6, 149 – 174.

Yip, Moira. 1996. Tone in East Asian languages, in *The Handbook of Phonological Theory*, ed. by John A. Goldsmith, 476 – 494, Oxford: Blackwell.

Yip, Moira. 2007. Tone. *The Cambridge Handbook of Phonology.* Edited by Paul de Lacy. Cambridge University Press. 229-307.

Zec, Draga. 2007. The syllable. *The Cambridge Handbook of Phonology*. Edited by Paul de Lacy. Cambridge University Press. 161-193.

Zec, Draga. 1988. *Sonority Constraints on Prosodic Structure*. Stanford University dissertation.

Zhang, Jie. 2000. The phonetic basis for tonal melody mapping. *WCCFL 19*. Somerville, MA, Cascadilla Press, pp.603–616