

SEGMENTAL PROCESSES IN LOANWORD ADAPTATION IN DAGBANI

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Abstract

The focus of this paper is to offer an empirical account of the segmental processes that underpin loanword adaptation in Dagbani, a Mabia (Gur) language spoken in the Northern part of Ghana. Unlike previous related studies in the language, this current study examines the typology of loanword adaptation in Dagbani. I show that adaptation processes are triggered by syllable structure differences in the adaptor and donor languages. Evidence gleaned from Dagbani loanword phonology supports the claims of previous studies that Dagbani has CV as the unmarked syllable structure, which is in line with typological claims that CV syllable is unmarked. Lexical items that are borrowed from contact languages such as English, Arabic, and Hausa into Dagbani undergo some phonological processes such as palatalization, debuccalization, liquid substitution, flapping and fortition. These processes ensure that the borrowed items are adjusted into the syllable structure rules of Dagbani. Data of 127 loanword are drawn from multiple sources including a Dagbani dictionary, previous related studies, elicitation and also my intuition as a native speaker, and analysis was done descriptively guided by Basic Linguistic Theory. I conclude that loanword from the three source languages undergo various forms of segmental processes. I also contend that the need to fill lexical and semantic gaps, religious and cultural dominance as well as trade license borrowing in Dagbani. The paper is important because it approaches the study of loanword adaptation from a perspective that has not received attention so far in Dagbani yet.

Key words: Dagbani, segmental processes, adaptation, loanword, phonological nativization

Tuma Kolivaai

Vihigu ɲo buyisimi wuhi Dagbani bachipaɲda bachikoba kumsi nahingban' sheɲa ɲan tayira ɲa paɲbu shee. Dagbani nyela "Mabia" zuliyanima la puuni zay' yini m-be Tudu polo Ghana tingbani ni. Vihigu ɲo ni woligi ka che di tatabiti ɲan pun niɲ Dagbani ni nyemi, di zahimla bachipaɲda ɲan yi zuliya bobigu sheɲa ni n-kpe na Dagbani zuliya ni. N wuhiya ni binsheɲu din tahiri bachikoba kumsi nahingban' sheɲa tayibu na Dagbani bachipaɲda ni maa jendi la bachijila woliginsim din be Dagbani mini di ni paɲdi bachinima maa zuliya sheɲa ni maa. Dagbani bachipaɲda fonoloji shehira din yina vihigu ɲo ni gba sayi ti tuuli vihisi din pun niɲ kadama Dagbani mali la CV bachijila bieɲigu, ka di lu n-zahim vihisi ɲan pun niɲ ka wuhi ni zuliyanima pam mali la CV bachijila bieɲigu. Bachinima ɲan yi zuliya sheɲa ni kamani Silimiinsili, Laribu ni Gbengbehili n-kpe na Dagbani ni tayiri doli fonoloji so' sheɲa kamani /s/, /k, q/ ni /g, ɸ/ tayiri leeri [ʃ], [tʃ] ni [dʒ] n-doli taba "palatalization", /k, q/ tayiri leeri [ʔ] "debuccalization", /l/ mini /r/ zaani taba zaashee "liquid substitution", /d/ tayiri leeri [ɾ] "flapping", /b/, /v/ ni /z/ tayiri leeri [p], [f] ni [s] n-doli taba ka /dʒ/ mini /tʃ/ gba tayiri leeri [z/ʒ], [s] n-doli taba "fortition". Lala tayibu ɲo niɲdi mi n-doli Dagbani bachijila bieɲigu zalisi. Vihigu ɲo yaai bachipaɲda kalinli paai kobiga ni pishinaayopɲin (127) yay' bobigu kamani Dagbani "dictionary" ni, vihisi ɲan pun niɲ n-jendi bachipaɲda, vihigu lahabali deebu niriba sani nti pahi m milinsi zaɲ jendi Dagbani zuliya yeltɔya, ka vihigu maa kahigibu niɲ dalim "Basic Linguistic Theory". N wuhiya vihigu ɲo kolivaai puuni ni zuliya diba ata bachipaɲda bachikoba kumsi nahingbana n-tayira ɲa paɲbu shee. N lahi wuhiya ni boya ɲan doni bachinima mini "semantics" ni, adiini mini zuliyanima yaligibu zileli ni daliri n-che ka Dagbamba paɲ bachinima. Vihigu maa mali anfaani dama, di kpuɲi la so' sheli so ni na bi doli n-kahigi Dagbani bachipaɲda.

1. Introduction

Although literature abounds in the segmental processes of loanword adaptation in many languages, existing literature in Dagbani has focused on the English loanwords in the language (see Hudu, 2002; Alhassan, 2006; Ibrahim, 2013). For instance, Hudu (2002) and Alhassan (2006) investigated consonant substitution in English-Dagbani loanwords with little or no attention given to typological investigation into loanwords adapted from other source languages such as Arabic and Hausa. This study therefore examines segmental processes of loanword adaptation in Dagbani, a Mabia (Gur) language of the Western Oti-Volta Branch and a sub-group within the Niger-Congo languages (Naden, 1988; Olawsky, 1999). Dagbani as a tonal language with three major dialects: *Tomosili* spoken in and around Tamale, Western part of Dagbon, the administrative capital of Northern Region; *Nayahili* is spoken in

Yendi, Eastern part of Dagbon and known as the traditional capital of the Dagbamba, and *Nanunli* is spoken in Bimbila, South-east of Dagbon (Naden, 1988, 1989). Nanunli is a dialect of Dagbani, which is mutually intelligible with Dagbani (Olawsky 1999, Issah 2008, 2012, Hudu, 2010). Dagbon (also traditionally known as Dagbanj), refers to the entire geographical area in the Northern region where Dagbani is spoken.

Analysis in this study is however based on the Western Dialect (Tomosili). This is because it is a dialect in which most Dagbani reading materials in schools and religious books such as the Qur'an and the Bible are written (Hudu, 2010). 'English words are prevalent in many languages including Dagbani because, the Dagbamba in the 1930s operated under the 'indirect rule' of the British policies (Staniland, 1975), and because of the interaction between the Dagbamba and the English-speaking people in various spheres of life, some words were borrowed into the language. Again, English is an official language in Ghana and it is learnt in Ghanaian schools. Words borrowed from other source languages such as Arabic and Hausa into Dagbani is because of historical contact and the social interaction such as trade and religious activities among them (cf. Baldi, 1997: 267 cited in Olawsky, 2004).

During lexical borrowing, many languages including Dagbani have rules that ensure that words that are borrowed overcome certain barriers by undergoing some alternations in order to conform to the phonotactics of the language (Fasold & Connor-Linton 2006 and Haspelmath, 2009 as cited in Petryshyn, 2014). The alternation is referred to as *nativization* (Katamba, 2005), *adoption* (Zawawi, 1979; Rosenhouse and Kowner, 2008), *adaptation* (Daulton, 2008), *accommodation* (Kerswill, 1994), *assimilation* (Barber, 1993), or *integration* (Galstyan, 2012) as cited in Petryshyn (2014). This study adopts the term 'adaptation' for the purpose of consistency.

The data for this study were gathered from both primary and secondary sources. While the processes used to obtain primary data were my native speaker intuition (Tomosili) and elicitation, the secondary data were sourced from Dagbani dictionaries (Naden, 2014; Mahama, 2015; Blench, 2004) and existing literature (Hudu, 2002; Alhassan, 2006 and Ibrahim, 2013) guided by my native intuition. Elicitation for example was done in two forms: formal elicitation and informal elicitation. During the elicitation process, data from spontaneous utterances of the native speakers was informally elicited at public gatherings (e.g. religious preaching, wedding grounds, market, etc) and discussions on radio and television. Sometimes too, with the consent of the native speakers, a picture of an item was shown to them and they were asked to provide its name in Dagbani. This process was appropriate for picturable words. However, words that were not picturable were presented to colleague native speakers who were mostly bilinguals for their judgements during conversation. Formally, I first sought their consent before I presented a question for them to pass their judgement. Sometimes, it happened informally but in most cases I informed them before putting forward what I wanted them to offer their views. These words borrowed into Dagbani were transcribed based on the way they were naturally produced.

Transcription of data was guided by existing literature of the languages under study: Dagbani (Hudu, 2005, 2010, 2016, 2018), Hausa (Caron, 2015; Guba, 2016) and Arabic (Bueasa, 2015). Transcription of English words was however based on Ghanaian English Pronunciation (Huber, 2008; Suglo, 2014). Data was also verified by four bilingual native speakers of Dagbani (two males and two females aged 50 years or above) who were purposefully selected. The two male consultants were

I am very thankful to the two anonymous reviewers of JWAL whose insightful comments and suggestions have helped in shaping this paper to its current stage. I also show gratitude to Peter Nindow Mahama of EP College of Education for checking the entire document for typos and language. However, any shortcoming in this paper remains mine.

selected based on their long-standing engagement in setting Dagbani questions as chief examiners for West African Examination Council in Ghana, whilst the other two female consultants were selected based on their rich experience in teaching Dagbani close to fifty-five (55) years today. The main purpose for employing more than one step to gather data was to crosscheck and strengthen the credibility and validity of the data gathered (Honorene, 2017). The transcribed inputs were analysed descriptively guided by Basic Linguistic Theory (BLT) of Dixon (2010, 2012) which offers a holistic empirical analysis of data by making them intelligible, leading to inductive testable generalizations. Beyond the introduction, the rest of the paper is organized as follows: Section 2 presents a Review of Relevant Literature while discussion on segmental processes is presented in Section 3 and conclusion drawn in Section 4.

2. Literature Review

There is global interest in the novel contribution of phonology to the growth and development of languages (Petryshyn, 2014). The study of loanword has attracted more global attention and has become more interesting to phonologists because of the important role it plays in enhancing phonologists understanding of the phonotactic constraints that they display in the native languages during the borrowing process (Davis, 1993). For example, it brings to bare the native phonological constraints that would never have had the chance to surface, and this provides new and interesting insights that will ultimately help readers to better understand the phonological theory of the native language (Guba, 2015; Bueasa, 2015).

2.1 Principles of loanword Adaptation

Languages in the world have borrowed some number of lexical items and other semantic sub-domains from other languages (Bueasa, 2015). Some loanwords borrowed from donor languages contain sounds or combination of sounds that are not found in the borrowing language, and this usually violates the phonotactics of the borrowing language because the unique phonological features of the loanword appear different from the native vocabulary (Davis, 1993). Thus, when words are borrowed from one language into another language, the grammar of the recipient language compels the loanword to undergo certain alternations before it is allowed into the linguistic context of the recipient language (Fasold and Connor-Linton 2006:294 as cited in Petryshyn, 2014). For example, native languages will have to ensure some segment deletion and insertion into foreign words and sound substitution before they are allowed into the phonotactics of the native language (Olawsky, 1999; Hudu, 2002; Adomako, 2008; Hudu, 2010 and Wornyo, 2016).

Also, the recipient language may adopt new sounds into its system. For instance, there are some sounds in the donor language which the recipient language considers foreign and thereby replaces such perceived foreign sounds by either sieving and preserving the loanword whose phonological features are underlyingly contrastive in the native phonology or the recipient language preserves the phonetic characteristics of the loanword (Clements 2001, Herd 2005, Dresher 2009 as cited in Kang, 2011). The processes these loanwords undergo during adaptation make it interesting to phonologists (Davis, 1993). Dagbani scholars such as Hudu (2002, 2010), Alhassan (2006), Ibrahim (2013) and Nindow (2017) agreed that, loanword undergo some phonological changes during their adaptation into the recipient language. Examples of these adaptation processes of loanword in Dagbani noted by previous studies include epenthesis, deletion and substitution of sounds (Hudu, 2002; Alhassan, 2006). This paper however focuses on segmental processes without considering the syllable structure processes such as epenthesis and deletion.

2.2 Vowel and consonant inventory in Dagbani

A good description of Dagbani phonology is essential to the analysis and understanding of words borrowed from other languages such as English, Hausa and Arabic into Dagbani. For instance, providing an overview of vowel and consonant inventory in Dagbani aids the analysis of data in this study and enhances readers understanding of how the vowels and consonants interact during the adaptation process in Dagbani. This study adopts the vowel inventory of Hudu (2010) in which 15 Dagbani vowels are classified according to their ATR quality as shown in (1) below.

(1) Dagbani Vowel Inventory (Hudu, 2010)

Class I Vowels [+ATR]		Class II Vowels [-ATR]	
Ii:	uu:	i	u
ee:	oo:	ε	o
ə		a, a:	

(2) Dagbani Consonant Inventory (Hudu, 2005, 2018)

	Labial	Labio-Dental	Alveolar	Palato-alveolar	Palatal	Labio-velar	Velar	Glottal
Plosive	p b	[tp] [db]	t d			kp gb	k g	
Nasal	m	[nm]	n		ɲ	ŋm	ŋ	
Affricate				tʃ dʒ				
Fricative	f v		s z	[ʃ] [ʒ]			[X]	[h] [ʔ]
Liquid			l [r]					
Glide					j	w		

2.3 Sounds Alternation

From the list of 15 vowels identified in Hudu (2010), 10 of them (e.g /i, ε, a, u, o, i:, e:, a:, u:, o:/) are phonemic (Hudu, 2018). In this study, the –ATR variant of [i] is crucial in the analysis of loanword adaption, and according to Hudu (2010, 2016), the [-ATR] variant of [i] is identified as /i/, since there is no context in Dagbani where the two vowels [i] and [ə] surface as claimed by previous studies (e.g Olawsky, 1999; Hudu 2005). The study therefore, adopts Hudu (2010) vowel inventory which considers all alleged cases of [-ATR] variant of [i] to be [i] and not [i] or [ə]. Considering the consonant inventory for this study, a list of consonants in the Hudu (2018) are adopted together with the labelling in Hudu (2005) for the purpose of clarity and/or comprehension as illustrated in (2) above. It has been noted in existing literature that consonants such as /k, g/ are both realized as a glottal stop /ʔ/ in postvocalic position after vowels (Olawsky, 1999; Hudu, 2010, 2018), and the same velars are also realized as affricates /tʃ, dʒ/ before front vowels (Hudu, 2010, 2018) in Dagbani.²

² This current study uses /ʔ/ in all surface forms, though /y/ appeared in some contexts where orthographical representation was required for clarity.

It has been widely agreed that the glottal stop /ʔ/ does not have any phonemic status in Dagbani, and that /ʔ/ does not begin a word in Dagbani. It is usually found either in word-medial beginning a syllable or as coda. This is illustrated in examples such as [gɔ.ʔi.li] ‘a shirt’, [zu.ʔɔ] ‘head’, [paʔ.suŋ] ‘nice woman’ and many others. This is to say that consonants such as [m, ŋ, n, r, l, b, ʔ] occur in coda position or word medial in Dagbani (Abu-Bakari, 1977; Olawsky, 1999). In addition, consonants such as /r/ and /h/ do not occur at word-initial position just as the glottal stop in Dagbani but they do occur in loanword where /r/ will alternate with /l/, in which case /h/ still maintains its stricture as it occurs at word-initial (Olawsky, 1999, Hudu, 2005, 2010). It has also been established that /d/ becomes a trill /r/ in semi-final position of lexical items whilst at intervocalic position, /d/ is realized as a tap /ɾ/ (Olawsky, 1999; Hudu, 2005, 2010 and 2018), and in another environment, a tap /ɾ/ is realized as a surface variant of a lateral /l/. In this study, the trill /r/ is used throughout the analysis.

Again, fricatives such as /s/ and /z/ respectively become palatal sounds (e.g /ʃ/ and /ʒ/) when they precede front vowels (Hudu, 2005, 2010). What is worth pointing out in the phonology of Dagbani is that, certain combinations of sounds do not occur in Dagbani. For instance, front vowels do not occur with velar consonants /k, g, ŋ/ in a CV syllable (Wilson and Bendor-Samuel, 1965; Olawsky, 1999), and labiovelars /kp, gb, ŋm/ rarely occur with back vowels (Olawsky, 1999). Also, [gi] do not occur in the root of the syllable, except at the stem final position as in [gba:gi] ‘catch’, [da:gi] ‘push’ etc.

3. Analysis of Segmental Processes

The most commonly observed segmental processes analyzed in this paper are palatalization and consonant mutation; a phenomenon involving phonetic changes that occur in consonants to make them either weak (lenition), strong (fortition) or to cause nasalization (Grijzenhout, 2011). Grijzenhout (2011) further explains in more specific terms asserting that consonant mutation refers to “a class of processes by which a consonant turns into another segment with a different degree of voicing, continuance or nasality that is not due to neutralization or assimilation to a neighbouring segment of the same natural class” (pp.184). Grijzenhout further noted that consonant alternation is an instance of consonant mutation in the sense that it provides a phonological environment where an oral stop turns into fricative between a sonorant and a vowel, a phenomenon previously observed in Dagbani by Hudu (2002, 2010, and 2018). The major segmental processes analyzed in this paper are palatalization, debuccalization, and substitution of liquid, flapping and fortition.

3.1 Palatalization

Palatalization is a phonological process in which consonants and vowels interact resulting in the acquisition of secondary palatal articulation (Kochevo, 2011). Kochevo further relates that, palatalization “usually happens under the influence of the adjacent vowel and/or palatal glide” (pp. 313). In Dagbani, some phonemes have surface variants before front vowels and such surface variants are as a result of palatalization processes in Dagbani (Hudu, 2010). Consonants which undergo palatalization before front vowels in Dagbani and are relevant to this discussion include: /s/→[ʃ], /z/→[ʒ], /ŋ/→[ɲ], /k/→[tʃ] and /g/→[dʒ]. They are illustrated in (3) showing how palatalization is manifested in native Dagbani lexicon.

(3). Palatalization of underlying /s, z, k, g, ŋ/ (Hudu, 2010: 13)

- | | | | |
|--------------|---------|----------|----------------|
| a. /s/ → [ʃ] | /si-a/ | [ʃi-ja] | ‘bee-SG. |
| b. | /sɛ-ʔɔ/ | [ʃɛ-ʔɔ] | ‘rainy season’ |
| c. /z/→[ʒ] | /zɛ-ʔɔ/ | [ʒɛ-ʔɔ] | ‘storm’ |
| d. | /zi-li/ | [ʒi-li] | ‘load-SG’ |
| e. /k/→[tʃ] | /kilim/ | [tʃilim] | ‘delay’ |

f.	/kɛ-hi/	[tʃɛ-hi]	‘ripin pieces’
g. /g/→[dʒ]	/gɛ-linsi/	[dʒɛ-linsi]	‘hatred’
h.	/gɛba/	[dʒɛba]	‘hate them’

The phenomenon illustrated in (3) is commonly observed in loanword adaptation in Dagbani especially words adapted from English, Hausa and Arabic into Dagbani. This phenomenon was earlier observed in previous studies on English-Dagbani loanword such as Hudu (2002) and Alhassan (2006) where the voiceless alveolar fricative /s/ in English is palatalized before front vowels. The present study gleaned more data from other languages such as Hausa and Arabic to expound on the English-Dagbani models. Of the consonants that undergo palatalization as far as segmental processes of loanword adaptation is concerned in Dagbani, palatalization of the coronal (e.g. /s/) and the dorsal (e.g. /k, g/) are widely observed, and they are discussed in this study. The data in (4) through (6) respectively illustrate the palatalization of voiceless alveolar fricative before a palatal vowel [i] in loanword adapted specifically from English, Hausa and Arabic into Dagbani.

(4) Palatalization of /s/ in English-Dagbani loanwords³

a. /stɔ:/	[ʃitɔʔu]	‘store’
b. /sku:l/	[ʃikɔrɔ]	‘school’
c. /hɔspitl/	[aʃibiti]	‘hospital’
d. /skrɔdjɔraɪvə/	[ʃikɔrɔdira:ba]	‘screwdriver’
e. /sɪmɛnt/	[ʃimiti]	‘cement’
f. /sɪnɪmɑ/	[ʃini:]	‘cinema’
g. /sɪgəɹɛt/	[ʃɪgə:ri]	‘cigarette’
h. /sɪdi/	[ʃi:ri]	‘cedi’
i. /sti:mɑ/	[ʃitima]	‘steamer’

According to Hudu (2002), there are some ordered rules, which help loanwords undergo the palatalization processes. For instance, he noted that since Dagbani phonotactics disallow consonant clusters, the inputs from the donor languages first undergo a phonological process such as epenthesis before being subjected to further changes in order to ensure a complete adaptation. For instance, /sku:l/ ‘school’ becomes /sikuru/, where there is substitution of the liquids as well as insertion of /i/ and /u/ as required by the phonotactics of Dagbani. According to Hudu (2002), /sikuru/ now becomes the input for palatalization where the first syllable with /s/ as the onset in /sikuru/ is realized as [ʃikuru] as sanctioned by a phonotactic rule in Dagbani as already stated in the preceding paragraph. In some languages, for instance, in Polish, alveolar preceding a front vowel is palatalized by converting into alveolopalatal /ɕ/ (de Lacy, 2007). Similarly, the alveolar /s/ in loanword adapted from both Hausa and Arabic also undergo palatalization before front vowels as follows:

(5). Palatalization of /s/ in Hausa-Dagbani loanwords

a. /sikiri/	[ʃitʃiri]	‘sugar’
b. /sia/	[ʃija]	‘ridicule/joke’
c. /asi:ri/	[aʃili]	‘a secret’
d. /ko:sai/	[ko:ʃe]	‘floppy cake made with beans dough’
e. /se:da/	[ʃɛhira]	‘a witness/example’
f. /masi:fa/	[maʃi:fa]	‘trouble’
g. /ʃe:ge/	[ʃe:dʒe]	‘bastard’

³ Note that this study focus on the Ghanaian English pronunciation which is the source of borrowing in Dagbani, therefore transcriptions are done based on Ghanaian English phonology which emphasised on seven vowels; e.g i, e, ɛ, a, u, o, ɔ (Huber, 2008).

(6) Palatalization of /s/ in Arabic -Dagbani loanwords

a. /mus ^h i:b/	[mɔʃi:ba]	‘suffering’
b. /qa:sim/ ‘distributor’	/ka:simu/ [ka:ʃimu]	‘male personal name’
c. /wa:θiqa/ ‘confident’	/wa:sika/ [wa:ʃika]	‘female personal name’
d. /bas ^h i:r/ ‘wise’	/basi:ru/ [baʃi:ru]	‘male personal name’
e. /na:s ^h r/	/na:siru/ [na:ʃiru]	‘victory, success’
f. /ʔalχa:mis/	/ala:misi/ [ala:miʃi]	‘Thursday’

The data in (7) are some exceptions in Dagbani where palatalization occur in an environment that does not trigger palatalization. Interestingly, it is possible to **have** [sa:] ‘rain’, [sa:mba] ‘strangers’ etc in the Dagbani lexicon, but it is rare to have *[ʃa:]. The data in (7) can therefore be considered to be some of the exceptions that characterize loanword phonology.

(7) Some exceptions that characterize loanword phonology.

a. /has ^h r/ ‘hinderance’	/asa:ra/ [aʃa:ra]	‘misfortune’
b. /hafs ^h a/ ‘cub’	/hafisa/ [aʃiʃa]	‘female personal name’
c. /χansa:/ ‘pugnosed’	/hamsa:/ [hamiʃawu]	‘female personal name’
d. /ʔannas ^h a:ra/	/anasa:ra/[anaʃa:ra]	‘white man’

However, when the post-alveolar fricative /ʃ/ is not preceded by a front vowel in the input, /s/ surfaces in the output which is expected in the phonology of Dagbani as shown in the examples provided in (8) below.

(8) /ʃ/ becomes /s/ before any vowel other than front vowel

a. /ʃɔvil/	[so:buli]	‘shovel’
b. /ɔpireiʃin/	[apole:sa]	‘operation’
c. /patiʃin/	[pate:sa]	‘partition’
d. /steiʃin/	[te:sa]	‘station’
e. /kwɛʃin/	[ko:sa]	‘question’
f. /teliviʒin/	[telivisa]	‘television’
g. /kɔmpitiʃin/	[kɔmpate:sa]	‘competition’

In (8e), /ɛ/ is deleted in the first syllable leaving [k^w] to surface in Dagbani with the same phonetic property as [ko:]. And since the alveolar nasal does not end lexical words in Dagbani, the loanword phonology of Dagbani replaces pattern expressed as [-ʃən] in the final syllable of loanword with [-sa] as captured in other models illustrated in (8b-g) above.

Also, the velars /k, g/ and the uvular /q, ɣ/ undergo palatalization before front vowels during loanword adaptation in Dagbani. While the palatalization of /k, g/ are evident in both English and Hausa loanwords in Dagbani, /k, q, ɣ/ are palatalized in the Arabic models. The data in (9) through (11) illustrate this process. In (11), data is drawn from Hudu (2018:216) but without tone marking (of course, tone marking is not of interest in the present study).

(9) Palatalization of /k, g/ before front vowels in English-Dagbani loanwords

/k/ → [tʃ]	a. /breik/	[bire:tʃi]	‘brake’
	b. /kɛndl/	[tʃɛndiri]	‘candle’
	c. /briks/	[bilitʃisi]	‘bricks’
	d. /ki:nsk/	[tʃiʃi:nsi]	‘kiosk’
/g/ → [dʒ]	e. /ba:g/	[ba:dʒi]	‘a bag’

(10) Palatalization of /k, g/ before front vowels in Hausa-Dagbani loanwords

/k/ → [tʃ]	a. /kiriki/	[ʃiriʃi]	‘valuable’
	b. /makeri/	[matʃele]	‘blacksmith’
	c. /saʊki/	[so:tʃi]	‘an improvement in health’
	d. /saʊke/ ‘to bring down from the head’	[so:tʃe]	‘trade’
	e. /sariki/	[salitʃi]	‘chief’
	f. /keke/	[tʃetʃe]	‘bicycle’
/g/ → [dʒ]	g. /girima/	[dʒilima]	‘respect’
	h. /ba:ngida/	[ba:ndʒira]	‘toilet’
	i. /zirigi/	[zilidʒi]	‘train’
	j. /ʃe:ge/	[ʃe:dʒe]	‘bastard’
	k. /gijadi/	[dʒa:ra]	‘kitchen’

Considering the palatalization of the velar /k/ and the uvulars /q, ʁ/ in the Arabic models, the data in (11) demonstrate their existence though not widely distributed in Dagbani. Palatalization of /ʁ/ in Arabic-Dagbani loanword is mainly observed among personal names as illustrated in (11g).

(11) Palatalization of /k, q, ʁ/ before front vowels in Arabic -Dagbani loanword

/k/ → [tʃ]	a. /malik/ ‘king’	/maliki/ [malitʃi]	‘male personal name’
	b. /mulk/ ‘authority’ sovereignty’	/muliki/ [mʊlitʃi]	‘subjects’
/q/ → [tʃ]	c. /ʔal haq/ ‘the right’	/alahiki/ [alahitʃi]	‘sin’
	d. /ʔarriziq/ ‘wealth’	/ariziki/ [arizitʃi]	‘wealth’
	e. /haqi:qa/ ‘truly/	/aki:ka/ [atʃi:ka]	‘truly/indeed’ indeed’
/ʁ/ → [dʒ]	f. /ʔasʔada:q/ ‘dowry’	/asada:ki/ [asara:tʃi]	‘dowry’
	g. /muʁi:s/ ‘helper’	/muʁi:su/[mudʒi:su]	‘male personal name’

The data in (9) through (11) demonstrate that, front vowels /i, e/ triggers palatalization of the velars /k, g/ in English and Hausa models and the uvulars /q, ʁ/ in the Arabic models. In fact, there are exceptions in some cases where palatalization occurs in environment that does not condition palatalization as in the case of (10k). According to Hudu (2018), palatalized consonants are coronal irrespective of their underlying place specification. In Section 3.2, debuccalization is discussed.

3.2 Debuccalization

In many different languages, debuccalization involves neutralization of segments in contrast at the end of a prosodic domain usually at a syllable coda (Brockhaus, 1995 as cited in Grijzenhout, 2011). According to Hudu (2018), debuccalization occurs when a segment loses its underlying oral constriction. In Dagbani and many other languages for instance, the voiced velar stop /g/ is glottalized as [ʔ] in postvocalic position (Hudu, 2010). This same feature is associated with voiceless velar stop /k/ especially in the Western Dialect of Dagbani where both /k/ and /g/ as the only target consonants are realized as [ʔ] in weak positions such as affixes, particles, and bound roots (Hudu, 2018). This is exemplified in 12 below.

(12) Debuccalization of /k, g/ in Dagbani native words (Hudu, 2018:212-214).

a /sa-ki/ [saʔi]. 'be sufficient'

b /ʌɔg-ri/ [ʌʔ-li] 'side-SG'

c. /mɔ-gɔ/ [mɔ-ʔɔ] 'grass-SG'

However, in the case of the voiced velar stop /g/, it does not always surface as a glottal stop in Dagbani. While Olawsky (1999) claims [ɣ] surfaces in all cases after vowels, Hudu (2018) claims [ʔ] surfaces in all cases after vowels. However, the data in (13) and (14) are lexical words in Dagbani demonstrating an interesting pattern of the distribution of [ɣ] and [ʔ]. It may perhaps be deduced from the data in (13) and (14) that, while the lexical roots in (13) have CV structure, the lexical roots in (14) have CVC structure, implying that [ʔ] does not form part of the root in patterns with CV structure. [ʔ] is realised as the onset of the suffix that marks number as illustrated in (13). [ɣ] on the other hand forms part of the lexical root and surfaces in patterns with CVC structure. The data in (13) and (14) respectfully illustrate the distribution of [ʔ] and [ɣ].

(13) [ʔ] distribution in Dagbani CV lexical structure

a. [sɔ-ʔɔ] 'broom-SG'	[sɔ-ri] 'broom-PL'	[so' karili] 'big broom'
b. [da-ʔɔ] 'wood-PL'	[da-ri] 'wood-PL'	[dabɔbili] 'bundle of wood'
c. [vi-ʔɔ] 'owl-SG'	[vi-ri] 'owl-PL'	[vi' polli] 'young owl'
d. [ɔ-ʔɔ] 'water pot-SG'	[ɔ-ri] 'water pot-PL'	[lo' karili] 'large water pot'
e. [mɔ-ʔɔ] 'grass-SG'	[mɔ-ri] 'grass-PL'	[mɔkpalli] 'flaming grass torch'

What is worth noting in (13) is that, [-ʔɔ] represents number suffix with [-ri] being the corresponding plural suffix.

(14) [ɣ] distribution in Dagbani CVC lexical compounds

a. [paya] 'woman-SG'	[payiba] 'woman-PL'	[pay' vielli] 'beautiful woman'
b. [zuyu] 'head-SG'	[zuyuri] 'head-PL'	[zuy' titali] 'big head'
c. [duyu] 'pot-SG'	[duyuri] 'pot-PL'	[duy' sabinli] 'black pot'
d. [buyum] 'fire-SG'	[buyum] 'fire-PL'	[buyun' niɛŋ] 'burning fire'

This phenomenon also occurs across word boundary in Dagbani especially in a rapid speech where the voiceless velar stop [k] in native words is debuccalized as follows:

a. <Ya ka a yina> [jaʔa:jina]? 'Where are you coming from?'

b. <Bo ka a dira> [bɔʔa:dira]? 'What are you eating?'

According to Olawsky (1999), the voiced velar stop /g/ is blocked at the morpheme boundary in compounds to be realised as [ɣ] as exemplified in the word /piɛgula/ 'shepherd-SG' (a combination of /piɛyu/ 'sheep' and /-gula/ 'watch').

In loanword adaptation in Dagbani, the voiceless velar stop [k] and the uvulars [q, ʁ] undergo the process of debuccalization before vowels. It is however noted that, /g/ debuccalization in loanword is not widely distributed as opposed to /g/ debuccalization in the native lexicon shown in (12b-c). For instance, the immediate examples illustrating the rareness of /g/ debuccalization in loanword are exemplified in the following Hausa loanwords; /maagani lua/ 'water medicine' and /aliguufu/ 'dishonest', which are respectfully adapted as [ma:ganilua] 'alum' *[ma:ʔanilua] and *[aliʔu:fu]. The data in (15) show /k/ debuccalization in loanword. However, the examples provided in (15a-c) are pulled from Hudu (2002:15) with some modification in the transcription.

(15) /k, q/ debuccalization in Dagbani loanword; /k, q/ → [ʔ]/ V_

a. /dɔkta/	[dɔʔta]	‘doctor’	English
b. /spoks/	[sipɔʔsi]	‘spokes’	English
c. /bakɛt/	[bɔʔati]	‘bucket’	English
d. /kɔndɔkta/	[kɔndɔʔte]	‘conductor’	English
e. /tikɪt/	[tiʔti]	‘ticket’	English
f. /pakɛt/	[paʔati]	‘packet’	English
g. /mɪks/	[miʔsi]	‘to mix’	English
h. /sɔks/	[sɔʔsi]	‘socks’	English
i. /taksi/	[taʔsi]	‘taxi’	English
j. /watawɛ:ks/	[watawaʔsi]	‘water works’	English
k. /waqt/	[waʔati]	‘time’	Arabic
l. /yɛkayɛka/	[jaʔa jaʔa]	‘a sieve’	Twi

One important observation about the phenomenon in (15) is that, with the exception of (15k-l) which respectfully originates from Arabic and Akan, the rest (most of the examples) are from English. Regardless of the origin of the loanword, the change in place specification (i.e. from dorsal to glottal) is because of the preceded vowels in the surface forms, which is motivated by the phonotactic rule of Dagbani. At this point, I turn my attention to other segmental processes, which are prevalent in loanword adaptation in Dagbani. They include liquid substitution, flapping (the alternation between liquid and stop), and fortition.

3.3 Liquid substitution

Consonant substitution also affects the liquids /l/ and /r/. Liquids are diverse set of sounds whose constituency is language specific and they typically include trills, taps, and lateral approximants (Proctor, 2009). Liquids do not share simple universal phonetic property unlike nasals, stops and vowels, which are more canonical major classes. However, they (liquids) have a compelling phonological evidence which usually involves syllable-level phonotactic constraints (Proctor, 2009). For example, the syllable structure of every language determines which consonants are licensed at onset or coda position, and the sequencing constraints at both ends of the syllable. In reporting about apicals in palatalization among languages such as Russian and Belorussian, Bhat (1978:71-72) as cited in Bateman (2007) argues that, lateral continuants or trills change into flaps, and non-lateral liquids change into laterals. Liquid substitution is a common pattern that is observed in the adaptation of loanword in Dagbani. This segmental process is expected because the phonology of Dagbani disallows the occurrence of the alveolar trill at word-initial, as such when adapting words from the source language into Dagbani, models with the alveolar /r/ at word-initial are substituted with the alveolar lateral /l/ (Olawsky, 1999; Hudu, 2002). The data in (16) and (17) respectively illustrate liquids substitution in English-Dagbani and Hausa-Dagbani loanword.

(16) Substitution of /r/ by /l/ in English-Dagbani loanwords

a. /raiswata/	[laswata]	‘rice water’
b. /repɜ:ra/	[lipe:la]	‘repairer’
c. /rʌbə(r)/	[lɔba]	‘rubber’
d. /rɛdʒɪmənt/	[lɪndʒɪma]	‘regiment’
e. /f(r)ɛɪm/	[filim]	‘frame’

But the English word /film/ is borrowed as [filim], ensuring an insertion of an epenthetic vowel at the initial cluster to break the CC sequence.

(17) Substitution of /r/ by /l/ in Hausa-Dagbani loanwords

a. /re:mo/	[le:mo]	‘an orange’
b. /ra:kumi/	[la:kum]	‘camel’
c. /rake/	[latfe]	‘sugarcane’
d. /sariki/	[salitfi]	‘chief’
e. /zirigi/	[zilidzi]	‘train’
f. /amarija/	[amilija]	‘wedding’
g. /ta:rija/	[ta:lija]	‘wedding items’
h. /du:ra/	[du:la]	‘syringe’
i. /araha/	[alaha]	‘cheap’
j. /fura/	[fola]	‘a ball of cake made with millet’
k. /ko:kari/	[ko:kali]	‘Good effort/endeavour’
l. /fi:ra/	[fi:la]	‘conversation’
m. /tula:re/	[tula:le]	‘perfume’

In (16), the alveolar trill in the source language precedes a vowel playing the role of an onset, and as already established in the Dagbani phonology, /r/ does not occur at word initial, instead the lateral is preferred at word initial since it is tolerated at the initial position in lexical words (e.g. [liʔiri] ‘money’, [lɛbila] ‘adze’, [luŋa] ‘drummer’, [lɔʔo] ‘water pot’ etc).

Also, in the adaptation of liquids, it is observed that English models with the alveolar lateral changes into the alveolar trill perhaps because nouns which roots end with /l/ are not common in the Dagbani lexicon, therefore loanword which roots end with /r/ look more natural to the native words such as [kpar.li] ‘a baboon’ [sar.ga] ‘veil’, [dʒer.gu] ‘a fool’ [dar.gu] ‘a ladder’ etc. The data in (17) demonstrate the preference of /r/ in the roots of loanword in Dagbani.

(17) Substitution of /l/ by [r] in English-Dagbani loanword

a. /sku:l/	[ʃikuro]	*[ʃikulo]	‘school’
b. /pedil/	[pɛdiri]	*[pɛdili]	‘pedal’
c. /smɔgil/	[simɔgiri]	*[simɔgili]	‘smuggle’
d. /kolpot/	[kurofo:to]	*[kulofoto]	‘coal pot’
e. /polis/	[pirinsi]	*[pilinsi]	‘police’
f. /kɔləkta/	[kɔrata]	*[kɔlata]	‘collector’
g. /ple:t/	[parante]	*[palante]	‘plate’

Morphologically, the data in (17a-c) is obviously identified with the root analysis, but (17d-g) are exceptions in the Dagbani loanword phonology. It can therefore be predicted that /r/ does not occur in onset position and/or word initial in Dagbani. It is also noted that when the root of the source word ends with /l/ as shown in (17a-c), the lateral will be substituted with /r/ in the target language (Dagbani) to conform to the phonological rule of the native word in the language. At this point, I will turn my attention to Section 3.4 where analysis of /d/ and /t/ substitution is discussed.

3.4 Flapping

This segmental process involves the replacement of alveolar stops by either alveolar flap /r/ or the retroflex /ɾ/ (Gurevich, 2011) especially in languages with the alveolar flap. According to Radford et al. (2009), flapping usually involves tapping the alveolar ridge with the tip of the tongue very quickly and the stop is normally found between two vowels. Radford et al. (2009) also noted that during flapping there could be a change in one or more phonetic features of a consonant sound (that is, a change in voicing, place of articulation, or manner of articulation), and the targeted

consonants in flapping include the alveolar stops (e.g /t, d/) as related in Radford et al. (2009) and the alveolar flap /ɾ/ or the retroflex /ɽ/ (Gurevich, 2011). This phenomenon is very common among the varieties of English spoken in North America, Australia and New Zealand, as exemplified in Australian English in (18) where a voiceless sound /t/ changes into a voiced sound /ɾ/.

(18) A voiceless sound changes into a voiced sound (Radford et al., 2009:62)

[lɪtə]→[lɪɾə] 'litter'
 [bɪtə]→[bɪɾə] 'bitter'
 [gɛtɒf]→[gɛɾɒf] 'get off'

In Dagbani, the voiced alveolar stop is substituted with a tap [ɾ] in post-vocalic position (see Hudu 2018, 2010; Olawsky 1999). In a compound especially in a rapid speech, Hudu (2002) reports on how /d/ surfaces as [ɾ] in Dagbani. This is illustrated in (19) as follows:

(19) Substitution of /d/ by [ɾ] in Dagbani native lexicon (Hudu, 2002:16)

a. /mo do:/ [mo:ɾ] 'moshi man'
 b. /bɪdɪbga/ [bɪɾɪbga] 'a child (male boy)'
 c. /bida:/ [bɪɾa:] 'they did'

Similarly, loanword in Dagbani display the above observed pattern and this is shown in (20) through (22). The data in (20a-e) were previously noted in Hudu (2002), and I have expounded on them with some little modification in their transcriptions. In the case of (20b), /ð/ is adapted as [d] which shares similar phonetic feature with the source sound, hence becoming an input for flapping.

(20) Substitution of /d/ by [ɾ] in English-Dagbani loanwords

a. /hedmæn/ [he:ɾimani] 'headman'
 b. /fɑ:ðə/ /fada/ [fɑ:ɾa] 'father (reverend)'
 c. /bɔ:dəgɑ:d/ [bɔ:ɾigɑ:ɾi] 'border guard'
 d. /kɔdɪmɛɪtə/ [kɔ:ɾine:ta] 'coordinator'
 e. /mʌdɡɑ:d/ [mɔ:ɾigɑ:ɾi] 'mud guard'
 f. /kɑ:d/ [kɑ:ɾi] 'card'
 g. /jɑ:d/ [jɑ:ɾi] 'yard'
 h. /paʊdə(r)/ [pɔ:ɾa] 'powder'

(21) Substitution of /d/ by [ɾ] in Hausa-Dagbani loanword

a. /takada/ [takara] 'a paper'
 b. /ba:ngida/ [ba:ndʒɪɾa] 'toilet'
 c. /gjadɪ/ [dʒɑ:ɾa] 'kitchen'
 d. /sa:da/ [ʃɑ:ɾa] 'expensive'
 e. /fasada/ [fasara] 'explanation'
 f. /la:da/ [la:ɾa] 'reward'

What is worth noting in this Section is that, the alternation between /d/ and [ɾ] is a phonological requirement. As related in earlier studies (e.g. Olawsky, 1999; Hudu, 2005), /d/ and [ɾ] are allophonic variants of /d/ in Dagbani. Thus, when /d/ occurs between two vowels in a rapid speech, it surfaces as [ɾ]. Flapping therefore occurs in loanword borrowed from English and Hausa. In the next Section (3.5), I present discussion on fortition, another segmental process which characterizes loanword adaptation in Dagbani.

3.5 Fortition

Fortition is a phonological process which involves a consonantal change or strengthening the degree of stricture resulting in devoicing or formation of stops (Grijzenhout, 2011). For instance, a fricative or approximant may become a stop as noted in Goodman (1964) cited in Kirchner (1998) where at word-initial position, /v/ becomes [b] in Creole French. To Hayes (2009), onset consonants have stronger degree of closure than coda consonants as exemplified in English casual speech; [tɛl] ‘tell’ and [lɛt] ‘let’ where the /l/ in [tɛl] can optionally lose its alveolar closure in the coda position as opposed to the /l/ in [lɛt] in onset position whose degree of stricture is strengthened. In Dagbani, Hudu (2018:206), posits that the labial and coronal places are the targets of enhancement in patterns of fortition. The pattern observed in Creole French is similarly displayed in Dagbani as shown in (22) involving only the English models where the fricative /v/ becomes a stop /b/ before vowels while maintaining its voicing property (i.e. a voiced labiodental fricative surface as voiced bilabial stop).

(22) Substitution of /v/ by /b/ in English-Dagbani loanwords

a. /draiva/	[dira:ba]	‘driver’
b. /silva/	[siliba]	‘silver’
c. /sivlɪən/	[sabi:la]	‘civilian’
d. /ʃɔvɪl/	[so:bolo]	‘shovel’
e. /gravɪl/	[girabolo]	‘gravel’
f. /fi:va/	[fi:ba]	‘fever’
g. /sevis/	[sabinsi]	‘service (taxi)’
h. /gwava/	[guabe]	‘guava’

The change from /v/ to /b/ occurs in the onset position in all the contexts to enable onset consonants have strong degree of closure. Also, deletion of the alveolar nasal in (22c) ensures a complete nativization of the loanword since /n/ does not end a lexical word in Dagbani. Insertion of alveolar nasal in some forms (e.g. 22g) together with vowel insertion also ensures complete nativization and subsequent increase in the number of syllables in the borrowing language (Dagbani). Again, loanword with diphthongs undergo some form of compensatory lengthening to ensure nativization of the loanword since diphthongization is uncharacteristic of lexical words in Dagbani. Interestingly, the fortition processes in (22) and (23a-f) involve only labials whilst the process in (23g—h) involves only coronals undergoing fortition process as already attested in Hudu (2018). In (23), there is obstruent final devoicing with voiced bilabial stop /b/ changing to either voiceless bilabial stop [p] or it changes to voiceless labiodental fricative [f]; the voiced labiodental fricative /v/ also changing to voiceless labiodental fricative [f]; and the voiced alveolar fricative /z/ respectively change into voiceless labiodental fricative [f] and voiceless alveolar fricative [s] all surfacing as coda consonants attesting to the assertion that consonants at coda position have weaker degree of closure (Hayes, 2009). The examples in (23) show this.

(23) Obstruent final devoicing

a. /braɪb/	[bira:po]	‘bribe’
b. /bɔlb/	[bolifo]	‘bulb’
c. /tju:b/	[tupo]	‘tube’
d. /li:v/	[li:fo]	‘leave’
e. /siv/	[si:fo]	‘sieve’
f. /staov/	[sitofɔ]	‘stove’
g. /ju:z/	[ju:si]	‘use’
h. /saiz/	[sa:si]	‘size’

Although some scholars argue that final devoicing is a process of lenition, Gordon (2011a: 828) as cited in Guba (2016) considers it a case of fortition. Final devoicing is motivated by phonetic factor (Hayes, 2004; Gordon, 2007 as cited in Guba (2016), perception (Yu 2011), and markedness criteria, which suspend marked features in weak positions (cf. Kiparsky 2006 as cited in Guba (2016). Close examination of the loanword corpus for the present study revealed deaffrication process; a phonological process involving affricates changing to fricatives or plosives as commonly observed in words borrowed from Arabic and Hausa. Examples are displayed in (24).

(24). /dʒ/ becomes [z/ʒ]

a. /darɗa/	[dariza]	‘valuable’	Arabic
b. /ʔaldʒanna/	[alizanda]	‘heaven’	Arabic
c. /ʔaldʒinn/	[alizini/alizini]	‘jinn/spirit’	Arabic
d. /dʒama:ʔat/	[zama:tu]	‘crowd’	Arabic
e. /haadʒara/	[azara]	‘female personal name’	Arabic
f. /maga:dʒia/	[maga:ʒia]	‘a leader of a group of women’	Hausa
g. /alima:dʒiri/	[alima:nʒiri]	‘begger’	Hausa

In the phonotactics of Dagbani, /z/ and /ʒ/ are allophonic variants (Olawsky, 1999; Hudu, 2010), and it is expected that /ʒ/ occurs before front vowels whilst /z/ occurs before any other vowel (Olawsky, 1999; Hudu, 2010). In (24f), the occurrence of /ʒ/ before front vowels is commonly observed in the Eastern dialect. Forms that are borrowed from both Arabic and Hausa undergo fortition process at syllable onset position but also maintain its voicing property. Thus, /tʃ/ and /s/ are both voiceless obstruent, and they surface in forms in which they are preceded by a nasal in both the donor and the recipient languages. This phenomenon is prevalent in Dagbani lexicon. Examples include *ʒilinsi* ‘ignorance’, *jelinsi* ‘hatred’ *milinsi* ‘familiarization’, and others have /-si/ occurring after a nasal. Thus, it is not possible to have forms such as **ʒilintʃi*, **jelintʃi*, **milintʃi* within the Dagbani native lexicon. One clear instance where this form is realized is a loanword from Akan (Twi) such as [bantʃi] ‘cassava’ that has gone through total adoption, and of course has the least distribution in the Dagbani phonology. Thus, during loanword adaptation in Dagbani, inputs with /tʃ/ being preceded by a nasal will surface as [s]. These are exemplified in (25).

(25) /tʃ/ becomes [s] in Hausa loanword in Dagbani when preceded by a nasal

a. /hukuntʃi/	[fokumsi]	‘authority/law’
b. /anzantʃi/	[anzansi]	‘courage’
c. /mɔsulintʃi/	[mɔsulinsi]	‘Islam’

4. Conclusion

Models borrowed from the four languages into Dagbani undergo some form of segmental processes such as palatalization, debuccalization, substitution of liquid, substitution of /d/ and /r/, and fortition. These processes were analyzed within the theoretical tenet of Basic Linguistic Theory of Dixon (2010, 2012), a theory that offers description and explanation of what languages are like and why languages are the way they are (Chomsky, 1973 as cited in Dryer, 2006). Thus, words borrowed into Dagbani are analysed descriptively and become more intelligible for formalization in any transient theory like Optimality Theory. Descriptive work in BLT is always of theoretical significance (Dryer, 2006). Of the four languages, English, Arabic and Hausa loanwords undergo palatalization and fortition. Coronals (e.g /s, z/) and the dorsal (e.g /k, g/) undergo palatalization before a high front vowel in Dagbani loanword. This involves models from English, Arabic and Hausa. Other models from

English and Arabic undergo debuccalization. Only /k/ undergoes the process of debuccalization in models borrowed from English and Arabic. Liquid substitution was also observed among models from English and Hausa. In liquid substitution, /r/ does not occur in onset position and/or word initial in Dagbani. It is also noted that when the root of the source word ends with /l/, the lateral will be substituted with /r/ in the target language (Dagbani) to conform to the phonological rule of the native words in the language. Finally, the fortition process involves fricative /v/ changing to a stop /b/, final devoicing of /b/ as it changes to [p] or [f], and then /v/ and /z/ reduced to [f] and [s] respectively. These processes are observed in models from English. Finally, on the process of fortition, words which contain affricates are changed to fricatives or plosives. Flapping was observed in models borrowed from English and Hausa. Most of the segmental processes displayed by loanword phonology in Dagbani are conditioned by phonological rules, thus, making the loanword exhibit varied phonological properties such as palatalization, debuccalization, substitution of liquids, flapping and fortition.

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