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Form and meaning in Fulfulde: a morphophonological study of Maasinankoore

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Chapter three Consonant alternation

3.0 INTRODUCTION

In this chapter the consonant alternation of Fulfulde which has been the subject of many studies is described. Consonant alternation occurs word initially, stem finally, and suffix initially.

mɔ <u>haal</u> -ii	'he has spoken'	ʃe <u>kaal</u> -ii	'they have spoken'
laaw -ol	'road'	laab -i	'roads'
dane - <u>wal</u>	'white' (NGAL)	juutu - <u>gal</u>	'long' (NGAL)

The issue of initial consonant alternation is discussed in Fulfulde grammars (Gaden 1913, Arensdorff 1913, Labouret 1952, Taylor 1953, Klingenheben 1963, Stennes 1967, Arnott 1970a, Noye 1974, Schmidt 1974, Labatut 1982a, Bidaud & Prost 1982, Sylla 1982, Pelletier & Skinner 1982, Ndiaye 1983, Fagerberg-Diallo 1983a and 1984, McIntosh 1984, Mohamadou 1985, Abu-Manga 1986, Paradis 1986), as well as in a number of articles (Klingenheben 1924, Arnott 1959, Mukarovsky 1962a, Skousen 1972, Ouane & Koval 1976, Anderson 1976, Labatut 1982b and 1984, Lieber 1984, Paradis 1987a, Churma 1988, Ternes 1990, Abba 1991) and some comparative linguistic studies (Meinhof 1912, Homburger 1929, Sapir 1971, Doneux 1975, Creissels 1989). The word initial consonant alternation in Fulfulde has also been used to exemplify theoretical issues in general linguistics (Sagey 1982, Wiswall 1989, Prunet 1992, Grijzenhout 1991). The consonant alternation in stem final position has received much less attention (Klingenheben 1941:30, Labatut 1982b). The conditioning environment of the stem final consonant alternations is visible at the surface (e.g. syllable structure), whereas the conditioning environment for the phonological changes occurring in word initial position appears to be absent.

Efforts have been made to explain the consonant alternations at the beginning of the suffix forms on analogy with the word initial consonant alternations (Skousen 1972, McIntosh 1984). In fact the similarity of the initial consonant alternations in stems with the alternations occurring in suffixes was the reason for calling the sets of suffixes "grades": the initial consonant gradation of the suffix form lends its name to the grade system. McIntosh (1984:36) gives the following list of alternating consonants in nominal class suffixes in Kaceccereere:

grades	Zero (A)	Continuant (B)	Plosive (C)	Prenasalized (D)	similar initial set
	Ø	w	g	ng	[w : g : ⁿ g]
	Ø	y	g	ng	[y : g : ⁿ g]
	r	r	d	nd	[r : d : ⁿ d]
	Ø	h	k	k	[h : k : k]
	Ø	j	ɗ	ɗ	

Class suffixes have up to four different forms which differ mainly in the manner of articulation of the initial consonant. The similarity of stem initial and suffix initial consonant alternations led to the assumption that the suffix grades were in fact the manifestation of the consonant alternation system in class suffixes (McIntosh 1984:36). However, the label “consonant alternation” in itself does not provide any explanation for these frequent sound changes. The whole of Chapter six is dedicated to the function and the historical phonological development of the different suffix forms, which is further exemplified in the extensive description of all the possible forms of the noun class suffixes in Chapter seven.

3.1 INITIAL CONSONANT ALTERNATIONS

3.1.1 THE FORMS OF WORD INITIAL CONSONANT ALTERNATIONS

In Fulfulde the initial consonant of nominal and verbal stems can alternate. The initial consonant alternation in such stems is conditioned by morphological (i.e. lexical or derivational) factors. The morphological conditioning environments in nouns, adjectives, and verbs are discussed separately because they show different patterns of consonant alternation.

A number of alternating consonants undergo influence from the following vowel, this process is demonstrated in section 3.1.5. These assimilations make some of the alternations irregular. These irregularities can also be explained historically, they are further discussed in the section on dialect comparison (3.1.6) where the stem initial consonant alternations of the Maasina dialect are compared with those of other Fulfulde dialects. The comparison with the Fulfulde dialect of the Ringimaaji proves to be particularly useful for the diachronic analysis.

This section discusses the forms of the alternating consonants. The word initial alternations are frequent and regular, and they obey a certain phonological pattern; i.e. the initial consonants that alternate usually have different manners of articulation, but the place of articulation and the voicing usually do not change. The figure below shows the word-initial consonant alternations that occur in Maasina.

														exceptional	
(F)	q	w	b	r	d	y	j	y	w	g	f	s	h	ʔ	h
(P)	b	b	b	d	d	j	j	g	g	g	p	c	k	g	k/d
(N)	^m b	^m b	^m b	ⁿ d	ⁿ d	ⁿ j	ⁿ j	ⁿ g	ⁿ g	ⁿ g	p	c	k	ⁿ g	k/ ⁿ d

Each horizontal row presents a series of consonants that occur in a particular morphological (or lexical) position. Each vertical row presents a set of consonants which occur initially in the same stem. This set is called an alternating consonant. There are basically three possible forms of an alternating consonant in initial position. The three series of consonants are labelled the basic series (F), the plosive series (P), and the prenasalized series (N). In the literature, the plosive consonants are often omitted from the first basic series (F) even though there are a number of stems with a basic plosive initial consonant that occur in the same morphophonological (lexical) environment as stems with a initial continuant (approximant or fricative). The fricatives and approximants only occur in the basic series. This is why Arnott

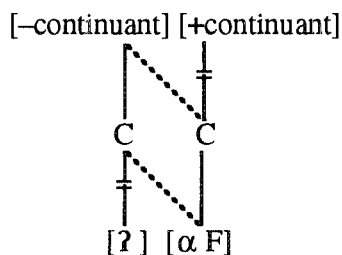
(1970:43) describes the three forms as the fricative series (F), the plosive series (P), and the nasal compound series (N). Arnott's (F) series only contains fricatives and approximants. McIntosh (1984:30) uses the terms continuant series, plosive series, and prenasalized series. Her first series also does not include plosives so she can use the name "continuant series" because the feature [+continuant] is shared by the fricatives and approximants that occur in the first series. In this study the basic series is defined differently from Arnott's fricative series, but Arnott's abbreviation (F) is used to avoid confusion with the B used for grade B suffixes. The underlying form of a stem is postulated with the initial consonant from the basic series (F) which can be a continuant or a plosive initial consonant, sometimes even a prenasalized initial consonant. Certain consonants do not alternate in Maasina:

t l m n ɲ ŋ ʙ ɗ j ʔ

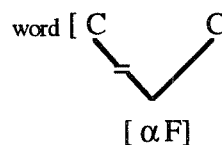
The rules that are postulated for the alternations can explain which consonants alternate and which do not. The (F) series contains the underlying initial consonant of the stem. The consonant form in the (P) series is arrived at by two rules: gemination caused by the merger of the stem initial consonant with a glottal stop and the shortening of the geminate consonant syllable initially. The phonological changes that the alternating consonants undergo are identical with the changes that a consonant undergoes when it becomes geminate. An additional rule describing the shortening of this geminate consonant syllable initially prevents an ill-formed syllable structure.

In the synchronic description a preceding glottal stop is postulated underlyingly, the only effect of this glottal stop on the surface is the change of the feature [+continuant] of the stem initial consonants to [-continuant]. This glottal stop precedes stems in word derivations where the (P) series occurs. The following rules apply in the derivation of the initial consonant in the plosive series (P).

Merger resulting in geminate (P-1)



Word initial de-gemination



The postulation of gemination resulting from merger of the basic consonant with an underlying glottal stop (P-rule 1) in the environments where the (P) series occur produces the correct changes and also accounts for the fact that certain consonants do not alternate. The following lists show the stages that occur in the derivation of the plosive series. The first row gives the underlying consonant from the basic series (F). The second row gives the geminate which is the result from merger of the underlying consonant with a glottal stop. The third row gives the plosive consonant, resulting from shortening the long consonant in syllable initial position.

	(F)	ʔ+(F)	(P)		(F)	ʔ+(F)	(P)
alternating:	w	bb	b		f	pp	p
	r	dd	d		s	cc	c
	y	jj	j		h	kk	k
not alternating:	b	bb	b		t	tt	t
	d	dd	d		l	ll	l
	j	jj	j		m	mm	m
	g	gg	g		n	nn	n
	(k	kk	k)		ɲ	ɲɲ	ɲ
	(c	cc	c)		ŋ	ŋŋ	ŋ
	(p	pp	p)		ʃ	ʃʃ	ʃ
	(^m b	^m bb	^m b)		ɖ	ɖɖ	ɖ
	(ⁿ d	ⁿ dd	ⁿ d)		ʒ	ʒʒ	ʒ
	(ⁿ j	ⁿ jj	ⁿ j)		ʔ	ʔʔ	ʔ
	(ⁿ g	ⁿ gg	ⁿ g)				

The consonant series in parentheses are rare. They are nevertheless included to give a complete picture and to show why these consonants (if they are the underlying initial consonant) do not change in the (P) series. The alternations of the approximants with the voiced velar stop [g] and the other exceptional alternations are not included in the above list. The following sets of alternating consonants do not occur frequently, these alternations are also exceptional because of a change of place features.

(F)	w	y	ʔ	h
(P)	g	g	g	d

The place changes that occur in these alternations do not result from gemination (P-rule 1) alone. To account for the correct alternation, the quality of the vowel adjacent to the stem initial consonant must be taken into account. The alternations with [g] are further discussed in section 3.1.5. The alternation **h : d/k : ⁿd/k** is explained by suppletion of the two verb stems ***hokk-** ‘give’ and ***rok-** ‘be generous’. In Maasina, this alternation occurs only in the following derivations of related words.

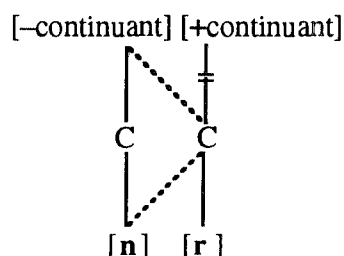
(F)	hokk-ude	‘to give’	
(F)	mi hokk-ii	‘I have given’	(centre and periphery of Maasina)
(N)	ʃe kokk-ii	‘they have given’	(centre and periphery of Maasina)
(N)	ʃe ⁿdokk-ii	‘they have given’	(periphery of Maasina)
(P)	dokk-al	‘gift’	
(P)	dokk-ɔ	‘generous person’	

The existence of three verb stems with related meanings: **rok-** ‘to give, to give a present, to permit’ (FJ, FT, M, NE), **ʔokk-** ‘to give, to offer, to be generous’ (FJ, FT, G), and **hokk-** ‘to give’ (M, DO) points to the fact that suppletion has taken place. The alternation **h : d : ⁿd**

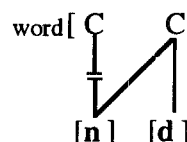
is not considered to be a true consonant alternation because forms that are derived from the verb stem usually follow the regular alternation **h** : **k** : **k** in Maasina. The alternation **h** : **ʰd** is only found productively with some (elder) speakers who use it in the singular and plural form of the verb. The nouns **dɔkkɔ** ‘generous person’ and **dɔkkal** ‘gift’ are derived from the underlying verb stem **rɔkk-** ‘to give, to be generous’, the forms with an initial [h] or [k] are derived from the underlying stem **hɔkk-** ‘to give’. The use of the form **ʰdɔkkii** ‘have given’ in the periphery of Maasina as the plural of **hɔkkii** ‘has given’ remains problematic unless a semantic difference can be demonstrated. Possibly a single subject literally gives, i.e. hands over a gift, while a plural subject cannot literally hand over a gift, therefore the verb ‘to be generous’ is more compatible with a plural subject than a verb literally meaning something like ‘to hand over’.

The prenasalized series (N) can be derived from the basic series in a similar way as the (P) series. A nasal prefix **n-** precedes word stems which appear in derivations with the (N) series in the underlying structure. This nasal element is deleted by a rule preventing an ill-formed syllable, because two consonants are not allowed syllable initially. The effect of this nasal element is only noticed when the basic or underlying initial consonant of the stem is [+continuant] or [+voiced]. The following figure shows a word derivation formed with the (N) series of a stem with an underlying initial consonant [r].

Head strengthening and Prenasalization



Word initial consonant simplification



The postulation of prenasalization as a result of the spreading of a nasal element to the following voiced consonant (A-rule 2) in the environments where the (N) series occurs produces the right changes and also accounts for the fact that a number of consonants remain unchanged. Voiceless consonants are identical in the plosive and the prenasalized series. The similarity in phonological form between the plosive and prenasalized series is due to the fact that forms preceded by a nasal always have to be plosive because [+nasal] cannot be followed by [-continuant]. And the segment [+nasal] can not combine with the segment [-voice] in one time slot, that is why the voiceless consonants cannot become prenasalized and the reason why their form in (P) and (N) is identical. The following figure lists the derivations of the prenasalized series of all the possible underlying consonants that can occur stem initially.

	(F)	n+(F)	(N)		(F)	n+(F)	(N)
alternating:	w	m ^m b	^m b		h	ŋk	k
	r	n ⁿ d	ⁿ d		b	m ^m b	^m b
	y	ɲ ⁿ j	ⁿ j		d	n ⁿ d	ⁿ d
	f	mp	p		j	ɲ ⁿ j	ⁿ j
	s	ɲc	c		g	ŋ ⁿ g	ⁿ g
not alternating:	t	nt	t	(^m b	m ^m b	^m b)	
	m	mm	m	(ⁿ d	n ⁿ d	ⁿ d)	
	n	nn	n	(ⁿ j	ɲ ⁿ j	ⁿ j)	
	ɲ	ɲɲ	ɲ	(ⁿ g	ŋ ⁿ g	ⁿ g)	
	ʃ	mʃ	ʃ	(k	ŋk	k)	
	ɖ	nɖ	ɖ	(c	ɲc	c)	
	ɗ	nɗ	ɗ	(p	mp	p)	
	ʔ	nʔ	ʔ				
	l	nl	l				

The glottal stop [ʔ] cannot be preceded by a nasal. The hypothesis is that the preceding nasal element is simply lost without any effect. The consonant [l] is rarely preceded by a nasal: the word *ɲɔ̃le* ‘seats’ has an alternative form *ɲɔ̃lle* which shows complete assimilation of the nasal to the geminate lateral [ll]. The assumption is that the nasal element is lost before a stem initial [l] without any effect, like the loss of the nasal element before the glottal stop or voiceless consonants. Again, the table above does not include the following exceptional alternations.

(F)	w	y	ʔ	h
(N)	ⁿ g	ⁿ g	ⁿ g	ⁿ d

The alternations with the prenasalized velar stop [ⁿg] are discussed in section 3.1.5. The exceptional alternation set [h : ⁿd] is explained by suppletion of the stems *rɔ̃kk-* and *hɔ̃kk-*. Alternation does not take place in certain words, even if the initial consonant belongs to one of the alternating sets. This is discussed in the following sections which describe the exact morphological (lexical) environments conditioning the alternations. The semantic content of the prefixes ʔ- and n- is not clear, for the moment they are postulated as part of the class marking when they occur in nouns.

3.1.2 INITIAL CONSONANT ALTERNATION IN NOUNS

The phonological form of the initial consonant of a noun is conditioned by its noun class. In the following figure the classes are grouped according to the phonological form that they condition word initially.

series	singular classes	plural classes
(F)	NDE, NGE, KO, NGO, NDU	'BE
(P)	NGAL, NGEL, NGOL, KAL, 'O, 'DUM	'DI, 'DE
(N)	KA, NGA, NDI, NGU, 'DAM, KI	KOY

Alternation of the initial consonant can be shown in word derivations whereby a stem is found with a number of different class suffixes. The following nominal paradigms, consisting of the singular, plural, diminutive, and augmentative forms of a noun, show the initial consonant alternation depending on the class marker.

		'village'	'song'	'goat'	'Fulbe'	'piece'
stem		wur-	yim-	bēh-	ful-	taj-
sg. class		NGO (F)	NGOL (P)	BA (N)	'O (P)	NDE (F)
sg.		wurɔ	jimol	ᵐbēewa	pulɔ	tayre
pl. class		'DE (P)	'DI (P)	'DI (P)	'BE (F)	'DE (P)
pl.		gure	jimi	bey	fulbe	taje
dim.	NGEL (P)	gurel	jimel	behel	pulel	tajel
dim. pl.	KOY (N)	ᵐguroy	ᵐjimoy	ᵐbehoy	puloy	tajoy
augm.	NGAL (P)	gural	jimal	bēhal	pulal	tajal
augm. pl.	'DE (P)	gureele	jimeele	bēheele	tajele	

The underlying initial consonant of the stem is the consonant that appears in words with a consonant from the basic series (F). The stem ***yim** of **jimol** 'song' occurs elsewhere in the language as the verb stem **yim-** of the verb 'to sing'. When a stem never occurs in an environment which conditions the basic series, it is not possible to say what the form of the basic consonant would have been. When a stem is only found in environments where the plosive series (P) or the prenasalized series (N) occur, the underlying stem initial consonant is taken from the plosive series, e.g. in the stem ***bēh-** 'goat'. If a certain stem occurs only with a prenasalized consonant, then this prenasalized consonant is taken to be the underlying initial consonant of the stem. The latter is rare, it occurs e.g. in the verb stem **ᵐdaar-** 'to look for'.

Clear examples of suffixes conditioning the form of the initial consonant can be found in the singular/plural formation which are both formed from the same stem, but with different suffixes. The diminutive and augmentative forms show their effect on the initial consonant in the same nominal paradigm. Other derivational relations also show that the change of the initial consonant is linked to the change of class suffix, e.g. in the following paradigms of uncountable mass nouns and small quantities.

		'porridge'	'soil'	'water'	'milk'
stem		bɔs-	ley-	diy-	hɔs-
uncountable: NDI, liquid: 'DAM	(N)	ᵐboyri	leydi	ᵐdiyam	kɔsam
small quantity of: KAL	(P)	bɔsal	leykal	diyal	kɔsal

The words in the 'DAM class can denote liquids, the words in the NDI class can denote uncountable quantities. The same stems combine with the KAL class to denote small

quantities. The following nominal derivations of terms for cows and bulls, which are based on the same stem, show the three possible initial consonant forms.

			'front in different colour'	'with white sides'	'with small spot'	'with coloured neck'
stem			wəh-	waag-	səl-	daak-
cow	NGE	(F)	wəhe	waage	səle	daake
bull	NDI	(N)	ᵐboori	ᵐbaagiri	coldi	ᵐdaakiri
plural	'DI	(P)	bohi	baagi	coli	daaki

The stems describe types of cattle. The cow names are derived from that stem with a suffix from the NGE class, and bull names occur in the NDI class. The plural forms of both are derived with a suffix from the 'DI class. The effect of the class on the initial consonant is also shown by the names of trees and their products based on the same stem.

			'doug palm'	'tamarind'	'acacia'
stem			yelle-	yaʃʃ-	wawd-
tree	KI	(N)	ᵐgelleewi	ᵐjammi, ᵐjaʃʃi	ᵐgawdi
fruit	NDE	(F)	yellere	yaʃʃere	wawdere
plural	'DE	(P)	gelleeje	jaʃʃe	gawde
flour	NDI	(N)	ᵐgelleeri		

These words show derivations of the same stem in a number of classes with a particular semantic relation between these classes, e.g. a tree name in the KI class (N) and the products taken from that tree, like fruits in the NDE class (F), flour in the NDI class (N), and foliage in the KO class (F). The plural of fruits and trees in the 'DE class (P) are identical.

The stem initial changes and the suffixes added to the stems suggest that the marking of the noun class involves two morphemes where one element precedes the noun stem and another follows the noun stem. The underlying forms postulated for the class markers are shown in the following table (see section 6.2).

class	initial series	noun derived with that class
NDE	(F)	noun stem + *re
NGE	(F)	noun stem + *we
KO	(F)	noun stem + *hɔ
NGO	(F)	noun stem + *wɔ
NDU	(F)	noun stem + *ru
'BE	(F)	noun stem + *ʃe
'O	(P)	*ʔ + noun stem + *ʔɔ
NGEL	(P)	*ʔ + noun stem + *wel
NGAL	(P)	*ʔ + noun stem + *wal
NGOL	(P)	*ʔ + noun stem + *wol
KOL	(P)	*ʔ + noun stem + *hol

class	initial series	noun derived with that class		
KAL	(P)	*ʔ	+ noun stem +	*hal
'DUM	(P)	*ʔ	+ noun stem +	*ʔum
'DE	(P)	*ʔ	+ noun stem +	*ʔe
'DI	(P)	*ʔ	+ noun stem +	*ʔi
NGU	(N)	*n	+ noun stem +	*wu
KA	(N)	*n	+ noun stem +	*ha
BA/NGA	(N)	*n	+ noun stem +	*wa
KI	(N)	*n	+ noun stem +	*hi
NDI	(N)	*n	+ noun stem +	*ri
'DAM	(N)	*n	+ noun stem +	*ʔam
KOY	(N)	*n	+ noun stem +	*hoy

The meaning of the element preceding the noun stem should be closely related to the meanings expressed in the class suffix. In Bedik, a related language, the consonant alternation can be used to indicate the distinction between singular and plural (Ferry 1968). For Fulfulde, the historical hypothesis is that the alternations are remnants of a phonological conditioning by class markers that preceded the noun stem, indicating the fact that the noun class markers were once prefixes (see De Wolf 1985a). However, the initial consonant alternation sometimes functions synchronically as an additional marking of the difference between singular and plural in some singular/plural class pairs. Perhaps the change of the initial consonant series of the KI class in Maasina to a prenasalized series occurred to distinguish the singular from the plural stem. This change is an innovation of the dialects of Maasina and the adjacent Liptaako. In other dialects the initial consonant of the KI class is from the plosive series (P). The following words have different initial consonant series affecting the initial consonant of the KI class in different dialects.

	Tooro	Liptaako	Maasina	Aadamaawa
'palm'			ⁿduɓɓi	duɓɓi
'doug palm'		ⁿjelleehi	ⁿgelleewi	gellohi
'tamarind'	jammi	ⁿjataɓi	ⁿjaɓɓi, ⁿjammi pl. jaɓɓe	jaɓɓi pl. jaɓɓe
'acacia'		ⁿgawdi	ⁿgawdi	
'shelter'	daŋki		ⁿdaŋki pl. dandɛ	daŋki pl. dandɛ

The (F), (P), and (N) series all occur in both singular and plural classes. There are a few class pairs that have the plosive series both in the singular and in the plural, i.e. NGAL/'DE, NGOL/'DI and KOL/'DI, but it happens more frequently that the series of a particular singular class is different from the series in its plural class. The meaning of the prefixes ʔ- (P) and n- (N) must be in close relation with the semantic content of the class marker. Nevertheless, it is not possible to link their meaning to a singular/plural distinction.

Initial consonant alternation does not occur in most relationship terms and in many loan-words. The relationship terms occur in two forms depending on whether they are used in an alienable or inalienable construction. The inalienable form is used as the address term for such a relative and it is the form used with the special genitive marker for relationship terms. The inalienable form does not have a class suffix. The absence of such a suffix not surprisingly results in the absence of initial consonant alternation because the class suffix conditions the initial consonant alternation in nouns. However, the initial consonant alternation also does not take place when the alienable forms of the relationship terms contain a suffix of the 'O or 'BE class.

baaba, ʔabba	'father!'	
baab-ir-aa-dɔ	'a father'	'O (P)
baab-ir-aa-ɸe	'fathers'	'BE (F)
gɔggɔ	'aunt! (father's sister)'	
goggiraafɸe	'aunts (father's sisters)'	'BE (F)
dendɪ	'cross cousin!'	
dendiraafɸe	'cross cousins'	'BE (F)
banⁿdiraadɔ	'parallel cousin'	'O (P)
genⁿdi	'wife!'	
kaw	'uncle! (mother's brother)'	
daadi	'name for eldest sister (< mother)'	
yaaya	'name for eldest sister (< mother)'	

The following relationship terms, however, do show initial consonant alternation.

dewɔrdɔ / rewɔrɸe	'potential in-law; someone for whom you have a restraint, with whom you are not allowed to eat'
bappaapɔ / wappayɸe	'uncle (father's brother)'

There is no vocative form of the kinship term for **dewɔrdɔ**, perhaps because there is an avoidance behaviour prescribed for this relative and one is not supposed to call out to one's **dewɔrdɔ**. The inalienable form with which one calls one's father's brother is the term **ʔabba** 'father' (rather than the term **baaba** 'father' which is more informal). These words do not have an inalienable relationship term which is based on the same stem. This means that these stems always occur with a class marker. Like in other nouns, this class marker conditions the form of the initial consonant.

Loan-words also often do not show consonant alternation. Most of them do not have a class suffix that could condition the initial consonant alternation. Some loan-words are morphologically integrated and have a class suffix which has either been added or the last syllable of the loan-word is interpreted as the suffix. The class suffix which can be added to integrate loan-words in a particular noun-class is always a suffix of grade B. However, even then word initial consonant alternation often does not take place. Frequently, no initial consonant alternation occurs when the plural, diminutive, and augmentative forms are derived by the addition of grade B suffixes to the singular noun:

	'coal pot' [Fr. 'réchaud']		'word, language' [Ar.]
sg.	resɔ	'O (P)	haala 'O (P) or KA (N)
pl.	resooji	'DI (P)	haalaa-ji 'DI (P)
dim.	resowel	NGEL (P)	haala-wel NGEL (P)
dim. pl.	resowoy	KOY (N)	haala-woy KOY (N)
augm.	resɔwal	NGAL (P)	

The absence of word initial consonant alternation is common for loan-words that do not have a class suffix in the singular form:

sakkoosi / sakkoosiji	'bag'	sacoché	[French] (Tioulenta 1991:209)
fɔtɔ / fotooji	'photo'	photo	[French] (Tioulenta 1991:209)
seesi / seesiji	'chair'	chaise	[French]
farilla / farillaaji	'duty'		[Arabic]
sɔgɔne / sogoneeji	'elbow'	sogone	[Soninke] (Tioulenta 1991:351)
futte / futteeji	'bride price'	futte	[Soninke] (Tioulenta 1991:348)

Word initial consonant alternation is often attested when loan-words are integrated with the addition of a class suffix in the singular:

sagiire / cagiije	'cloth'	sagi	
hemere / keme	'one hundred'	kémé	[Bambara] (Tioulenta 1991:332)
hɔlɔɔre / kɔlɔɔje	'kernel'	kóló	[Bambara] (Tioulenta 1991:333)
puneeje / funeeje	'twins'	fune	[Soninke] (Tioulenta 1991:348)

Loan-words in which the last syllable is interpreted as the class marker also show word initial consonant alternation:

'book' < defter	'scripture' [Ar.]	kémé	'hundred' [Bambara] (Tioulenta 1991:332)
dewt-ere	sg.: NDE (F)	kem-e	pl.: 'DE (P)
dewt-e	pl.: 'DE (P)	hem-ere	sg.: NDE (F)
dewt-el	dim.: NGEL (P)		
dewt-oy	dim. pl.: KOY (N)		
dewt-al	augm.: 'DE (P)		

Here the last syllable of the loan-word is interpreted as the class marker. Alternation does occur when the derived plural, diminutive and augmentative are formed by replacing this suffix (with, in this case, grade A suffixes). When loan-words do not undergo initial consonant alternation, then their plural, diminutive, and augmentative derivations are formed by the addition of grade B suffixes to the whole singular noun. The nouns in grade B are words that often do not undergo initial consonant alternation, not only when they have a loan-word as their stem but also when they are based on Fulfulde nouns.

	'rainy season'		'face'	
sg.	"duŋⁿgu	'O < NGU (N)	yeeso	NGO (F)
pl.	"duŋⁿguuji	'DI (P)	yeesooji	'DI (P)

The absence of initial consonant alternation is caused by the derivational process of these nouns. Grade B nouns have a full noun functioning as their noun stem. The stem of such a noun already contains a class suffix that conditions the initial consonant. Thus, grade B nouns can have two class suffixes. The first class suffix belongs to the stem and the initial consonant does not change in the derivation. Based on this observation Anderson (1976:123) proposes the following generalization: when a form has more than one suffix, the initial series of the stem is that which is appropriate to the innermost of these. The following paradigms show that the class suffix in the stem determines the series of the initial consonant.

stem	hoo-re	'head' NDE (F)	yees-o	'face' NGO (F)
sg.	hoo-re-jo	'chief' 'O (P)	yeeso-jo	'person in front' 'O (P)
pl.	hoo-re-be	'chiefs' 'BE (F)	yeeso-be	'persons in front' 'BE (F)

The nominal paradigms of **hoo-re-jo** 'chief' and **yeeso-jo** 'person in front' are derived from the Fulfulde nouns **hoo-re** 'head' and **yeeso** 'face' respectively. The suffix in the stem also determines the initial consonant of the derived words. The following grade B words do not contain an internal suffix and show initial consonant alternation.

	'cloth'		'stomach'	
sg.	sagii-re	NDE (F)	huusee-ru	NDU (F)
pl.	cagii-je	'DE (P)	kuusee-ji	'DI (P)
dim.	cagi-wel	NGEL (P)	kuse-wel	NGEL (P)
dim. pl.	cagi-woy	KOY (N)		

These loan-words are fully integrated and the initial series is determined by the class suffix. The singular noun also has a class suffix (compared with other forms in the nominal paradigm). The main difference between nominal paradigms with and without initial consonant alternation seems to lie in the relation between the singular and the rest of the nominal paradigm. If the plural, diminutive, and augmentative are derived by addition of a plural, diminutive or augmentative class suffix to the full singular noun, then no initial consonant alternation does occur (as in **yeeso/yeesooji** 'face' and in **haala/haalaaji** 'word, language'). If those forms are derived by replacement of the singular class suffix by the suffixes of the plural, diminutive or augmentative class suffixes, then initial consonant alternation does take place (as in **sagii-re/cagii-je** 'cloth' and in **dewtere; "dewtoy** 'book; little books').

The change of class suffixes seems to indicate a greater integration in the noun class system, compared to the addition of class suffixes. Likewise the initial consonant alternation seems to indicate a greater integration into the noun class system compared to the absence of initial consonant alternation. That is also the reason why Tioulenta (1991:213-217) states that the absence of consonant alternation is an indication for a loan origin of a Fulfulde word.

3.1.3 INITIAL CONSONANT ALTERNATION IN ADJECTIVES

Gaden (1913:18) already talks about the influence of the class on the initial consonant. He states that the class determines the form of the initial consonant. As described in the previous section, the classes are divided into three groups. Each class determines that the initial consonant of a word belongs either to the basic (F), plosive (P), or prenasalized (N) series.

However, it appears to be necessary to modify this statement for the word class of adjectives in the Fulfulde of Maasina. The pattern of initial series appearing in adjectives that follow the head noun as a modifier is simpler than the pattern found in nouns. The prenasalized series (N) does not occur in adjectival stems which function as modifiers, only the plosive (P) and continuant (F) series occur. There is a correlation between these two initial series and the form of the class marker. This distribution seems typical for the Maasina dialect. The initial consonant can be predicted from the last segment of the noun class suffix when the adjective follows the head in a noun phrase. In the following examples the adjective is preceded by the noun class suffix of the demonstrative.

			series of modifier	series of noun
preceded by vowel final suffix	"dii wodeeri	'this red one'	(F)	(N)
	"duu wodeeru	'this red one'	(F)	id.
	"dee wodeere	'this red one'	(F)	id.
	baa wodeewa	'this red one'	(F)	(N)
	"gee wodeewe	'this red one'	(F)	id.
	"gaa wodeewa	'this red one'	(F)	id.
	"guu wodeewu	'this red one'	(F)	(N)
	kaa wodeewa	'this red one'	(F)	(N)
	kii wodeewi	'this red one'	(F)	(N)
	kaa wodeewa	'this red one'	(F)	id.
	bee wodeebe	'this red ones'	(F)	id.
preceded by consonant final suffix	"gal bodewal	'this red one'	(P)	id.
	"gel bodewel	'this red one'	(P)	id.
	koy bodewoy	'these small red ones'	(P)	(N)
	kal bodewal	'this red one'	(P)	id.
	"gol bodewol	'this red one'	(P)	id.
	d'am bodejam	'this red one'	(P)	(N)
	dum bodejum	'this red one'	(P)	id.
preceded by laryngealized vowel final suffix	d'ee bodeeje	'these red ones'	(P)	id.
	d'ii bodeeji	'these red ones'	(P)	id.
	?aa bodeeja	'this red one'	(P)	id.

All the adjectives that follow a noun ending in a consonant final suffix take the initial consonant from the plosive (P) series. All adjectives that take the initial consonant from the basic (F) series follow a class suffix ending in a vowel. The suffixes that end in a vowel and where the following adjective takes an initial consonant from the plosive (P) series have a [+constricted] consonant in the suffix. Perhaps the laryngealization of the vowel has an

influence on the initial consonant of the following adjective, causing the same phonological rule as when a glottal stop would have preceded the initial consonant of the adjective.

The fact that all class markers ending in a consonant {l, m, y} condition a stem initial plosive consonant can be explained by assuming an influence of the class marker on the noun (or demonstrative) preceding the adjectival stem. When the adjective is used as a modifier, either the suffix of the preceding noun or the suffix in the demonstrative preceding the stem is always there to trigger the phonological rule that causes the initial consonant plosive to prevent the sequence *[l] [continuant] or *[m] [continuant]. From the sonority hierarchy in Fulfulde (see section 4.4.4) it follows that continuants cannot be preceded by [l] or [m]. The change from a continuant to a plosive initial consonant takes place to prevent such an ill-formed sequence. This motivates the initial plosive consonant of the adjectives in words of the class NGEL, KAL, NGAL, NGOL, 'DAM, 'DUM.

The final consonant of the KOY class cannot be responsible for the strengthening of the initial continuant consonant of the stem, because according to the sonority hierarchy a sequence of two different glides is possible. Perhaps an older form of the class marker *koyŋ or *kop (these forms exist in other dialects) could explain the strengthening of a following consonant. Here a diachronic and cross-dialectal argument is needed to explain synchronic consonant alternations. Synchronically, all consonant final class suffixes condition a plosive initial consonant on the following adjective. Therefore it is likely to be a regularized new pattern.

The distribution of the two patterns of initial series is linked to the syntactic function of a nominal word in the noun phrase. The following examples show a possible variation of the initial series in the NDI class.

ⁿgaari wodeeri ⁿdi	'the red bull'
^mbodeeri ⁿdi	'the red one (bull)'

As the first example shows, the initial consonant alternation of the adjective **wode-** 'red' is a continuant when it follows the head noun **ⁿgaari** 'bull'. Thus the series of its initial consonant of the stem is different from the series of the initial consonant that is prenasalized in the noun **ⁿgaari** 'bull', although both combine with a suffix of the same NDI class. The same stem **wode-** can occur in the same class with an initial continuant or with an initial prenasalized consonant. The position of a word in the noun phrase (linked to its syntactic function) conditions this seemingly arbitrary choice of the different forms of initial consonants. So, the class is not the only determining factor in the choice of the series of the initial consonant. An adjective shows the same patterns of initial consonant alternations as nouns when this adjective occurs as the head of the noun phrase. The pattern of initial consonant alternation is restricted to the basic (F) and plosive (P) series when the adjective functions as a modifier which follows the head of the noun phrase. The alternation patterns differ for head nouns and modifying adjectives with respect to the class markers of the NDI, BA/NGA, KA, NGU, KI, 'DAM, and KOY classes. These classes are characterized by a prenasalized initial consonant in the nouns. The following list shows the different series of the initial consonant of the head noun and the modifier.

		class	series of noun	series of modifier
ⁿgaari selluⁿdi	‘healthy bull’	NDI	(N)	(F)
ⁿgesa yɔɔrba	‘dry field’	BA	(N)	(F)
laana ranɛɛwa	‘white boat’	KA	(N)	(F)
puccu wootu	‘one horse’	NGU	(N)	(F)
lekki selluki	‘healthy tree’	KI	(N)	(F)

The nouns in these classes have a prenasalized initial consonant and the adjectives have an initial consonant from the basic series when the adjective occurs as a modifier following the noun. The initial prenasalized consonant is used when the adjectives stand independently (i.e. as the head noun) initially in a noun phrase.

		class	series of adjective which is head noun
celluⁿdi	‘the healthy one’	NDI	(N)
ⁿjɔɔrba	‘the dry one’	BA	(N)
ⁿdaneɛwa	‘the white one’	KA	(N)
ⁿgootu	‘the one’	NGU	(N)
celluki	‘the healthy one’	KI	(N)

The initial continuant consonant of the basic series (F) only appears in these classes when the adjective is functioning as a modifier following the head noun. The prenasalized series (N) occurs on the adjective combining with one of these classes when the adjective is a head noun.

Adjectives in the 'DAM and KOY classes occur both with an initial plosive consonant (P) and with an initial prenasalized consonant (N). The distribution of the two forms also appears to be syntactically conditioned. When the word is used as an adjective which modifies a preceding noun, the plosive initial form of the consonant is preferred. When the word is used independently as a noun phrase, only the initial prenasalized consonant of the stem is accepted.

kulloy bunewoy	‘brown small things’
^mbunewoy	‘brown small ones’
kulloy danewoy	‘white small things’
ⁿdanewoy	‘white small ones’
ⁿdiyam gɔɔɗɗam	‘other water’
ⁿdiyam jaraaɗam	‘the water that has been drunk’
ⁿdanejam	‘white one (liquid)’

This alternative initial consonant series is described as a fluctuation because sometimes the independent series is also accepted in the modifier series. The sequence **kulloy ^mbunewoy** ‘small brown things’ is also acceptable.

The patterns of the initial consonant alternation in participles is identical to that of adjectives. The basic (F) and plosive (P) series appear when a participle functions as a modifier

following a head noun. All three series appear when the participle is the head of a noun phrase.

Consonant alternation does not take place in the formation of the verbal nouns, e.g. the infinitive and the agentive adjective. The stems of these nouns always appear with a consonant from the basic series. The following examples are infinitives, verbal nouns, and agentive nominals formed with the stems **donn-** 'drive', **goll-** 'work', and **wall-** 'help'.

NDE class (F)		'O class (P)	
infinitive		agentive	
donnude	'to drive'	donnɔɔwɔ	'driver' (driving person)
gollude	'to work'	gollɔɔwɔ	'worker' (working person)
wallude	'to help'	wallɔɔwɔ	'helper' (helping person)
NGOL class (P)		NDI class (N)	
verbal noun		agentive	
donnugol	'driving'	donnoori	'driving (bull)'
gollugol	'working'	golloori	'working (bull)'
wallugol	'helping'	walloori	'helping (bull)'

The agentive adjective derivation is very productive. The initial consonant takes the form it has in its "basic" verb stem form. The agent noun formed with the morpheme **-wɔ** is followed by a suffix from grade B, e.g. **-wɔ** in the 'O class. The noun has ²**ɔ** as its concord, it belongs to the 'O class, e.g. in **wallɔɔwɔ** 'helper, someone who is helping'. Normally this class suffix conditions an initial plosive, but not in the productive derivation of agentive adjectives.

3.1.4 INITIAL CONSONANT ALTERNATION IN VERB FORMS

The stem initial consonant alternation of verb forms is conditioned by two factors: the number of the subject, and the presence of a pronominal subject affix. Only the basic series and the prenasalized series occur in verb forms. The series of the alternating consonants that occur stem initially in the verb forms are schematically given below.

	SV order	V-SPro order
singular subject	(F)	(N)
plural subject	(N)	(N)

The initial consonant of the verb stem is the consonant that occurs in the basic form when the subject is singular and when it precedes the verb. The initial consonant of the verb form is prenasalized when the subject is plural, or when a pronominal subject affix follows the verb. The following examples show the correlation of singular/plural subject and inversion with the series of the verb initial consonant.

	SV-order	V-SPro	
S = sg.	war	—	‘come!’
	mi warii	ⁿ gar-mi	‘I have come’
	?a warii	ⁿ gar-d’aa	‘you have come’
	(mɔ) warii	—	‘he/she/it has come’
	N warii	—	‘N has come’
S = pl.	—	ⁿ gar-ee	‘come!’ (pl.)
	min ⁿgarii	—	‘we excl. have come’
	?en ⁿgarii	ⁿ gar-d’en	‘we incl. have come’
	?ɔn ⁿgarii	ⁿ gar-d’ɔn	‘you (pl.) have come’
	ʃe ⁿgarii	—	‘they have come’
	N+N ⁿgarii	—	‘N+N have come’

The stem with the consonant from the basic series also appears in the infinitive. The infinitive is a verbal noun formed with the NDE class suffix. The initial series of all nouns combining with the NDE class suffix is the basic series. A number of verbs have a plosive consonant as the underlying stem initial consonant. There are also some verb stems with a prenasalized consonant in the basic series. The infinitive takes its initial consonant from the basic series. The examples below show all possible consonants that can occur in the basic series in Maasina.

continuant initial basic form:

wadude	‘to do’
yiide	‘to see’
rewde	‘to follow’
fijude	‘to play’
sellaade	‘to be healthy, whole’
haalde	‘to speak’

etc.

plosive initial basic form:

bonude	‘to be bad’
boogude	‘to paint indigo’ < boogu ‘indigo’ Bam.
jɔgaade	‘to have, hold’
gollude	‘to work’ < golle ‘work’ Son.

etc.

prenasalized initial basic form:

ⁿdaarde	‘to look at’
ⁿdaartude	‘to look at, to look for’
^mboopude, ^mboofude	‘to err, to make a mistake’

However, basic forms with a prenasalized initial consonant are rare. The verb **ⁿdaarde** has an initial [l] in other dialects (e.g. Ringimaaji). The alternation l : d : ⁿd is also not common. Possibly the [ⁿd] is taken as the basic form to eliminate this exceptional alternation pattern. The dialectal comparison between Maasina and Ringimaaji shows the exceptional initial consonant alternation in the verbs **ⁿdaarude** [M] and **laarugo** [Rm] ‘to look (for)’.

Maasina:	mi ⁿ daarii	'I've been looking'
	ʃe ⁿ daarii	'they have been looking'
Ringimaaji:	mi laari	'I've been looking'
	ʃe ⁿ daarii	'they have been looking'

The verb ^m**boofude**, also ^m**boopude** and **woofude** 'be mistaken', sometimes shows a prenasalized initial consonant in the basic series (Fagerberg 1984:95). The consultants from the centre of Maasina use the regular alternation pattern **w** : **b** : ^m**b**. The following examples show the different alternation patterns of the verb **woofude**, ^m**boofude**, ^m**boopude** 'to be mistaken' which all occur in Maasina.

w : b : ^m b :		^m b :	
woofude	'to make a mistake, to err'	^m boofude	'to make a mistake, to err'
mi woofii	'I made a mistake'	mi ^m boofii	'I made a mistake'
ʃe ^m boofii	'they made a mistake'	^m boopude	'to make a mistake, to err'
mi woofu	'I really made a mistake'	mi ^m boopii	'I made a mistake'

For speakers who use the regular **w** : **b** : ^m**b** pattern with [w] in the basic series, the underlying initial consonant is [w]. For speakers who use an initial prenasalized consonant in the infinitive and in the verb form preceded by a singular subject, the underlying initial consonant of this verb stem is prenasalized. The hypothesis is that the development of the prenasalized consonant as the underlying initial consonant is a late innovation. This view is partly supported by the fact that speakers that have the underlying initial prenasalized consonant in verb forms, also use certain nominal derivations from the same stem with the regular alternation pattern **w** : **b** : ^m**b**. These are the following nouns which are derived from the verb stem **wɔɔf**- 'to be mistaken'.

wɔɔfan ⁿ dɛ	'mistake'
bɔɔfandɛ	'mistakes'

The infinitive in Maasina takes the initial consonant from the basic series. The basic series could be determined by the NDE class, because the suffix **-dɛ** forms the infinitive in Maasina. The Fuuta Tooro dialect also uses the NDE class suffix **-dɛ** to form the infinitive, but in other dialects other class suffixes are used for the infinitive. Infinitives are formed with the NGO class suffix **-gɔ** in the Kaceccereere dialect (McIntosh 1984:10-12) and in the Ringimaaji dialect. In Gombe (Arnott 1970a:18) the infinitive is formed with a suffix **-ki** from the KI class. Thus, the infinitive has the following forms in the different dialects:

	'to come'	'to read'		
Ringimaaji, Kaceccere:	wargɔ	jaŋⁿgugɔ	NGO	(F)
Gombe:	warki	jaŋⁿguki	KI	(P) in Gombe
Maasina, Tooro:	warde	jaŋⁿgudɛ	NDE	(F)

All dialects use the basic series for the initial consonant of the infinitive even if the initial consonant belongs to a set of alternating consonants. In Gombe the infinitives begin with the

basic series, while the KI class marker generally co-occurs with the plosive series. Perhaps the basic series occurs in the infinitive because the infinitive is the basic form of the verb.

3.1.5 INFLUENCE OF THE VOWEL ON INITIAL CONSONANT ALTERNATION

In Maasina the exact consonant alternation of stems with an initial underlying consonant [w] or [y] cannot be predicted by the rules given in 3.1.1 alone. The following alternations with [w] and [y] occur in Maasina:

(F)	w	w	y	y
(P)	b	g	g	j
(N)	^mb	ⁿg	ⁿg	ⁿj

The historical hypothesis for the irregularity in the alternation patterns with the velar stop is discussed in the next section (3.1.6). Here we show that synchronically some paradigm levelling has occurred in the language to regularize the correlation of the basic consonant with the form of the consonant in the plosive (P) and prenasalized (N) series. Paradigm levelling may involve the replacement of an approximant by its plosive form in the basic series. Paradigm levelling occurs frequently in consonant sets alternating with [w] and [y]. The quality of the following vowel is an important factor in the alternation patterns and the process of paradigm levelling. The following examples show the correlation between the alternation patterns of [w] and [y] and the vowels that follow these consonants in Maasina.

w : b : ^mb before all vowels:

i	wippɔ / bippe	‘wing’
e	weeⁿdu / beeli	‘pond’
ɛ	wecɔ / bece	‘breast, chest’
a	waadere / baade	‘raindrop’
ɔ	wɔjere / boje	‘hare’
o	wowru / bofi	‘mortar’
u	wuugaaⁿdu / buugaali	‘dove’

w : g : ⁿg before [–front] vowels:

a	waɓɓuⁿgɔ / gaɓɓule	‘cheek’
ɔ	wɔɔmre / gɔɔɓe	‘swallow, gulp’
o	wooduⁿde / gooduⁿde	‘beautiful’ (adj.)
u	wuddu / gulli	‘navel’

y : g : ⁿg before [+front] vowels:

i	yitere / gite	‘eye’
ɛ	yelde / gele	‘space between teeth’
e	yeddude; geddel [?]alla	‘to contradict’; ‘salamander’

y : j : ⁿj before all vowels:

i	yimre / jime	‘religious song’
e	yee ⁿ du / jeeli	‘ant-eater’
ε	yεwtere / jεwte	‘joke’
a	yanaa ⁿ de / janaale	‘tomb’
ɔ	yɔntere / jɔnte	‘week’
o	yofude; ⁿ joɓdi	‘to pay; wages’
u	yurmee ⁿ de / jurmeele	‘compassion’

The regular alternations of the labio-velar approximant with the labial stops **w : b : ^mb**, and the regular alternation of the palatal approximant with the palatal stops **y : j : ⁿj** both occur before all possible vowels. The place changing alternation of the labio-velar approximant with the velar stops **w : g : ⁿg** occurs only before vowels that are [-front]. The place changing alternation of the palatal approximant with the velar stops **y : g : ⁿg** occurs only before vowels that are [-front]. The hypothesis is that an historical underlying continuant ***ɣ** has become [y] before [+front] vowels and [w] elsewhere. The proposed split of earlier ***ɣ** into conditioned allophones resulted in two alternation sets **y : g : ⁿg** and **w : g : ⁿg**, overlapping with the existing sets **w : b : ^mb** and **y : j : ⁿj**.

The obstruents occurring in the alternation set **y : g : ⁿg** have in most cases been further changed under the influence of a following [+front] vowel and have become [j] and [ⁿj]. Cognate forms with [g] and [ⁿg] remain in (older) nominal derivations.

y : g : ⁿg —> **y : j : ⁿj** / before [+front] vowels

This replacement has not taken place everywhere in the lexicon, that is why examples of both alternation sets **y : g : ⁿg** and **y : j : ⁿj** can be found before a [+front] vowel within derivations from the same stem.

yid-	‘love, like, want’
^ʔ ɔmɔ yid ⁱ	‘he loves’
^ʔ εbε ⁿ jid ⁱ	‘they love’
jilli	‘love, desire’
gidɔ / yiɓbε	‘friend, lover’
gid ^a aadɔ	‘beloved one’ (name)
gid ⁱ iraadɔ / gid ⁱ iraabε	‘friend, companion’
yedd-	‘contradict’
bε ⁿ jeddii	‘they have contradicted’
jeddi	‘contradictions’
geddel ^ʔ alla	‘salamander’ (lit.: “little contradiction of God”)

The distribution between the overlapping alternation sets **w : g : ⁿg** and **w : b : ^mb** is gradually becoming complementary.

w : g : ⁿg —> **w : b : ^mb** / before [-front] vowels

The alternation pattern **w : g : ⁿg** is replaced by the pattern **w : b : ^mb** before [-front] vowels. The change has occurred more often in verbs, it has not affected all nouns.

wutaaⁿdu	‘head of millet’
butaali also guttaali	‘heads of millet’
woowude	‘to be used to’
ḡe ^mboowii	‘they are used to’
^mbɔɔwka also ⁿgɔɔwka	‘habit’
wɔf-	‘bark’
dɪ ^mbofii	‘they have barked’
wɔfaaⁿgɔ	‘barking’
gɔfaali	‘barkings’
wula	‘be hot’
dɪ ⁿgula	‘they are hot’
^mbuleefi	‘heat’ (Maasina periphery)
ⁿguleefi	‘heat’ (centre and periphery)
woofude	‘take a draught’
ḡe ^mboofii	‘they took a draught’
ḡe ⁿgoofii	‘they took a draught’
wɔɔmre	‘draught’
gɔɔḡe also bɔɔḡe	‘draughts’ (Zoubko 1980:517)
wɔttaade	‘to lunch’
ḡe ⁿgottike	‘they lunched’
bɔttaari	‘lunch’
woofude	‘be good, beautiful’
ʔeḡe ⁿgoodi	‘they are good, beautiful’
boodum	‘sth. good, beautiful’

The replacement of the consonant alternation **w : b : ^mb** with **w : g : ⁿg** is a late innovation. It has not spread through the whole lexicon. Therefore some stems alternate with both labial and velar stops. The alternation sets with a glide in the basic series have sometimes been further simplified, the voiced plosive now occurring in both the basic and the plosive series.

y : g : ⁿg —> g : g : ⁿg	gidiraadɔ / gidiraabe	‘friend, companion’
w : g : ⁿg —> g : g : ⁿg		
w : b : ^mb —> b : b : ^mb	bappaano / bappayḡe, wappayḡe	‘paternal uncle’
y : j : ⁿj —> j : j : ⁿj		

Evidence for these changes comes mainly from a comparison of dialects.

3.1.6 DIALECT COMPARISON OF ALTERNATIONS WITH [w] AND [y]

Phonological patterns of stem initial alternating consonants are compared in the dialects of Maasina, Fuuta Tooro, and of the Ringimaaji dialect (Mbororo) in Cameroon. Special attention is paid to the comparison of the irregular alternations **w** : **g** : ⁿ**g** and **y** : **g** : ⁿ**g** in Maasina.

It is disputable whether such a diachronic analysis can be used for a synchronic description of the stem-initial consonant alternations. Can distinctions in one dialect be used for the description of another dialect where this distinction is lost? Before answering this question with a categorical no, one must bear in mind that mutual intelligibility exists between speakers of these dialects. The passive knowledge of Fulfulde speakers therefore is clearly greater than the active knowledge. Surely diachrony can explain how the system in a particular dialect came about historically. Diachrony can explain synchrony.

Systems of consonant alternations are very common in Atlantic languages (Doneux 1975:118-119). Fulfulde has only a restricted number of alternating consonants compared to languages like Tanda, Basari, Bedik, Konyagi, Bafiada, and others (Sapir 1971:67-68). Although the system of consonant alternation probably goes back to the stage of proto-Atlantic, the precise alternations keep changing and examples of reanalysis can be found. The alternations with a velar stop are thought to be reflexes of the alternation ^y**y** : **g** : ⁿ**g** that has been lost in Fulfulde.

Klingenheben (1927:111) postulates the consonant ^y**y** which alternates with velar stops for proto-Fulfulde ("Urful"). He states that ^y**y** in word initial position has changed under the influence of the following vowel. For the western dialects (Fuuta Tooro and Fuuta Jallon) he describes the changes ^y**ya** > ^ʔ**a**, ^y**y** > **y** before [+front] vowels, and ^y**y** > **w** before [+back] vowels. In the eastern dialects including Maasina, ^y**ya** > **wa** instead of ^y**ya** > ^ʔ**a**.

A comparison of the alternations in the different dialects shows the distribution described by Klingenheben. In Fuuta Tooro the consonants [g] and [ⁿg] alternate with [y], with [w] and, as Paradis states, with zero. Paradis (1986:172-175) inserts a glottal stop before vowel initial words with an automatic rule. Therefore the zero will be compared with the initial glottal stop in Maasina. The following nominal paradigms show alternations with a velar stop in Fuuta Tooro (Paradis 1986:69-70, 331-405).

^ʔ : **g** : ⁿ**g** before [+low] vowels:

abbere	'seed'	gabbe	'seeds'
aɓɓugo	'cheek'	gaɓɓule	'cheeks'
asde	'to dig'	ⁿgaska	'hole'
mi arii	'I have come'	ɓe ⁿgarii	'they have come'

w : **g** : ⁿ**g** before [-front] vowels:

worɓe	'men'	gorko	'man'
wuyɓe	'thieves'	gujjo	'thief'
wurɔ	'village'	gure	'villages'

y : **g** : ⁿ**g** before [+front] vowels:

yena^ade	'tomb'	genaale	'cemetery'
yimre	'poem'	gime	'poems'

However, in Pulaar (Fuuta Tooro) alternations involving the velar stops **g** : **ⁿg** are complicated. In Fuuta Tooro the ambiguity of [w] alternating with both labial and velar stops and the ambiguity of [y] alternating with both palatal and velar stops is solved by paradigm levelling. The alternations **w** : **g** : **ⁿg** and **y** : **g** : **ⁿg** are sometimes replaced with the alternation **ʔ** : **g** : **ⁿg**. In some nouns the alternation **ʔ** : **g** : **ⁿg** is replaced with a non alternating glottal stop [ʔ]. Thus the alternation pattern **ʔ** : **g** : **ⁿg** has become exceptional in Fuuta Tooro.

ʔ : **g** : **ⁿg** before all vowels in Pulaar:

abbere	‘seed’	gabbe	‘seeds’
islaŋⁿgo	‘sneeze’	gislaali	‘sneezes’
omᵐboode	‘envelope’	gomᵐboode	‘envelopes’
uumanⁿgo	‘lamentation’	guumaali, uumaali	‘lamentations’
uuwre	‘wound’	guube, uube	‘wounds’

The alternation **ʔ** : **g** : **ⁿg** is more frequent in Pulaar, but in Maasina it is only found in some derivations from the stem **ʔas-** ‘to dig’.

ʔ : **g** : **ⁿg** before [+low] vowels in Maasina:

mi ʔasii	‘I have dug’	be ʔasii	‘they have dug’
ʔasirgal	‘spade’	ʔasirde	‘spades’
ⁿgayka	‘hole’	ⁿgayde	‘holes’
ⁿgaykaare	‘hole’	ⁿgaykaaje	‘holes’
gasol	‘furrow’	gasi	‘furrows’

The word **ʔasirgal** ‘spade’ which literally means ‘thing/stick to dig with’ uses the verbal stem with a normal non-alternating glottal stop stem initially. The word **ⁿgaykaare** ‘hole’ has taken the form **ⁿgayka** as its stem, its initial prenasalized consonant does not alternate. It is only through a comparison of the verb stem **ʔas-** with the words **ⁿgayka** ‘hole’ and **gasol** ‘furrow’ that the alternation pattern **ʔ** : **g** : **ⁿg** can be retrieved.

In the dialect of Ringimaaji the pattern **ʔ** : **g** : **ⁿg** of the verb ‘to dig’ has been replaced with the regular alternation **w** : **g** : **ⁿg** in the verb and in its derived nouns. Dialect comparison shows the different types of paradigm levelling involving this stem.

Tooro	Maasina	Ringimaaji	
asde	ʔasude	wasugo	‘to dig’
ⁿgaska	ⁿgaykaare	ⁿgaska	‘hole’
gasde	ⁿgaykaaje	gahede	‘holes’

The dialect comparison above shows that the isogloss indicating the occurrence of the alternation **ʔ** : **g** : **ⁿg** does not clearly divide Fulfulde into eastern and western dialects. Surely the occurrence of only one paradigm with the alternation **ʔ** : **g** : **ⁿg** in Maasina is not sufficient to classify this dialect with Fuuta Tooro where this alternation occurs much more frequently.

By comparing the dialects of Fuuta Tooro, Maasina, and Ringimaaji, the paradigm levelling replacing **y** : **g** : **ⁿg** with **y** : **j** : **ⁿj** can be shown in Fuuta Tooro and Maasina. The alternation set **y** : **g** : **ⁿg**, occurring only before the vowels [e] and [i] has undergone a

palatalization rule resulting in the alternation set $y : j : {}^n j$. The result is that $[y]$ always alternates with $j : {}^n j$ before $[+front]$ vowels and that the alternation set $y : g : {}^n g$ gets lost. As noted earlier, some nouns in Maasina still show the older forms $y : g : {}^n g$, but only the alternation set $y : j : {}^n j$ occurs in verbs. The same is true for the dialect of Fuuta Tooro. In the Ringimaaji dialect this paradigm levelling does not occur. The following dialect comparison shows the paradigm levelling of the initial consonant alternation whereby $y : g : {}^n g$ is replaced with $y : j : {}^n j$ in Fuuta Tooro and Maasina.

Fuuta Tooro	Maasina	Ringimaaji	
yim- / ${}^n jim$ -	yim- / ${}^n jim$ -	yim- / ${}^n gim$ -	'to sing'
jimol	jimol / jimi	gimol / gimi	'song'
yimre / jime	yimre / gime		'poem'
yitere / gite	yitere / gite	yitere / gite	'eye'
gidɔ / yidɓe	gidɔ / yidɓe	gidɔ / yidɓe	'friend, lover'
yid- / ${}^n jid$ -	yid- / ${}^n jid$ -	yid- / ${}^n gid$ -	'to love'
yenaande	yanaa ⁿ de		'tomb'
genaale			'cemetery'
jenaale	janaale		'cemetery'
yeldɛ / jeldɛ	yeldɛ / gele		'space between teeth'
yɛɛwt- / ${}^n jɛɛwt$ -	yɛɛwt- / ${}^n jɛɛwt$ -	yɛɛwt- / ${}^n gɛɛwt$ -	'to chat'
yɛɛsɔ / jɛɛsɛ	yɛɛsɔ / yɛɛsooji	yɛɛsɔ / gɛɛsɛ	'face'
	jɛɛsal / jɛɛsɛ		'big face'

Some, especially common, words like *yitere/gite* remain unchanged in all dialects. In some words the alternation $y : g : {}^n g$ is replaced with $y : j : {}^n j$ only in Fuuta Tooro, such as *jimre/jime* 'poem' and *yeldɛ/jeldɛ* 'space between teeth'. If the paradigm levelling occurs in Maasina, it occurs also in Fuuta Tooro. The conclusion is that the palatalization of the velar stops in the alternation $y : g : {}^n g$ before $[+front]$ vowels occurred first in Fuuta Tooro and it spread later to Maasina. The Ringimaaji dialect has not been affected by this process. The dialect of the Ringimaaji shows another type of paradigm levelling which also provides evidence for the postulation of the loss of the alternation set $*y : g : {}^n g$. In Ringimaaji the alternation pattern $*y : g : {}^n g$ has become $y : g : {}^n g$ and sometimes $h : g : g$ before $[+front]$ vowels, and $w : g : {}^n g$ before $[+round +back]$ and $[+low]$ vowels.

w : g : ⁿg before [-front] vowels:

wasugɔ	‘to dig’	ⁿgaska	‘hole’
mi wasi	‘I have dug’	ʃɛ ⁿgasi	‘they have dug’
wawru	‘well’	gaawi	‘wells’
mi wari	‘I have come’	ʃɛ ⁿgari	‘they have come’
[?]emi wapi	‘I hate’	[?]ɛʃɛ ⁿgapi	‘they hate’
wollo	‘cheek’	golle	‘cheeks’
wulugɔ	‘to be hot’	[?]ɛʃɛ ⁿguli	‘they are hot’
wonⁿdugɔ	‘be together’	ʃɛ ⁿgonⁿdi	‘they were together’
mi wujji	‘I have stolen’	ʃɛ ⁿgujji	‘they have stolen’

y : g : ⁿg before [+front] vowels:

yeesɔ	‘face’	geese	‘faces’
yitere	‘eye’	gite	‘eyes’
yidugɔ	‘to want’	[?]ɛʃɛ ⁿgidɪ	‘they want’

h : g : ⁿg sometimes before [+front] vowels:

hiite	‘fire’	giite	‘fires’
himʃɛ	‘people’	gimɔɔ	‘person’

In Ringimaaji the split of the historical consonant ***y** which led to the overlap of **w : g : ⁿg** with the existing alternations set **w : b : ^mb** resulted in different forms of paradigm levelling.

w : b : ^mb —> **β : b : ^mb**

The alternation set **w : b : ^mb** is replaced with the set **β : b : ^mb** in order to regularize the correlation between the consonant of the basic series and its form in the plosive and prenasalized variant derived from the basic consonant [**w**].

When the words with **w : b : ^mb** and **ɥ : b : ^mb** in Maasina and Fuuta Tooro are compared with cognate words in Ringimaaji, their distribution appears to be different from the distribution of the alternating forms **w : b : ^mb** and **β : b : ^mb** in the Ringimaaji dialect. In Fuuta Tooro and in Maasina the [ɥ] is an allophone of [w], phonologically conditioned by the spread of the feature [+front] of the following vowel. In Ringimaaji [β] is a consonant that regularly alternates with **b : ^mb**. The consonant [β] occurs before all vowels, the segment [w] only occurs before [-front] vowels. The comparison in the following table shows the different distributions of [ɥ] in Maasina and [β] in Ringimaaji.

Maasina	Ringimaaji
w : b : ^mb before [+front] vowels:	β : b : ^mb before all vowels:
qiya / ^m biya	βi ² a / ^m bi ² a 'say'
qin ⁿ da / ^m bin ⁿ da	βin ⁿ da / ^m bin ⁿ da 'write'
qela / ^m bela	βela / ^m bela 'be nice'
qee ⁿ du / beeli	βee ⁿ du / beeli 'lake'
	βutaa ⁿ du / butaali 'maize'
w : b : ^mb before [-front] vowels:	βumβe / bumɖɔ 'blind' (pl./sg.)
wutaa ⁿ du / butaali	βoβru / bobi 'mortar'
wumβe / bumɖɔ	βɔjere / bɔje 'hare'
wowru / bobi	βaɖa / ^m baɖa 'mount a horse'
wɔjere / bɔje	βaata / ^m baata 'to die (animals)'
wad ⁿ da / ^m baɖ ⁿ da	
waata / ^m baata	w : b : ^mb sometimes before [a]
wara / ^m bara	wara / ^m bara 'to kill'
walla / ^m balla	walla / ^m balla 'to help'

From the cognates given above it is clear that the consonant [β] in Ringimaaji is not conditioned by a following [+front] vowel since [β] does occur before [-front] vowels also. The paradigm levelling which occurred in the dialect of Ringimaaji and which should explain this distribution is the replacement of the alternation **w : b : ^mb** by **β : b : ^mb**. This replacement made the set **w : g : ⁿg** the regular alternation with the underlying consonant [w] in the basic series, whereas **β : b : ^mb** is the regular alternation pattern of the basic consonant [β]. This paradigm levelling is also not complete because a few basic words **war-** 'kill' and **wall-** 'help' kept their old forms with an alternation of [w] with a labial stop.

The paradigm levelling replacing the alternation set **w : b : ^mb** with **w : g : ⁿg** before [+back] vowels in Maasina can be shown by dialect comparison. This paradigm levelling did not occur in Ringimaaji.

Tooro	Maasina	Ringimaaji	
gumɖɔ	bumɖɔ	bumɖɔ	'blind person'
wumβe	wumβe	βumβe	pl.
wutaa ⁿ du	wutaa ⁿ du	βutaa ⁿ du	'spadix, cob, ear'
butaali	butaali, guttaali	butaali	pl. pl.
	wul- / ⁿ gul- ^m buleefi	wul- / ⁿ gul-	'to be hot'
ⁿ guleeki	ⁿ guleefi		'heat' (Haayre) 'heat' (Maasina, Gimmballa)
	wɔɔɖ- / ⁿ gɔɔɖ- boodum ^m bodeefi	βɔɔɖ- / ^m bɔɔɖ-	'be good, beautiful' 'sth. good, beautiful' 'goodness, beauty'

wofan ⁿ go gofaali	wɔf- / ^m bɔf-	'to bark'
	wɔfaa ⁿ gɔ gɔfaali	'barking' pl.
goowe ⁿ deral	wɔɔw- / ^m bɔɔw-	'to be used to'
	^m bɔɔwka, ⁿ gɔɔwka	'habit' 'familiarity, mutual habit'

The replacement of **w** : **b** : ^m**b** before [+back] vowels with **w** : **g** : ⁿ**g** occurs both in Maasina and in Fuuta Tooro. Further comparison is needed to see where this innovative paradigm levelling started. What is clear is that the actual changes that occur are there to eradicate the ambiguity of the alternation of the underlying consonant [w] with either velar or labial stops.

The alternation of the reflexes of this underlying initial continuant is not entirely predictable from the vowels that follow it. This is what Paradis (1986:64-81) tries to do, she predicts the precise alternation of [w], [y] and Ø (= [ʔ]) from the following vowel. There still is some (historical) morphological information necessary to explain the alternation patterns of some frequent words. The hypothesis is that part of the alternations of [w] with both labial and velar stops and of the alternations of [y] with both palatal and velar stops are unpredictable because of the following historical rules applying to *y.

*y > w / __ V [+back]

*y > y / __ V [+front]

The ambiguity involving alternations with the velar stop is being resolved by different types of paradigm levelling in the different dialects. Each of these dialects has some additional different phonological changes involving *y.

Fuuta Tooro *y > ʔ / __ V [+low]

Maasina *y > w / __ V [+low]
 *y > ʔ / __ V [+low] (one example)

Ringimaaji *y > w / __ V [+low]
 *y > h / __ V [+front] (few examples)

Dialect comparison shows that the irregular place changing alternations always involve alternations with the velar stops **g** : ⁿ**g**. The hypothesis is that these irregular alternations are reflexes of a proto-Fulfulde alternation *y : **g** : ⁿ**g** that has been lost, as postulated by Klingenberg (1927:150). Different dialects show different strategies of paradigm levelling to regularize the consonant alternations.

3.2 STEM FINAL CONSONANT ALTERNATIONS

Stem final consonant alternation is not frequent. Most stems, combining with verbal or nominal affixes, do not change their last consonant. Stem final consonant alternation occurs especially in a few high frequency words. In many words the phonological environment conditioning the stem final consonant change is present in the surface form. This sound change can be the result of assimilation of the final consonant of the stem to the initial consonant of the suffix. Its adjacency to nasal consonants can lead to nasal assimilation. The adjacency of a nasal to an obstruent can lead to place assimilation. The adjacency of the stem final consonant to high vowels can lead to palatalization. The occurrence of the stem final consonant in syllable final position can lead to a higher sonority. Aside from processes of partial assimilation, the process of total assimilation of the stem final consonant to the suffix initial consonant also does occur.

When assimilation occurs, it is often difficult to find the morpheme boundary between the stem and the suffix. When total assimilation has occurred, it is not easy to distinguish between the conditioning environment and the underlying form of the two consonants that have merged. Total merger occurs frequently when a stem precedes one of the class suffixes with an initial glottal stop [ʔ]. Examples of total merger have been found in nouns combining with the class suffixes of grade A in the 'O class, in the 'DE class and in the 'DI class. The underlying form of the grade A suffixes in these classes are *ʔɔ, *ʔe and *ʔi respectively. The assimilation of a stem final consonant to a glottal stop has already been noted by Klingenberg (1941:20-38), who described these changes in his hamza assimilation rules ("Hamza-Assimilationsgesetze"). The type of consonant change occurring in examples where the stem final consonant change is the result of total merger show much similarity with the type of alternation that occurs word initially. These examples of assimilation to a suffix initial glottal stop [ʔ] are discussed in section 3.2.1. The phonological rules describing other stem final consonant changes are discussed in sections 3.2.2-6. Explanations are given as far as it is possible to do so. This is sometimes difficult, especially when a certain stem final consonant alternation is found in only one nominal paradigm.

3.2.1 KLINGENHEBEN'S HAMZA ASSIMILATION RULES

Klingenberg (1941:20-38) describes the hamza assimilation rules as an assimilation of the final consonant of the stem to the initial glottal stop of the suffix. Klingenberg derives the name of the rule from the hamza, the name of the orthographic sign in the Arabic script that is used for the glottal stop. This phonological change resulting from the merger of a stem final consonant with a glottal stop (P-rule 1) can be deduced when corresponding singular and plural forms are compared. There are a few nouns where the merger only leads to lengthening of the stem final consonant.

sg.	*ful	+	*ʔɔ	>	pullɔ		pl.	fulbɛ	'Fulbe person'	
pl.	*laac	+	*ʔɛ	>	*laacce	>	laace	sg.	laaci	'tail'

Phonological changes occur when the underlying stem final consonant is [+continuant]:

pl. *lef	+ *ʔi	> leppi	sg. lef-ol	‘woven strip’
pl. *nɔf	+ *ʔi	> noppi	sg. now-ru	‘ear’
pl. *hɔf	+ *ʔi	> koppi	sg. how-ru	‘knee’
pl. *fɔw	+ *ʔi	> pobbi	sg. fow-ru	‘hyena’
pl. *hɔls	+ *ʔe	> kɔlɕe	sg. hɔls-ere	‘hoof’
sg. *law	+ *ʔɔ	> labbo	pl. law-ʃe	‘woodworker’
sg. *rew	+ *ʔɔ	> debbo	pl. rew-ʃe	‘woman’
sg. *wuy	+ *ʔɔ	> gujɔ	pl. wuy-ʃe	‘thief’
pl. *maay	+ *ʔe	> *maajje > maaje	sg. maay-ɔ	‘river’
pl. *lew	+ *ʔi	> lebbi	sg. lew-ru	‘moon, month’
pl. *saw	+ *ʔi	> cabbi	sg. saw-ru	‘stick’
pl. *naw	+ *ʔe	> nabbe (nawe)	sg. naw-re	‘pond, lake’
pl. *ɲiiw	+ *ʔi	> *ɲiibbi > ɲiibi	sg. ɲiiw-a	‘elephant’
pl. *laaw	+ *ʔi	> *laabbi > laabi	sg. laaw-ol	‘road, times’

In the examples **nowru/noppi** ‘ears’ and **howru/koppi** ‘knees’, the underlying stem final [f] is replaced in syllable final position by the more sonorant [w] in Maasina. The merger of an underlying [+continuant] stem final consonant [f] with a glottal stop (P-rule 1) results in a [-continuant] long consonant [pp], an alternation pattern which is also found to occur stem initially. The same alternations also appear when verb roots combine with the intensive extension, which is marked by the gemination of the stem final consonant which occurs due to its assimilation to an underlying glottal stop [ʔ], as shown in the following intensive verb derivations.

wis-	‘sprinkle water’	wiccude	‘to sprinkle with drops’
ʔuw-	‘bury’	ʔubbude	‘to bury’
yof-, yoof-	‘leave, liberate, abandon’ (Z:DO)	yoppude	‘to leave, abandon, let’
hif-	‘turn over’ (Z:G-A)	hippude	‘to turn over (recipient)’
daw-de	‘to travel’	dabbude	‘to pass the cold season’
hes-	‘new’	heccude	‘to be fresh’
taf-ude	‘to forge’	tappude	‘to castrate; beat’
duf-	‘crush’ (Z:FJ)	duppude	‘to burn, roast’
heef-	‘pluck’ (Z)	heppude	‘to irritate oneself’
wes-	‘winnow, shift’	weccude	‘to change’
tef-	‘intervene’ (Z)	teppude	‘to throw (between warp)’
ɲguy-ka	‘theft’	wujjude	‘to steal’
ɖoy-ru	‘cough’	ɖojjude	‘to cough’
hɔɔs-	‘collect; give present’ (Z)	hoocude,	
		hoocude	‘to collect what was lost; to give guest presents’

Alternation patterns similar to those found in initial word position occur in both the nominal and verbal word derivations. Consonant alternation patterns which occur both stem finally and stem initially are listed below.

stem final	stem initial
*f + *ʔ > pp	f : p
*s + *ʔ > c	s : c
*w + *ʔ > bb, b	w : b : ^m b
*y + *ʔ > jj, j	y : j : ⁿ j

The similarity between the type of consonant alternation of a single continuant and a geminate plosive has led to the hypothesis that the initial consonant alternation is the result of the total merger of the underlying consonant with a glottal stop.

The stems which contain a long vowel show an alternation of a single [+continuant] with a single [-continuant] when they undergo hamza assimilation. The hypothesis is that a merger with an underlying glottal stop [ʔ] has led to gemination, i.e. lengthening of the merged consonant. This geminate long consonant is shortened if it appears after a long vowel. Shortening of the long consonant occurs to prevent the marginal CVVC syllable structure in the plural of the words **maayo**/**maaje** 'river', **niwa**/**niibi** 'elephant', and **laawol**/**laabi** 'road'.

Some of the stems that undergo hamza assimilation also have an alternative plural formation which does not show this stem final consonant alternation.

		old plural	new plural
maayo	'river'	maaje	maayooji
leeso	'bed'	leese	leese, leesooji
laawol	'road'	laabi	laawi

The alternative plural for the form **maaje** 'rivers' is **maayooji** 'rivers'. There is an alternative plural **laawi** 'roads' for the word **laabi** 'roads'. Its singular form **laawol** 'road' also means 'time, occurrence'. A semantic distinction has developed between these two plural formations. The plural form assimilating to the initial consonant of the underlying suffix *ʔi is now used for the literal meaning of the singular **laawol/laabi** 'roads', while the regularized plural is used to form the plural of the figurative meaning **laawol/laawi** 'times, occurrences'.

What is remarkable is the fact that most nouns which show hamza assimilation occur in the Swadesh basic word list (of 200 words). It seems that the hamza assimilation rule is no longer productive. In regular word formation a glottal stop occurring in the underlying structure is simply deleted without leaving any trace. The postulated historical phonological rule of hamza assimilation is a retention that survived only in some frequently used basic words.

The existence of alternative plurals above indicates that the nouns formed with a suffix with an initial glottal stop are replacing the formation with hamza assimilation by the more regular formation showing no stem final alternation as described above due to the simple deletion of the underlying suffix initial glottal stop. The alternative plurals have regularized the plural formation of these words.

3.2.2 ALTERNATION OF LARYNGEALIZED WITH NASAL CONSONANTS

Sometimes a laryngealized labial consonant has become nasal, especially in syllable final position.

kem-d'aa < * heɓ + * d'aa	'have you'
fim-re / piɓ-e	'knot; wedding ceremony in the mosque'
nim-re / niɓ-e	'darkness'
sum-ⁿgɔ / cuɓ-e	'choice'

The stem final alternation [ɓ]/[m] is proposed to be the result of a phonological change of the stem final consonant [ɓ]. The laryngealized bilabial [ɓ] cannot occur in syllable final position (if it is not the initial part of a long consonant). It is replaced with a more sonorant labial nasal [m] in that position. The alternation [ɓ]/[m] is also found regularly in other places. The derivation of the following words needs additional explanation because both alternating consonants [m] and [ɓ] appear in syllable initial position.

julm-ere / julɓ-e	'piece of charcoal/charcoal'
tamm-ere / taɓɓ-e	'fruit of water lily that grows in mud'

Possibly the consonant [ɓ] in these words is the result of the merger of a stem final [m] with the initial glottal stop of the plural suffix *ʔe. The following paradigms show that a stem final laryngealized consonant causes the occurrence of several possible alternations.

leembol / leeɓi	'hair, feather'	[Maasina, Gimballa]
leeɓol / leeɓi	'hair, feather'	[Maasina, centre]
leemburu / leeɓi	'hair, leaf'	[Maasina]
leemre	'hair'	[Maasina, centre]
leeɓre / leeɓe	'hair, fur'	[Diamaré]
leeɓol / leeɓi	'hair'	[Fuuta Jallon, Volta, Eastern Niger]

A more regular alternation would be that the laryngealized labial [ɓ] becomes nasal in syllable final position, like in the word **leemre** 'hair'.

The alternation [ᵐb]/[ɓ] is more difficult to explain. This alternation of a prenasalized voiced labial plosive which alternates with a laryngealized labial plosive is supposed to be the result of a number of phonological changes and reanalyses. The underlying stem final consonant [ɓ] has been replaced with the more sonorant nasal [m] in syllable final position. The sequence [mr] is ill-formed in derivations like the word **leemburu** 'hair, leaf'. Perhaps an epenthetic voiced plosive is inserted between a nasal and a liquid consonant. The proposed historical derivation of the different consonant sequences that are attested is the following:

ɓr > **mr** > **ᵐbr** > **ᵐbVr**

The form **leembol** is the result of the reanalysis of the stem in the word **leemburu** as having a prenasalized final consonant [ᵐb]. It is remarkable that all proposed underlying steps of the historical derivation of the alternation [ᵐb]/[ɓ] can be found in the different cognate forms of

the word ‘frog, toad’ in the different Fulfulde dialects. This lends some support to the plausibility of the proposed derivation. In most orthographies **mbr** and **^hmbr** are not distinguished.

faabru / paafi	‘frog, toad’	[Aadamaawa] (Taylor 1932:46)
faabru / paafi	‘frog, toad’	[Diamaré] (Noye 1989:102)
faabru	‘toad’	[Fuuta Tooro] (Gaden 1913:9)
fabru / paafi	‘frog, toad’	[Ringimaaji]
faamru / paabi	‘toad’	(Zoubko 1980:157)
famru	‘toad’	[Fuuta Tooro] (Gaden 1913:9)
faambru / paafi	‘toad’	[Maasina?] (Zoubko 1980:156)
famburu	‘toad’	[Fuuta Tooro] (Gaden 1913:9)
faa^mburu / paafi	‘frog, toad’	[Maasina]
faawru / paafi	‘toad’	[Volta] (Zoubko 1980:156)
faabru / paafi	‘frog’	[Aadamaawa] (Klingenheben 1963:62)
faabru / paabi	‘frog’	[Fuuta Jallon] (CRDTO 1971:156)

The laryngealized labial [ɓ] can also alternate with a labial approximant [w] in syllable final position. The alternation [w]/[ɓ] is found in one of the cognate forms derived from the stem **faaɓ-** ‘frog, toad’, and in a derivation of the stem **wɔɓ-** ‘mortar’.

faawru / paafi	‘toad’	[Volta] (Zoubko 1980:156)
wowru / bofi	‘mortar’	

Perhaps the change **ɓr** > **wr** instead of the change **ɓr** > **mr** occurs to avoid the sequence [mr] which violates the sonority hierarchy. In productive derivations, [mr] is one of the few consonant sequences which violate the sonority hierarchy. An [m] should not precede a consonant [r] because in a sequence of two different consonants, the first should be less sonorant. The cognate **wɔɓru/bofi** ‘mortar’ in Eastern Niger (Zoubko 1980:513) supports the postulation of an underlying stem final consonant [ɓ] in **wowru / bofi** ‘mortar’ in Maasina.

The replacement of the feature [+laryngealized] with [+voiced] in syllable final position occurs in the Fulfulde spoken in 'Yola, Nigeria. This has resulted in the form **faabru** ‘frog, toad’, a form that is found in more Aadamaawa dialects. The dialect comparison gives sufficient evidence to support the claim that the underlying stem final consonant in the stem final alternation [^hɓ]/[ɓ] is the laryngealized labial [ɓ].

The following examples show a stem final consonant alternation of an alveolar laryngealized consonant with a nasal consonant.

kaɗ-ɗɔ / ham-ɓɛ	‘who has refused’	< haɗ-	‘refuse’
kiin^hgal	‘which is worn off’ (NGAL class)	< hiid-	‘be worn off’

This alternation is not frequently attested, possibly because the laryngealized [ɗ] generally assimilates totally to the adjacent consonant. In the plural form **ham-ɓɛ** ‘those who have

refused' the nasal consonant has also assimilated in place to the initial labial consonant of the suffix **-be**. The stem final nasal in the adjective **kiinⁿgal** 'which is worn off' assimilates to the initial nasal part of the suffix **-ⁿgal**.

The stem final alternation of the palatal consonants [ɲ]/[j] occurs only in a few stems. The phonological rule appears to make the laryngealized consonants [ɖ] and [ɓ] nasal in syllable final position. This rule would be in competition with the rule that an alveo-palatal laryngealized affricate [j] alternates with an alveo-palatal approximant [y] in syllable final position. Other phonological changes must be assumed to have led to the stem final alternation [ɲ]/[j] in the following words:

heɛn-ɛɛ / keɛj-ɛ	'liver'
ɲuun-u / ɲuuj-i	'ant'
jaanⁿje / jaanⁿj-ɛ	'herd consisting of several cefe '
jaanⁿje / jaaj-ɛ	'place where herds gather'
jaanj-ɛ	'total of herds'

The alternation [ɲ]/[j] is the result of a merger between the stem final consonant [ɲ] and the initial glottal stop [ʔ] of the plural suffix **-ʔi**. The derivation of a plural form **keɛje** 'livers' is proposed to be the following:

***heɛn- + *-ʔɛ > *keɛn-ʔɛ > *keɛj-je > keɛje**

The geminate consonant that resulted from the assimilation of the stem final [ɲ] and the suffix initial [ʔ] was shortened to prevent the less well-formed syllable CVVC, resulting from the sequence of a long vowel followed by a long consonant.

The given derivation (**j < ɲ + ʔ**) takes the alveo-palatal nasal [ɲ] as the underlying stem final consonant. The same underlying consonant is proposed for the stem in **ɲiiⁿde/ɲiije** 'tooth'. The alternation [ɖ]/[j] that appears in the surface forms is not a regular alternation. Consonant alternations seldom show a change of place features. The exceptional alternation is the result of several phonological changes in the singular form. The comparison with a cognate singular/plural formation of the same word gives further clues to the derivation of this word.

ɲiiⁿde / ɲiije	'tooth' [Maasina]
ɲiire / ɲiije	'tooth' [Fuuta Tooro, Fuuta Jalon]
ɲiiⁿdere / ɲiije	'tooth' [Gombe] (Arnott 1970a:129)

The derivation of the plural form is identical to the plural forms of **keɛje** 'livers' and **jaaje** 'places where herds gather'.

*heɛn + *ʔɛ > *keɛjje >	keɛje	'livers'
*jaan + *ʔɛ > *jaajje >	jaaje	'gathering place'
*ɲiɲ + *ʔɛ > *ɲiijje >	ɲiije	'teeth'

The singular form would have, as a regular suffix, the vowel initial allomorph **-ere** to prevent the occurrence of [ɲ] in stem final position. Additional phonological changes can only be explained if a shortening of the word to a disyllabic word has occurred. The shortening of a word to a disyllabic form can be shown in a number of other words, but it is not a productive process applied to all words. The domain of this shortening seems to be words which are used very frequently.

***niin- + -re > *niinere > *niin-re > *niin-ⁿde > niinde**

The shortening of the underlying form ***niinere** made the alveo-palatal nasal [ɲ] come to be adjacent to the alveolar trill [r]. The nasal assimilated in place to the alveolar. The trill changed its feature [+continuant] to [-continuant]. The trill became a plosive alveolar [d] because the sonority hierarchy would otherwise be violated. The correct order of segments in the syllable according to their sonority hierarchy determines that a nasal alveolar cannot precede an alveolar trill.

3.2.3 NASAL ASSIMILATION

When the stem final consonant is a nasal, it takes on the place features of the initial consonant of the suffix, e.g. it becomes labial before the suffix **-be**.

janan-ɔ / janam-be	'who belongs elsewhere'		
dɔn-dɔ / rɔm-be	'heir, heiress'	rɔn-	'inherit'
don-u-dɔ / ron-u-be	'heir, heiress'	rɔn-	'inherit'
gɔn-dɔ / wɔm-be	'so. who is at (a place)'	wɔn-	'be'
bum-dɔ, bun-dɔ / wum-be	'blind person'	wum-	'be blind'
bɔn-dɔ / bɔm-be	'bad person'	bɔn-	'be bad'

Nasals often assimilate in place to the following consonant. The alveolar [n] always assimilates in place to the following consonant. The labial [m] sometimes assimilates in place to the features of the following consonant. That the nasal consonant [m] does not assimilate without exception to the place features of the following consonant can be observed in the forms of the word **bumdɔ, bundɔ** 'blind person'. The nasals {n, ŋ, ɲ} can only precede a consonant with identical place features. The (stem final) palatal [ɲ] often changes to [y].

ɲeɲɲ-ɔ / ɲeɲɲ-be	's.o. of the cast of artisans, praise singers'
gaɲ-ɔ / way-be, waɲu-be	'enemy'

The alveo-palatal nasal [ɲ] does not occur word finally. The phonemic velar [ŋ] is rare, it does not occur word finally. Place assimilation of nasals also occurs across word boundaries. A word final vowel nasal sequence is often realized as a nasal vowel.

/kɔsɐm/	‘milk’	/fiyan/	‘(will) hit’
kɔsɐ	‘milk’	fiyɐ	‘(will) hit’
kɔsan nagge	‘milk of a cow’	fiyan ʰdu	‘(will) hit it’
kɔsam ʱbeewa	‘milk of a goat’	fiyam mɔ	‘(will) hit him/her/it’
kɔsaŋ ʱgelɔɔba	‘milk of a camel’	fiyaŋ kadiija	‘(will) hit Kadiija’
kɔsaŋ ɲiiwa	‘milk of an elephant’	fiyaŋ ɲaaku	‘(will) hit the bee’

3.2.4 TOTAL ASSIMILATION

A stem final consonant often assimilates totally to the following consonant, e.g. the initial consonant of the suffix **-be**.

gɔdɔ / wɔbɛ	‘another person/others’	
gidɔ / yiɛɛ	‘friend, lover’	< yid- ‘love’
kɔdɔ / hɔbɛ	‘guest’	< hɔd- ‘settle’
kɔdɔ / hɔbɛ	‘s.o. who is settled’	< hɔd- ‘settle’

Some of these stems are verbs that end in the consonant [d]. The laryngealized alveolar [d̥] assimilates totally to the laryngealized labial [ɓ], which accounts for these changes. This phonological rule has to be applied to prevent the ill-formed syllable with an obstruent in syllable final position (that is not the first part of a geminate consonant).

reedu / deedi	‘belly’
suudu / cuudi	‘house, room’
ɓɔɔdde / ɓɔɔde	‘ball’
ɓɔɔdere / ɓɔɔde	‘ball’

The stem final consonant alternation [d]/[d̥] is the result of the total assimilation of the underlying stem final consonant [d] to the initial laryngealized consonant of the plural suffixes **-di** and **-de**. The resulting geminate consonant [dd̥] has been shortened after a long vowel to avoid the less well-formed syllable structure CVVC. The alternative grade A forms **ɓɔɔdere/ɓɔɔde** ‘ball’ show that the voiced alveolar plosive [d] is the underlying stem final consonant.

3.2.5 SYLLABLE FINAL CONSONANT ALTERNATION

A number of repair rules prevent ill-formed syllable structures which result from the adjacency of ill-formed consonant sequences in underlying structures. The effect of these rules is a set of stem final consonant alternations, which can however be explained by referring to the syllable structure (see section 4.5). The stem final consonant [f] becomes a labio-velar approximant [w] in syllable final position. The alveo-palatal [y] alternates also with the voiceless alveolar fricative [s] that cannot occur in syllable final position. The consonant [y] alternates with all alveo-palatal consonants [j], [ɟ], and [ɲ] which cannot occur syllable finally (unless they are the initial part of a geminate consonant).

haw-re / kaf-e	‘sheaf, bundle of grass’
sew-re / cef-e	‘herd’
kes-ɔ; hey-re	‘new’ (‘O class; NDE class’)
bɔs-al; mboy-ri	‘little bit of porridge; porridge’
baas-udɔ, baay-dɔ / waas-ufɛ	‘have-not, can-not’ < waas- ‘lack’
gujj-ɔ / wuy-fɛ	‘thief’
jɔm^mbaaj-ɔ / yɔm^mbay-fɛ	‘newly wed’
fuy-re / puj-e	‘pimple, spot, ball-shaped piece’
haay-re / kaaj-e	‘stone, rock, hill’
bappaar-ɔ / wappay-fɛ	‘uncle: father’s brother’
ɲɛɛr-ɔ / ɲɛɛy-fɛ	‘cast of artisans, praise singers’ (younger speakers)
ɲɛɛr-ɔ / ɲɛɛy-fɛ	‘cast of artisans, praise singers’ (elder speakers)

3.2.6 EXCEPTIONAL ALTERNATIONS

There are a number of alternations that occur only in one nominal paradigm. Possibly they are remnants of alternation sets which have disappeared, sometimes a phonological conditioning seems traceable.

wiige / bijji	‘calf 3 to 4 years, mature heifer’	[g - j]
nagge / nay, na²i	‘cow’	[g - ʔ]
capaat-ɔ / safar-fɛ	‘Mauritanian’	[t - r]
luur-de / duul-e	‘cloud’	[r - l]
gumardi / gumali	‘bull without horns’	[r - l]
wumare / gumali	‘cow without horns’	[r - l]
moorol / mooli, moolli	‘braid, plait’	[r - l]

The examples involving the stem final consonant [g] are also discussed in section 7.2.5.3. The stem final alternation [g]/[j] in the paradigm **wiige/bijji** ‘calf of three to four years, mature heifer’ is the result of palatalization of the stem final consonant [g] in between two high front vowels. The consonant [g] also alternates with [y] or with the glottal stop [ʔ] in the paradigm **nagge/nay, na²i** ‘cow’. The alternation [ʔ]/[g] is also found stem initially, in Fuuta Tooro. The glottal stop is the result of the loss of a continuant velar *ɣ, which no longer occurs in Fulfulde. Historically the stem final consonant of the stem for cow is reconstructed as *ʔ. The glottal stop [ʔ] is deleted in the plural **na²i** ‘cows’, the vowel [i] has become consonantal (y) in the plural form **nay** ‘cows’. The stem final glottal stop in *na²- has merged with the initial velar consonant in the noun class suffix *ɣe which has resulted in a geminate voiced velar consonant [gg] in the singular form **nagge** ‘cow’.

The alternation t-r occurs uniquely in the word **capaat-ɔ/safar-fɛ** ‘Mauritanian’. The [t] functions in Fulfulde as the only voiceless plosive that does not alternate. Maybe the consonant [t] historically has also been an alternating consonant, possibly with a voiceless alveolar continuant [t̪] that changed to [r] or [l]. Because the only non-alternating continuant in the consonant system is the alveolar voiced lateral, the consonant [l] is the most likely consonant to have once alternated with [t]. The obstruent consonant [t] in syllable final position should alternate with its continuant or sonorant counterpart. This [r] acts sometimes as the sonorant counterpart of [l].

A petrified stem final consonant alternation [r]/[l] can be found in a few nouns derived from the stems **wum-ar-* ‘without horns’ and **mɔɔr-* ‘plait’. The morpheme *-ar-* in *wum-ar-* is the pejorative marker. The underlying consonant of these stems is an [r]. The consonant [l] appears at the surface in words where this stem final [r] is in contact with the underlying suffix initial glottal stop which conditions a gemination of the stem final consonant. In this respect the alveolar trill [r] behaves like a [+continuant] and the lateral alveolar [l] behaves like a [-continuant] segment. The appearance of [r] in syllable final position when it alternates with [l] could be related to the difference in the sonority hierarchy of these two consonants. The more sonorant [r] is being allowed in syllable final position here, the less sonorant [l] is not. The different variant forms of these nouns show that reanalysis has taken place in the formation of the words derived from the stem **wum-ar-* ‘without horns’. Synchronically [l] and [r] occur in all possible positions.

wumare / gumali	‘cow without horns’	[r - l]
wumale / gumali	‘cow without horns’	[l - l]
ⁿgumardi / gumali	‘bull without horns’	[r- l]
ⁿgumaldi / gumali	‘bull without horns’	[l - l]
ⁿgumardi / gumardi	‘bull without horns’	[r - r]

The stem in the reanalyzed forms has the same final consonant in both the singular and the plural form. It is remarkable that the choice of a regularized stem ending in [r] results in the plural suffix *-di* in *ⁿgumardi/gumardi* ‘bull without horns’. This supports the analysis that the verbal noun suffix *-di/-di* of grade C is conditioned by a stem final [r]. Synchronically, both [l] and [r] can occur in syllable final position, in Maasina both [ll] and [rr] can occur as geminate consonants. The stem final consonant alternations of [r] with [l] have contributed to the complicated distribution of the plural suffix form *-li*.

The consonant alternation of an [l] which is replaced with an [r] in syllable final position also does occur in the paradigm of the word *luurde/duule* ‘cloud’.

luur-de / duul-e	‘cloud’ [Maasina]
ruul-dere / duul-e	‘cloud’ [Seeno]

The irregular suffix form *-dere*, probably the result of a double suffix of the NDE class in the singular form, indicates that in Seeno also this form is not regular. If the stem final consonant is [l] the singular suffix expected would be *[-de]* not *[-de-re]*. In the Maasina word *luurde* ‘cloud’, a metathesis of a syllable initial with a syllable final consonant seems to have occurred. The fact that the lateral [l] is replaced by the trill [r] in syllable final position confirms that in the sonority hierarchy the trill [r] is more sonorant than the lateral [l].

A summary of the stem final consonant alternation is given in the following table. All stem final consonant alternations contain the following underlying consonant.

stem final alternation	underlying consonant	stem final alternation	underlying consonant
f : p	*f	w : ɸ	*ɸ
w : p	*f	d : dʰ	*d
w : b	*w	r : l	*r
g : j	*g	r : t	*t
g : ʔ, y	*ʔ	ɲ : j	*ɲ
ᵐb : ɸ	*ɸ		

Different phonological rules and different historical derivations account for the two alternating consonants that appear in the surface forms.