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Aspects of the Phonology of Nankarɛ Dialect of Farefari Winneba Campus of the University of Education, Winneba

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Abstract

The purpose of the study was to determine the phonological processes in Nankarɛ using autosegmental approach. The study was qualitative research and three focus groups were formed in three communities with five members in each group. The sample size was 15 elderly native speaker of Nankarɛ. Purposeful sampling technique was used. Data elicitation technique was employed during interview to obtain data from individual native speakers and in focus group sessions. The technique involves the description of a scenario where the individual or the group gives the appropriate expression in Nankarɛ. Observation was necessary in other to balance this need of everyday context with the need to maintain objectivity and not 'go native' leading to researched bias. The results of the study revealed that assimilatory processes involving [αATR] where, Cross high vowel harmony was in dominant operation. /gb/ and /kp/ precede [-Back] vowels in the dialect while /f/ and /s/ preceding back/front vowel respectfully become /h/.

Keywords: Autosegmental Aproach, data elicitation technique, distinctive features

1. Introduction

This introductory section provides the background of the study area. It discusses the sociolinguistic aspects of Nankarɛ. This discussion covered for instance, the location of speakers and classification of the dialects etc.

1.1 The Nankarɛ dialects

Research work available classify 'Nankarɛ' as a dialect of Farefari (see Dakubu, 1996:p5; Nsoh, 1997: p9; Atintono, 2002; Awedoba, 2002:p25). The dialect is spoken both in Ghana and in the southern part of Burkina Faso. In Ghana, Nankarɛ speakers are found mainly in the two Kasena Nankana administrative zones (Kasena Nankana East and West). Research work including Nsoh (1997:10) and Ayambire (1980) observed that Kasem influence Nankarɛ largely in the Kasem speaking areas.

According to Ghana Statistical Service Census Report 2012, the population of Nankarɛ speaking area stood at 180,611. This figure however does not represent the absolute number of Nankarɛ speakers. According to Vandera (1991) and Grimes (1996), the population of Nankarɛ speakers in our neighbouring Burkina Faso are 25,100. These include Yelewongo *[yéləwɔ̀ŋɔ̀]* and Bungum *[bùŋúm]* communities and few others. The Nankarɛ speaking living within Navrongo and its environs is marked (-N).

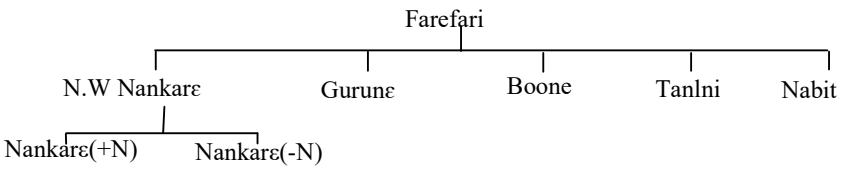

Figure1: Nankarɛ Genetic Classification

1.2 Statement of the Problem

Among the Northern Niger-Congo counterparts, Farefari has not received the linguistic attention it deserve (Atintono, 2010:p11). This is more serious with the Nankarɛ dialect. Indeed, I have come across literature in different aspects of grammars in Gurenɛ but not as much in Nankarɛ. The few works available in the language do not pay particular attention to this dialect. I therefore intend to do a detailed analysis of its phonology using the autosegmental approach. Objectives of the study were to identify the phonological processes in Nankarɛ as well as account for the constraints of the phonological processes identified.

Among many other questions, the following questions guided the study:
Research question 1: What are the phonological processes that exist in Nankarɛ Research question 2: What constraints are involved in the Nankarɛ phonological processes identified?

1.3 Significance of the Study

The study contributed significantly to our knowledge in the language particularly Nankarɛ phonology. It further raised other issues that will generate more research into the dialect. Finally, the findings deepened further insights of the language particularly Nankarɛ.

1.4 Limitations of the studies

The major issue is logistics without which quality cannot be guaranteed. This is because the success of this paper depends largely on accurate data that calls for a high quality-recording machine. A machine that can record the speech sound is therefore necessary.

The main data is speech sound. This also brings to mind the need for the human element motivation for maximum cooperation. This factor cannot be ignored since NGOs involvement in community entries has introduced people to incentive packages without which quality cannot be assured.

Intuitive data also caused the limitation. Judgment of sound quality by intuition of the researcher could not guarantee quality. Data also generated by intuition has bias tendency not to conform to the norms of the dialect.

Also equally important is respondent fatigue. The said NGOs like Navrongo Health Research Centre including research fellows from University for Development Studies, Navrongo campus traded research questionnaires in the Nankarɛ speaking community for too long. This breads possible contempt on values of questionnaires.

1.5 Delimitations

The paper is focused on aspects of the phonological processes and not all. Tone for example had not be discussed in this paper. Communities that were visited during the research work were limited to three.

2. Materials and Methods (methodology)

The target population of this study are three Nankarɛ speaking communities from the two administrative districts namely, Kasena Nankana East and West. In all, three separate focus groups were formed. These were formed in Nabango, Mirigu and Kolgo. Each group was made up of five members making a total of 15 through purposeful sampling technique. The purposeful technique was used to ensure that unadulterated data is obtained. Interview and observations was used. The interview was informal since data expected was in normal everyday context. This is also because data is not issues based but speech sound based. For clarity and easy understanding Autosegmental theory was used to analyze the data.

3. Results and discussion

3.1 Phonetic and Phonological analysis of Nankarɛ Consonants

The phonetic consonants of the Nankarɛ dialect are twenty-six sounds. Azagsiba (1977:p3) however identified bilabial nasal voiceless [m̥] sound in addition in Gurenɛ and Nankarɛ dialects but (Atintono, 2011:p24) did not see it in Gurenɛ consonant sound neither did I see it in Nankarɛ.

All of them can occur in the word positions especially the initial position except [r], which occurs only in word medial positions. Few can occur in word final position. A summarised description of Nankarɛ consonant sounds is presented in Table (1) below, followed by Nankarɛ consonant phonological analysis.

Table 1 The consonant sounds of the Nankarɛ dialect

	Bilabial Nɔɔgana	Labio-dental Nyinɛ-tilenɔganɛ	Alveolar Nyina tilen	Palatal Kalemalaka	Velar Kun kɔan	Labio-velar Kunkonɔganan	Glottal Kunkomi'isin
Stop(Gubasɛ)							
Voiceless	p		t		k	kp	ʔ
Voiced	b		d		g	gb	
Nasal (nyɔan)							
Voiceless	-		-	-	-	-	
Voiced	m		n	ɲ	ŋ	ŋm/ŋw	
Fricativ(siisɛ)							
Voiceless		f	s				h
Voiced		v	z		⊗		-
Affricate (Gubasera)							
Voiceless				ky(ʧ)			
Voiced				gy(ʤ)			
Lateral (zɛleŋan)							
Voiceless	-			-			
Voiced	w		l, r	j			

3.1.1 Distribution of Nankarɛ Plosives

The sound /b/ is a voiced bilabial stop that can occur before all types of vowels and in word initial and medial positions. Some examples are in (1):

(1)

	Word Initial	
bi	[bí]	'in'
bɛ	[bɛ∃]	'where'
ba	[bà]	'they'
be'o	[béʔo]	'bad'
	Word Medial	
tibesegɔ	[tĩbəsəgɔ]	'weight'
taberɛ	[tabərɛ]	'tobacco'
tabelɛ	[tabəlɛ]	'mend'

The sound /p/ too is a voiceless bilabial stop that is distributed in all positions except the final position. It can also precede all vowels in the dialect. Examples of words include the following.

(2)

	Word Initial	
pia	[pìa]	'ten'
piɛ	[pɪɛ]	'sweep'
pole	[pole]	'leather wrist band'
	Word Medial	
kampone	[kámpòne]	'toad'
kampinya	[kámpɪ⇔ja]	'snake'
kampunɛ	[kámpúnɛ]	'costume for war dance'
tampɔkɔ	[tampɔkɔ]	'bag'

The sound /d/ on the other hand is a voiced alveolar stop that can occur before all types of vowels in word initial and in word medial positions. Examples are in (3) below.

(3)

	Word Initial	
die	[die]	'rub'
di	[dɪ]	'eat'
de	[de]	'is'
	Word Medial	
dundugo	[dundugo]	'cobra'
tandɔkɔ	[tandɔkɔ]	'pit'
tanduŋa	[tanduŋa]	'pestle'

It is worth noting however, that in compound words, the voiced alveolar stop in the initial position of the second word becomes a flap [r] to function as an allophone of the voiced alveolar stop /d/. They are therefore playing a complementary distributive role as illustrated below.

(4)

	noun+noun	**compound**	**'gloss'**
i.	pesego + daa sheep + male	[pedaa/peraa]	'ram
ii.	taaba +daana mate + owner	[tadaana/taraana]	'colleaque'
iii.	nɔa + dɔɔ fowl+male	[nɔdɔɔ/nɔrɔɔ]	'cock'

The sound /t/ as a voiceless alveolar stop in the dialect can be found before all vowels as well as word initial and medial positions except word final.
Examples include the the subsequent s in (5) below.

(5)

		Word Initial	
ii	ti	[tɪ]	'and'
	tu	[tʊ]	'carry/ to insult'
iii	tue	[tue]	'mistake'
iv	tɔ	[tɔ]	'pound'
		Word Medial	
	tinta'aba	[tɪntaʔaba]	'locust'
	tintuo	[tɪntuo]	'shrub'
	tintuuro	[tɪntu:ro]	'shrubs'

The sound /g/ is a voiced velar stop. It precedes all types of vowels and occurs in word initial and medial positions. The voiced palatal Affricate /ʤ/ is however becomes it variant in the

case of S-N sub-dialect depending on the created phonological environmental conditions. This is evident in the words below.

(6i)	gi'i	[giʔi/ʤiʔi]	'short'
	gi	[gɪ/ʤɪ]	'hold with teeth'
	gere	[gere/ʤere]	'tigh'
	gingene	[gingene/ʤinʤene]	'wattle'
	gilega	[gɪləga/ʤɪl↔ga]	'short'

It is clear from data above that, the voiced velar plosive [g] is palatalised when preceding [-Back]

In medial position of words, the voiced velar fricative [ɣ] is in complementary distribution with /g/ particularly in disyllabic lexemes. The velar fricative occurs only in the intervocalic position as seen below.

(6ii)	baga	[baga/baɤa]	'idols'
	pɔga	[pɔga/pɔɣa]	'wife',
	lɔgerɔ	[lɔgərɔ/lɔɣərɔ]	'luggage'
	tɔgɛ	[tɔgɛ/tɔɣɛ]	'speak'
	pagelɛ	[pagəlɛ/paɤəlɛ]	'put on top'
	paga	[paga/paɤa]	'name of a town'

The sound /k/ is a voiceless velar stop consonant sound that occurs before all vowels. Like its counterparts, it is seen in word initial and medial positions. It alternates with /ʧ/ in the -N sub-dialect depending on the created phonological environmental conditions. For instance,

(7) **Word Initial**

	-N	
ki	[ki/ʧi]	'die'
ki'i	[kɪʔɪ/ʧɪʔɪ]	'first and last'
kele	[kele/ʧele]	'cry'
	Word Medial	
boko	[boko/-]	'pothole'
bakolego	[bakoləgo]	'soothsay'

It is evident from the data that where the voiceless velar plosive *[k]* precedes the [-Back] vowel, it is palatalised.

For the sound /gb/, it is a voiced labial velar. It occurs before [-Back] vowels and limited in word positions hence found in few words. It however abound in the other sister dialects of Gurenɛ and Boone.

(8)	gbeo	[gbeo]	'sickle'
	gbiɔ	[gbɪɔ]	'type of wild fruit'
	gbigelɛ	[gbɪgəlɛ]	'improportional'

The sound /kp/ on the other hand is a voiceless labial velar. Like its voiced counterpart, its Occurrence is limited to word initial position. It precedes spread vowels and occurs in S-N and the Nankarɛ sister dialects like Gurenɛ and Boone as in the few words below.

(9)	kpa	[kpa]	'to nail'
	kpɛ	[kpɛ]	'to miss an event'

This sound /ʔ/, a glottal stop, is a voiceless consonant that abounds particularly in the E-N. It occurs especially in word medial position. It also precedes and follows mostly vowels initiating and ending words. For instance, it is phonetically realized before most words that begin with a vowel and ends with vowels as below in (10). Orthographically, the apostrophe

(‘) is used in place of it in contrastive cases only. The Kasem influenced areas has lost it completely.

(10)

	Word Initial	
i	[ʔi]	‘them’
e	[ʔɪ]…	‘it’
ɛ	[ʔɛ]	‘search’
	Word Medial	
da’a	[daʔa]	‘market’
kɔ’ɛ	[kɔʔɛ]	‘break’
ki’ibɔ	[kɪʔɪbɔ]	‘soap’
	Word Final	
da’	[daʔ]	‘to buy’
bɔ	[bɔ∃ʔ]	‘give’

3.1.2 Distribution of Nankarɛ Nasal Consonants

The sound /m/ is a bilabial nasal sound. It occurs in word initial and medial position and among the few consonants that can occur in the word final positions. Its coda position in Nankarɛ is not derivational but underlyingly specified in the word final position such as seen among the given examples.

(11)

	Word Medial	
mi	[mi]	‘know’
mi	[mɪ]	‘build’
mu	[muʔ]	‘rice’
	Word Medial	
lomese	[loməse]	‘cross over many times’
pumpuka	[pʊmpʊka]	‘food’
kampunɛ	[kampʊnɛ]	‘instrument’
kampone	[kampone]	‘toad’
	Word Final	
zom	[zóm]	‘flour’
fum	[fʊm]	‘you’
bum	[bum]	‘to mix’

This sound /n/ is also a alveolar nasal sound. It can occur in all positions with all vowels except /e/ /ɛ/ /o/ in word initial position.

(12a)

	Word Initial.	
nira	[nɪra]	‘person’
naara	[naara]	‘early millet’
nɔregɔ	[nɔrəgɔ]	‘sore’
nankarɛ	[nankarɛ]	‘dialect of Nankaresi’
	Medial position	
nananewa	[nananəwa]	‘now’
nanɔgeba	[nanɔɤəba]	‘type of tree’
natandeleŋo	[natadeləŋo]	‘centipede’
nanugele	[nanuɤəle]	‘sweet potato’

The sound /n/ in Nankarɛ cannot precede /ʊ/ in any word position but abound in its sister dialects particularly Boone and Gurenɛ as in.

(12b) *nua [nʊa] ‘fowl’

*nuurɛ	[nʊːrɛ]	'mouth'
*nyuurɛ	[ɲʊʊrɛ]	'life'

With the /ŋ/ sound, it is a velar nasal and has limited occurrences in word positions. It occurs mostly in word medial positions except in *Dɔɔnɛ*, a subdialect of Nankarɛ spoken in Doba, and those in Navrongo environs, where in few words its occurrence in initial position is possible, such as;

(13)

	Word Initial S-N	
ŋwana/ŋana	[ŋwana/ŋana[1]]	'this'
ŋwani/ŋani	[ŋwanı/ŋanı[1]]	'why'

([1]spoken from Doba down to Naaga)

	Word Medial	
yeleminerɛ	[jelemıŋərɛ]	'truth'
tiŋasuka	[tıŋasʊka]	'middle'

The word [viːŋo/viːko] 'owel' however is a word that has /ŋ/ to complement with /k/ in Nankarɛ.

The sound /ɲ/ is a voiced palatal sound. Scholars in the language including Dakubu (1996) and Atintono (2011, p27) observe that it precedes nasal vowels only. In my opinion, it is the reason why it does not precede [e]and [o] which do not have nasal counterpart in languae. It occurs only in the initial position and represented orthographically in the language as [ny].

(14)

	Word Intial	
nyi	[ɲĩ]	'intercrop'
nyi	[ɲı)]	'excrete'
nyanɛ	[ɲãnɛ]	'disgrace'
nyɔkɛ	[ɲɔ)kɛ]	'catch'
nyɔɔrɛ	[ɲɔ):rɛ]	'life'

The sound /ŋm/ is a labial velar nasal sound. It occurs only in the initial position language. Its distribution is before spread-retracted nasal vowels only. It is a digraph as it is articulated as a single sound. It is not found in many words of the dialect. Some examples are below.

(15)

	Word Initial	
ŋmi	[ŋmı)]	'beat'
ŋma	[ŋmã]	'cut'
ŋmiregɛ	[ŋmı)rəgɛ]	'turn'
ŋmikɛ	[ŋmı)kɛ]	'squeeze'

3.1.3 Distribution of Nankarɛ Fricatives

/v/ this is a voiced labio-dental fricative. All types of vowels occur with it only in word initial.

(16)

	Word Initial	
vaala	[vaala]	'heaps of rubbish'
vole	[vole]	'swallow'
ve'e	[veʔe]	'pull'
vike	[vike]	'uproot'
viiɔ	[vɪːɔ]	'farm hurt'
vɔa	[vɔa]	'emptiness'

The /f/ sound is also a voiceless labio-dental fricative. It distributes over all vowels in word initial and final position. For instance;

(17) **Word Initial**

fa	[fã]	'cheat'
fɔ	[fa]	'become blind'
file	[file]	'to fan'

/z/ is a voiced alveolar fricative also precedes all types of vowels in word initial and medial positions. It does not occur in word final position. For example;

(18)

	Word Initial	
Zim	[zim/ʤim]	'fishes'
ziile	[ziile/ʤiile]	'vein'
zu'a	[zuʔa/ʤuʔa]	'fly'
zuke	[zuke/ʤuke]	'hasten'
	Word Medial	
kanzi'iŋa	[kanzɪʔɪŋa]	'shell type'
zinzira	[zinzira]	'pod type'
zinzirega	[zinzirəga]	'tree type'

And yet again, in the above data, the voiced fricative [z] is palatalised when preceding [αBack] vowel.

/s/ is a voiceless alveolar fricative. Its occurrence is before all vowels. Some examples include;

(19)

si	[si/ʧi]	'millet'
sirɛ	[sɪrɛ/ʧɪrɛ]	'friend'
sɛrɛ	[sɛrɛ/ʧɛrɛ]	'clay basin'
	Word Medial	
tigesego	[tigəsəgo]	'union'
pesego	[pesego]	'sheep'
kumesegɔ	[kʊməsəgɔ]	'train'
	Word Initial	
sise	[sise/ʧise]	'forbid'
sisɛ	[sĩsɛ]	'cut marks on body'
sisum	[sĩsum]	'sneeze'

Observing the data above, the voiceless alveolar fricative [s] in the data is palatalised when preceding [αBack] vowel.

The sound /h/ is a voiceless glottal fricative that has limited distribution in word initial position. In word medial positions, it becomes either the voiceless alveolar fricative /s/ or the voiceless labio-dental fricative /f/ when conditioned. The /h/ becomes [f] or [s] if the vowel that it precedes is a back vowel or front vowel respectively thereby complimenting each other.

(20)

[h]	**= [h]**	
hɔ	[hɔʔ]	'collect'
hai	[hai]	'shout to draw attention'
hai	[haɪ]	'uncomfortable'
haya	[haja]	'careless'
	[f] becomes [h]	
fum	[hʊm]	'you'
lagefɔ	[lagəhɔ]	'money'
keefo	[ke:ho]	'millet'

[s] becomes [h]

pɔsega	[pɔhɪga]	'to start'
kɔsegɛ	[kuhɪgɛ]	'cut rope'
gɔsegɔ	[gɔhɪgɔ]	'roof top'

/ɣ/ is a voiced velar fricative that does not occurs in the word initial but only occurs as a free variant of the voiced velar stop /g/in word medial as already discussed above. Below are examples.

(21)

baga	[baɤa]	'idols'
pɔga	[pɔɣa]	'wife',
lɔgerɔ	[lɔɣərɔ]	'luggage'

3.1.4 Distribution of Nankarɛ flap

[r] This sound is an alveolar flap. It never forms an onset of a primary syllable except in the secondary syllable.

(22)

	Word Medial	
sinsirego	[sinsirəgo]	'fairy'
dɔregɔ	[dɔrəgɔ]	'ladder'
kurego	[kurəgo]	'metal'
beere	[beere]	'tomorrow'
pɔgerɔ	[pɔɤərɔ]	'shells'
ligeri	[ligəri]	'monies'

3.1.5 Distribution of Nankarɛ Approximants

/l/ is an alveolar lateral approximant. It occurs in word initial and medial position and precedes all vowels. Below are examples. **Examples** (23)

	Word Initial	
lɛ	[lɛ]	'feed baby'
lia	[lɪa]	'axe'
	Word Medial	
lilege	[liləge]	'standout'
lelege	[leləge]	'to lick once'
pilege	[piləge]	'uncover'

/w/ is a labial velar approximant. It occurs before all oral vowels and some nasal vowels.

Examples (24)

	Word Initial	
wi	[wi]	'call'
wɛa'	[wɛaʔ]	'go'
wɛka	[wɛka]	'half'
	Word Medial	
sawɔ'ɔ	[sãwɔ'ɔ]	'grsshoper'
wulenwukɔ	[wʊlənwʊkɔ]	'sternum'
ŋwani	[ŋwãni]	

3.2 Phonetic and phonological analysis of Nankarɛ vowel sounds

Linguistically vowels are described phonetically as this will facilitate easy and clear classification. A summary of Nankarɛ vowel formation is presented in **Fig 2**

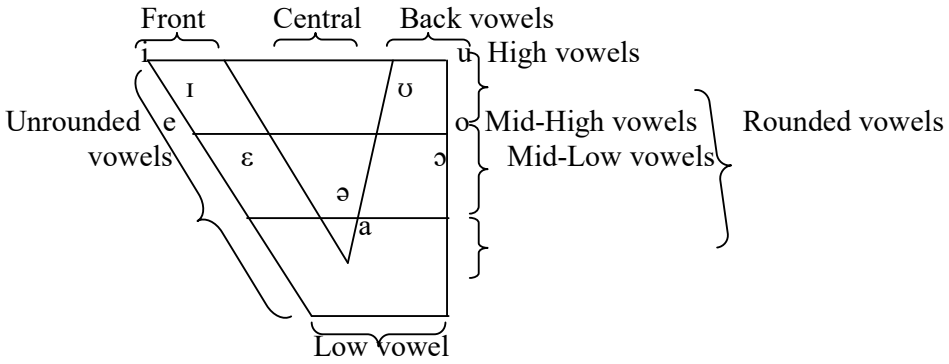

Figure 2 Nankarɛ vowel Chart

The phonetic vowels of the Nankarɛ dialect are nine which is same in Gurenɛ, a sister dialect (Azagsiba, 1977; Dakubu 1996; Adongo 2008). All the vowels in the dialect can occur in sequence except /aɔ, ae, ɛɔ and ɛʊ/ which could not occur sequentially in the Nankarɛ word. A brief account of the vowel sequence is given below after the phonetic descriptions.

3.2.1 Phonetic Description of Nankarɛ Vowels

Basically the vowels are divided into two; [+ATR] and [-ATR] (Dakubu, 1996:p23; Azagsiba, 1977: p37). But the individual vowels are best described in terms of the shape of the tongue and the lips configuration in their formation. Dolphyne (2006:p5) identified three types of vowels that are distinguished in this way; part of the tongue, height of the tongue and lip position. I opt to use the active player (part of the tongue) in this work.

3.2.2 Part of the Tongue.

This is the part of the tongue that is close to the mouth roof when the vowel in question is being made. These are classified into three sets. The first set is divided into two [+Front] and [+Back/Round] vowels.

i. Front vowels: these are produced with the front part of the tongue raised close to the mouth roof such as;

Example (25a)./i, ɪ, e, ɛ/

[bi] ‘there’	[bɪ] ‘grow’
[de] ‘is’	[bɛ] ‘where’

Back/Round vowels: these are also vowels that are produced with the back part of the tongue raised close to the roof of the mouth such as; the configuration of the lips rounded.

Example(25b)./u, ʊ, o, ɔ/

[du] ‘near’	[tʊ] ‘carry’
[too] ‘bitter’	[tɔ] ‘pound’

ii. And yet there is a vowel that is produced using the central part of the tongue in Nankarɛ. It is [-Round]

Example (25c)/a/ [*d*a] ‘don’t’

3.2.3 Height of the tongue.

The second Variable is the relative height of the tongue in the mouth, in relation to the palate during the articulation of the vowel in question. These are close, half-close, open and half-open that are distinguished in this way.

i. Close vowels: These are relatively closed to the palate during the articulation and are close vowels. They are four below;

Example (26a)/i, ɪ, ʊ, u/
[kulikuli] 'groundnut cake',
[dɪ] 'eat'
[kʊ] 'kill'.

ii. Half-Close vowels: These are relatively half-closed to the palate during the articulation and are half-close vowels. These are only two.

Example(26b)/e, o/
[obe] 'chew'.

iii. Half-opened vowels: They are relatively half-opened in relation to the palate during the articulation and are half-open vowels. These are also two.

Example (26c) /ɛ, ɔ/
[dɔkɛ] 'pick on top'.

iv Opened vowel: It is open in relation to the palate during the articulation and is the only open vowel. **Example(26d)** /a/
[da] 'don't'.

In another way, relative to height, the vowels are sometimes classified into three categories.

Example(27a)/i, u, ɪ, ʊ/ are high vowels
b /e, o, ɛ, ɔ/ are mid vowels
c /a/ is a low vowel

3.3 Phonological Analysis of Nankarɛ Vowels

Nankarɛ has nine cardinal phonemic vowels. The available literature in Nankarɛ including Awe)nnɛ la Awe)npɔka (1996) and Gue□lwongo (1997) agreed on the same number of vowels as; /i/ /ɪ/ /e/ /ɛ/ /a/ /ɔ/ /o/ /ʊ/ /u/ which have both short and long counterparts. According to Gue□lwongo (1997), all vowels of Nankarɛ are repeated to give their long vowel counterparts. The long vowels occur in both analogous and identical environments as their short vowels counterparts. This is exemplified in the following data.

Long Vowel as a Phoneme in Nankarɛ (28)

Short			**Long**		
/i/ → ani	[ànɪ]	'who'	/i:/ → anii	[ání:]	'eight'
/e/ → yele	[jèlè]	'tell'	/e:/ → yeele	[jé:lè]	'winow'
/ɛ/ → dɛna	[dɛnà]	'to be'	/ɛ:/ → dɛɛna	[dɛ:nà]	entertaininlaw'
/u/ → ture	[tùrè]	'throw'	/u:/ → tuure	[tù:rè]	'mistaking'
/ɔ/ → gɔŋɔ	[gɔŋɔ]	'animal skin'	/ɔ:/→ gɔɔŋɔ	[gɔ:ŋɔ]	'dumb'

One can say from the data that vowel length in itself in the dialect is phonemic as it contrast in words. For instance, there are many words on the right hand side that differ in meaning by lengthening the vowel alone.

3.3.1 **The Nankarɛ Nasal Vowels**

A vowel which is underlyingly specified for nasality and therefore occurs in phonological representation is a nasal vowel (Abakah, 2003:p60). This goes to say that nasalized vowel is unspecified for nasality and does not occur in lexical representation but copies nasality by spreading from a nasal autosegment. In other words, a situation where an oral segment acquires nasal features based on the environment is nasalized and only exhibits phonetic without phonemic properties whereas nasal segments are inherently phonological and exhibits phonemic properties.

All the Nankarɛ vowels are underlyingly specified for nasality except /e/ and /o/. This view is consistent with Awe)nnɛ la Awe)npɔka (1996) and Guélwongo (1997). Azagsiba (1977:p34), Dakubu (1996:p31), Atintono (2011:p31) have the same view in the Gurenɛ vowel a sister dialect of Nankarɛ.

3.3.1.2 Short and Long Nasal Vowels

In Nankarɛ, both the short and long nasal vowels are contrastive since this feature of nasality is phonemic and distinguish between words.

(29). **Nasal long vowel as a phoneme**

Oral Vowel			**Nasal Vowel**		
/i:/	ti:re	'information'	/ĩ:/	tĩ:re	'trying'
/ɪ:/	tɪ:rɛ	'chocking'	/ ɪ̃:/	tĩ:rɛ	'straightening'
/a:/	ka:sɛ	'cry'	/ã:/	kã:sɛ	'prepare'
/ɔ:/	dɔ:rɔ	'wood'	/ɔ̃:/	dɔ̃:rɔ	'dawadawa'
/u:/	ku:re	'score'	/ũ:/	kũ:re	'hoe'

It is clear that nasal vowels are separate phonemes in the dialect as they make difference in meaning.

Table 2 The Nankarɛ Vowel Sequence

	i	ɪ	e	ɛ	a	ɔ	o	ʊ	u
i	ii		ie		ia		io		iu
ɪ		ɪɪ		ɪɛ	ɪa	ɪɔ		ɪʊ	
e			ee				eo		eu
ɛ				ɛɛ	ɛa				
a		aɪ		aɛ	aa	aɔ		aʊ	
ɔ		ɔɪ		ɔɛ		ɔɔ		ɔʊ	
o	oi		oe				oo		ou
ʊ		ʊɪ		ʊɛ	ʊa	ʊɔ		ʊʊ	
u	ui		ue		ua		uo		uu

The chart is showing the vowel sequences in Nankarɛ. It mostly involves the [+high] vowel of the dialect. The [+high] is realised as a glide at the phonetic level especially [-Back]. In a situation where two [-Back] vowels are in a sequence, it is the first in the sequence that becomes a glide and the second vowel that does not become a glide, undergoes a compensatory lengthening. These vowel sequences occur in the the subsequent s.

Example (30) i. /ii/ bí:ré 'kid/key' dí…:ré 'forehead'
pí:sí 'sheep' fi:sì 'cut with fingers repeatedly'
ii. /io/ ío 'kind of lizard' bìo 'fibre'
màʔamío'okro seed' nànìo 'grasshopper'

Let me note that though, Nankarɛ exhibited the occurrence of vowel sequencing, /ʊɔ, ui, and ou/ sequencing is not as much as the rest of their counterparts. I am however not aware of the following sequencing /aɔ, ae, ɛɔ and ɛʊ/ in Nankarɛ.

Table 3 Vowel Distribution in Nankarɛ

	i	Gloss	ɪ	Gloss	e	Gloss	ɛ	Gloss		
b	bìre	stamer	bɪsɛ	look	be:re	tomorrow	bɛ	where		
d	die	massage	dɪ	eat	de	is	dɛ	make war dance		
f	fie	cut part with fingures	fɪsəga	buttock	fe:	bruise	fɛ	move on buttocks		
g	gire/ʤire	struggle	gɪ/ʤɪ	hold with teeth	gere	thigh	gɛ/ʤɛ	pick		
h	zu'uhi	smoke	gɛhɪ	short walls	kehe	despise	mɪhɛ	sprinkle		
k	ki/ ʧi	die	kɪʔɪ/ʧiʔɪ	first &last	ke/ʧe	there	ɛa/ʧɛa	malt		
l	lika	darkness	lɪʔ	chock	le	again	lɛ	spon feed		
m	mi	know	mɪ	also	*me	-	*mɛ	-		
n	ni	to rain	nɪ	asp	dune	knee	wɪnɛ	god		
ŋ	toŋi	adv	kaŋɪ	asp	loŋe	cross over	laŋɛ			
ŋm	ŋminini	perfect	ŋmɪ	beat						
ŋw										
p	pike	see by surprise	pɪkɛ	open (eyes)	pe:	wash	pɛ	sew		
r	bu:ri	family	tarɪ	to have	sore	path	bʊrɛ	sow	-	-
s	si/ ʧi	millet	sɪrɛ/ʧɪrɛ	friend	seke	okay	sɛ□rɛ□/ʧɛ	dowry		
t	tire	bean	tɪgɛ	satisfied	teke	halt	tɛka	end		
v	vie	dodge	vɪʔ	not constant	ve:se	peep	vɛpɪ	soaked		
w	wi	call	wɪɛ	plaster nside	we:	remain	wɛ	to hoe		
j	jire	house	jɪɛ	undress	je:	recover	jɛ	wear		
z	zim	fish	zɪʔ	to chain	zele	egg	zɛ	loot		
	a	Gloss	ɔ	Gloss	o	Gloss	ʊ	Gloss	u	Gloss
b	bà	they	bɔ	give	boko	hole	bʊ	doubt	buse	soak
d	daʔ	buy	dɔkɛ	remove on top	doe	cross over	dʊkɛ	remove on fire	du	near
f	fa	be blind	fɔ	pull out repeatedly	foe	pull out	fʊrɛ	cover	fuo	shirt
g	ga	dig holes	gɔ'ɛ	peak	gore	a tool	gʊ	hold onto	gu	stop
h	halɛ	yellow	hɔ)	take	niho	eye	hʊ)	you	bi:hu	pito chaff
k	ka	to peg	kɔ	to weed	kole	tick	kʊ	kill	kum	death
l	la	and	lɔ	extract	loe	take some	lʊ	pierce	lu	fall
m	ma	mother	mɔ	try	mole	red	mʊ	pat	mu	rice
n	nasa	being poor	nɔŋɛ	to like	lono	type of toads	*nʊ	-	nu'o	hand
ŋ	ŋanɪ	why	ŋɔʔɛ	squeeze face	goŋo	inner room	-	-		-

ŋm	ŋmaɛ	cut	ŋmɪ	beat						
ŋw	ŋwanɪ	why	ŋwanɛ	resemble						
p	pa	clap	pɔɪ	swear	poʔe	help	pʊ	share	puse	sprout
r	tara	have	sɔɔrɔ	brooms	toʔoro	baoba fruits	sɔrʊ	oversize	suru	state of being
s	Sa/ʧa	faint	sɔ/ʧɔ	father	sobe	dye	sʊɛ	share leaves	sune	bambra bean
t	taɛ	smear	tɔ	pound	tole	pass	tʊ	carry	tuko	shrine
v	va	live	vɔ)ɛ	uproot	vole	swallow	vʊbɛ	pound millet wet	vue	drag
w	waʔ	dance	wɔgɛ	be tall	woo	every	wʊɛ	inform	wuu	all
j	ja	you	jɔ	Pay	jo:	unknown	jʊ	shut	jule	leak
z	za	stand	zɔɛ	cross over	zoe	stop sth	zʊɔ	right hand	zuo	head

3.4 Phonetic description of Nankarɛ consonants and vowel Sounds

The description of the sounds in this section is based on the binary feature system according to Jacobson and Halle (1968) and others. In this framework, sounds are classified in terms of one of two features that has plus or minus (±) values.

3.4.1 The Distinctive features

Distinctive features are the minimal contrastive units that make up the sounds. This means that, features are the minimal internal structures of the human speech sounds. To differentiate sounds from one another one must established the various features with which sounds are made up of and group them into natural classes that in themselves lead to formulation of phonological rules. The sounds are described here by using the set of features under major class features, cavity features and manner features.

3.4.2 Major Class features

Sounds in this category are those that occur in or are conditioned by the same environments. These sound features are [± syllabic], [± sonorant] and [± consonant

Syllabic /Non-Syllabic [±Syllabic]
Syllabic /Non-syllabic; [±syllabic] are those sounds that constitute peak of syllable whereas those sounds that are in the margins of syllables are non-syllabic. Most vowels in Nankarɛ occur as syllabic peaks. Nasals and liquids are also syllabic in very restricted environment.

Sonorant/Non-Sonorants [±Sonorant]
Sonorants are sounds that are produced with relatively free air passage either through the mouth or through the nose (Chomsky & Halle, 1968:p302; cited in Hyman, 1975:p44). These include; liquids [r, l], glides [j, w], nasals [m, n, ŋ,), ŋm] and all the vowels in Nankarɛ.

Obstruents [-sonorants].
[-sonorants] are sounds produced with turbulent noise. All plosive in Nankarɛ [p, b, t, d, k, g, kp, gb] including the affricates and the fricatives [ʤ, ʧ,⊗, h, v, f, z, s,] are[-sonorants].

[±Consonantal]
Sounds that have constriction somewhere along the centreline in the vocal tract as to narrow it as required in the production of fricatives are [+ consonantal] Gussenhoven & Haike (2005:p60). [-consonantal] on the other hand are sounds produced without such an obstruction. These are vowels and glides.

3.4.3 Cavity Features

Cavity features specify the various points along the vocal tract where the modification of airstream is involved in sounds production processes. They are places of articulation features in consonants whereas in vowels they are tongue-body features.
These include for instance; [coronal], [labial], [Round], [Back], [High], [Low], and [Advanced Tongue Root] or [ATR].

[± Anterior]
Anterior sounds are produced with an obstruction that is located in front of the alveo-palatal region of the mouth and non-anterior sounds are produced without such an obstruction (Chomsky & Halle, 1968 cited in Hyman 1975: p48). Anterior sounds in the case of Nankarɛ are, [p, b, m, ŋ, ŋm, kp, gb, f, v] called Labials and [t, d, n, s, z, r, l] also being alveolar products. The [-Anterior] feature refers to those sounds produced with obstruction behind the alveo-palatal region. The remaining consonants in Nankarɛ are therefore [-Anterior].

[±Coronal]
Coronal sounds are produced with the blade of the tongue raised from its neutral position whereas [-coronal] sounds are produced with the blade of the tongue in the neutral position (Chomsky & Halle, 1968 cited in Hyman, 1975: p48 and Kanlik-pare, 1994:21). What this means is that, the tongue is a non-active articulator in non-coronal sounds production. [+coronal] consonants in Nankarɛ are as follows; [d, t, z, s, ʤ, ʧ, n, r, l]. Any other segment in Nankarɛ is [-coronal].

[± Labial]/[± Round]
[Labial] and [Round] sounds have common characteristic with varying degree of lips configuration (Akanlig-pare, 1994: p22). According to Abakah (2003:p34) labials are 'segments whose articulations involve a constriction formed by the lips as the active articulators. Labial and labiodental consonants as well as rounded vowels are classified as [+labial]'. The rounded segments are produced with a protrusion of the lips (Abakah, 1993:p45). Nankarɛ labial consonants include; [b, p, m, v, f, w, gb, kp, ŋm,] and [+round]/ [+Back] are [ɔ, ɔ̃, o, ʊ, ʊ), u, ũ].

3.4.4 Height specification

[+High]
[+High] sounds are produced by raising the body of the tongue towards the roof of the mouth. These segments in Nankarɛ are; [i, ɪ, ʊ, u]. Consonant produced in alveo-palatal and velar region posse [+High] features. These in Nankarɛ are [ʤ, ʧ, g, k, gb, kp, j, ʝ, ŋ, ŋm, w]

[+Low]
[+Low] are vowels that are produced by lowering the tongue below the neutral position. [a] is produced at this level in Nankarɛ. [+Low] consonants are [h, ʔ]

[+ATR]
[+ATR] involves a forward position of the tongue body with concomitant enlargement of the pharynx. [-ATR] are produced with a retracted tongue root Dakubu (1996:p23). This results in two sets of vowels in Nankarɛ;

Example (31) set i. [+ATR] [i, e, o, u]
set ii [-ATR] [ɪ, ɛ, ɔ, ʊ, a]

The feature [+ATR] distinguishes the following vowels in terms of [+High] features, [i, ɪ], [u, ʊ] and [e, ɛ], [o, ɔ]. For example [i, ɪ], [u, ʊ] differ in that the first of each pair is [+ATR] while the second is [-ATR] even though both pairs in the sets are produced with [+High] tongue configuration. In the same way [e, ɛ], [o, ɔ] are different because the first of each pair is [+ATR] while the second is [-ATR] even though both pairs in the sets are [-Low,-High].

3.5. Manner Features

Manner features describe the carvity that resulted as active and passive articulators that interact to modify the airstream during the production of sounds. The relevant features to describe Nankarɛ sounds and discussed here are; [continuant], [lateral], [nasal], [strident], [long] and [delayed released].

[+continuant]
[+continuant] sounds are those that produced where the flow of airstream past various points of articulation in the vocal tract is not completely blocked. The [-continuant] are the sounds produced where the flow of airstream involved is completely blocked. [+continuant] are [v, f, z, s, l, r, j w] while [-continuant] are also [b, p, d, t, g, k, gb, kp, ʤ, ʧ, m, n, ŋ, ɲ, ŋm]

[+Lateral]
[+Lateral] sounds that have a central tongue contact in the oral cavity with one or both side of the tongue being held away from the roof of the mouth allowing the air to escape there Gussenhoven et al. (2005:p65). One of such found in Nankarɛ is [l].

[+Nasal]
[+Nasal] are produced with the velum lowered to allow air escape through the nose and [-nasal] sounds are produced with the velum raised so that air from the lungs can escape through the mouth. Nankarɛ has the following such sounds; [m, n, ŋ, ŋm, ɲ].

[+Strident]
Gussenhoven et al (2005:p64) remarks that, 'a [+strident] is relevant for obstruents only, and refer to a type of friction. They cause greater noise than non-stridents'. In Nankarɛ, they differentiate the sibilants [z, s, ʤ, ʧ,] and labiodentals [v, f] from all other consonants.

[+Long]
[+Long] feature refers to sound duration. Citing Chomsky & Halle (1968), Akanlig-pare (1994:p31) said, '[+Long] feature is regarded as an accidental attribute of the feature [Tense]'. [+Tense] vowels are also long. There is no doubt that long vowels are contrastive in Nankarɛ and therefore cannot be accidental. Nankarɛ distinguishes between phonological long vowels /v:/ and phonological short vowels/v/. All the vowels in Nankarɛ have their long counterparts.

[+Delayed released]
[+Delayed released] this feature according to Akanlig-pare (1994) distinguishes stops from affricates. While stops are released instantaneously with much less or no turbulence, affricates are released gradually with turbulence generated in the vocal tract. The feature is describing [ʤ] and [ʧ] consonants in Nankarɛ.

3.6. Phonological Rules (P-rule)

Phonological rules (P-rules) are components of generative grammar that transforms underlyingly representation of an utterance to phonetic representation by ascribing predictable phonetic features. I would therefore use P-rules to describe alternation that a morpheme undergoes in certain unique environments.
In Nankarɛ for instance, one can describe a negative formation either morphologically or phonologically. Morphologically, the situations is presented with possible alternations as seen below: Example (32)

/m/ in the context before	/b/ as in /káN-bɔ∃ʔ/	[kámbɔ∃ʔ]	'don't give',
	/p/ as in /káN-páɛ/	[kámpáɛ]	'don't reach',
	/m/ as in /káN-mùm/	[kámmùm]	'don't close'.
/n/ in the context before	/d/ as in /káN-dì /	[kándì]	'don't eat',

	/t/ as in /káN-tú /	[kántú]	'don't dig'
	/s/ as in /káN-sɛ /	[kánsɛ∃]	'don't cut'
/ŋ/ in the context before	/g/ as in /kaN-goʔe/	[kaŋgoʔe]	'don't pluck'
	/k/ as in /káN-kʊ /	[káŋkʊ≅]	'don't kill'

Phonologically however, phonetic or distinctive features can be formulated to capture the various alternations as in rule (P_1)

$$[+\text{nasal}] \rightarrow \begin{bmatrix} \alpha\text{Labial} \\ \beta\text{Coronal} \\ \text{ɤ Dorsal} \end{bmatrix} / \_ \begin{bmatrix} \alpha\text{Labial} \\ \beta\text{Coronal} \\ \text{ɤ Dorsal} \end{bmatrix}$$

This statement means that a nasal consonant sound that precedes a consonant agrees in terms of place of articulation features of that consonant sound. When feature specification agrees with that of the surrounding segments a rule is obeyed to trigger the agreement leading to assimilatory process.

Phonological Rules may also involve in inserting entire segments completely different from the underlying representation. For example, a palatal glide /j/ is inserted between a VV sequence of CVV stem if especially V_1 is specified as [+high, -Back] and V_2 is [+low]. There is also a rule that deletes entire segments from the underlying representations. Nankarɛ in general, if a word final vowel is followed by another word that starts with a vowel in the same breath ground, one of the vowels is deleted.

3.6.1 Assimilatory Processes

Assimilation is a process in which changes of features of consonants or vowels occur by the influence of the sounds of segments over others during articulation. Lord (1974:p147) cited in Abakah (1996:p98) maintain that assimilation is ... 'a change of sound of a consonant or a vowel brought about by the influence of neighbouring, usually adjacent consonant or a vowel.

3.6.2 Vowel Assimilates Vowel Features

This is a process in which changes of features of vowel segment occurs by the influence of adjacent vowel segments in articulation. This type of assimilation is Vowel Harmony.

3.6.2.1 Vowel Harmony

Vowel Harmony (VH) is one of the assimilatory processes that is found in Nankarɛ. It could either be contiguous or non-contiguous. The domain of (VH) operation is in the root and its margin(s) but sometimes can spread across a word boundary in derivative affixation cases. It is the cross-height type that occurs in Nankarɛ. Those vowels that are produced when the pharynx is expanded eg; i, u, e, o [+ATR]. Those produced with the pharynx not expanded eg; ɪ, ʊ, ɛ, ɔ, a are [-ATR]. Exception /a/, the vowels are strictly drawn from one set in a simple foot. ATR Harmony in simple stem is by default but spreads either to or from suffixes in disyllabic, trisyllabic, polysyllabic stem and across morphemes in derivational cases. Some of these would be discussed.

ATR Harmony within simple Stem

33a.	stem +suffix	Gloss	**b.**	stem +suffix	Gloss
	#yu + e# [jue]	'delay'		#yʊ + ɛ# [jʊɛ]	'pour out'
	#si + e# [sie]	'shave'		#sɪ + ɛ# [sɪɛ]	'unskin'
	#zo + e# [zoe]	'wean'		#zɔ + ɛ# [zɔɛ]	'cross over
	#lu + a# [lua]	'falling'		#tʊ + a# [tʊa]	'bitterness'

The data above has demonstrated vowels drawing from one set. Indeed all the vowels, stem and suffix in (a) are exclusively [+ATR] while (b) are also exclusively [-ATR]. It is already explained that /**a**/ can occur with either [+ATR] or [-ATR] in a simple word. It is evident in (a) and (b) that notwithstanding the stem vowel *[u]* it has taken [-ATR] suffix. The simple stem vowel distribution was by default (Dakubu, 1996). A careful observation reveals that, the vowels of each word except */lua/* are from the same set. The occurrences of the post-nucleus margin depended on which set the nucleus vowel belongs to.

3.6.2.2 **Derived Nouns from Verbs**

According Nsoh (1997: p85), nouns are derived from verbs by adding suffixes to verb stems. The type of suffix depends on the verb structure. The suffix vowel finally determines the verb stem vowel. In disyllabic condition, vowels of different qualities induce influences through spreading of features to effect changes as the case below (34a&b).

(34 a.) **ATR Harmony in disyllabic stem+suffix**

i.	yee	[je:]	'to recover '	**ii.**	yɛɛra	[jɛ́:ra]	'recovering'
	pee	[pe:]	'to wash'		pɛɛra	[pɛ́:ra]	'washer'
	tee	[te:]	'to change'		tɛɛra	[tɛ:ra]	'changer'
	wee	[we:]	'to remain'		wɛɛra	[wɛ:ra]	'the one remain'

1ai. VH tier: [+ATR]
Segmental tier: #je + e# 'to recover'
stem + suff

ii. [+ATR] [-ATR]
#je: + ra# 'to recover'
stem +suff

b. Map, VH tier: [+ATR]
Segmental tier: #je + e# 'to recover'

[+ATR] [-ATR]
#je: + ra# 'recovering'

c. Spread VH tier:[+ATR]
Segmental tier: #je + e# 'to recover'

[+ATR][-ATR]
#je: + ra# 'recovering'

d. Derived VH tier: [+ATR]
Segmental tier: #je + e# 'to recover'
yee [je:]'to recover '

[-ATR]
#jɛ: + ra# 'recovering'
yɛɛra [jɛ́:ra]'recovering'

The stem vowel *[e]* in data (1ai) maps to [+ATR]. It spreads by default in (c) to its suffix to get *[e]* and finally derive *[jee]* in (d). This shows evidence of perseverative or progressive (left-to-right) spread in Nankarɛ simple morpheme.

In the derivational morpheme, as in (1aii) the stem vowel *[e]* maps to [+ATR] and the suffix vowel *[a]*also maps to [-ATR]. The stem vowel in this case could not spread to the suffix vowel *[a]*. Rather the suffix vowel *[a]*spreads [-ATR] features to the stem vowel *[e]* to delete [+ATR] features of *[e]* at (c). This was by the principle of No-Crossing of Association Lines where in Odden (1996:p456) opinion, violation of this conditions is repaired in the simplest way possible by insertion or deletion of association lines. This then gives us a regressive or anticipatory assimilation (right -to -left,) spread. The *[a]* [-ATR] features changes *[e]* → *[ɛ]*in derivational nouns to become /jɛɛra/.

For further clarification, we are considering polysyllabic word as seen below in example (2)

(34b)[αATR] **Spread by [-ATR] Suffix in polysyllabic Stems**

2ai. VH tier: i [+ATR] ii [+ATR] [-ATR]
Segmental tier: #bele + ge# 'to persuade' #belege + ra# 'persuading'
Stem +suff Stem +suff

b. Map, VH tier: [+ATR] [+ATR][-ATR]
Segmental tier: #bele + ge# 'to persuade' #belege + ra# 'persuading'

c. Spread, VH tier: [+ATR] [+ATR][-ATR]
Segmental tier: #bele + ge# 'to persuade' #belege + ra# 'persuading'

d. Derived, VH tier:[+ATR] [-ATR]
Segmental tier: #bele + ge# 'to persuade' #bɛlɪgɪ +ra# 'persuading'
belege [belege] 'persuade' bɛlɪgɪra [bɛlɪgɪra]'persuading'

The stem vowel *[e]* in data (2ai) as usual, maps to [+ATR]. It spreads in (c) to its suffix vowel *[e]* to finally derive at *[belege]* in (d). This shows the usual perseverative or progressive (left-to-right) spread this time not in monosyllabic but polysyllabic morpheme.

In the derivational morpheme in (2ii) the stem vowel *[e]* maps to [+ATR] and the suffix vowel *[a]*also maps to [-ATR] as we witnessed in (1aii). The stem vowel could not also spread to the suffix vowel *[a]*. Rather the suffix vowel *[a]*spreads [-ATR] features to *[e]* in the stem to delete [+ATR] features of *[e]* at (c) to repaired the violated conditions of the principle of No-Crossing of Association Lines (Odden, 1996:p456). This then gives us a regressive or anticipatory assimilation (right -to -left,) spread. The active [-ATR] *[a]* feature spreads to /e/ in derivational morpheme to acquire /ɛ or ɪ/ features to become *[bɛlɪgɪra]*. In Nankarɛ, the active segmental feature determines the direction of spread in disyllabic, polysyllabic and across morphemes. In conclusion, the occurrences of the post-nucleus margin in the dialect depended not on which set the nucleus vowel belongs to, but the vice visa. This is generalised as below.

P2 [+ATR]→[-ATR]/_ [-ATR]

The statement means a [-ATR] syllabic is realised in the context of [+ATR] preceding it.

In Nankarɛ, assimilation across word boundary is pervasive and this has been demonstrated below.

Example (35) **Assimilation Across Word # Boundary**.

[+High][+Low] [+High][+Low]
1ai. Segmental tier: #ti # a # yeti# ii. #a # yeti # ya#
'and 3PS said...' '3PS said that,'

b. Map, VH tier: [+High][+Low] [+High][+Low]
Segmental tier: #ti # a # yeti# #a # yeti # ya#

c. Spread, VH tier: [+High][+Low] [+High][+Low]

Segmental tier: #ti # a # yeti# #a # yeti # ya#

d. Derived VH tier: [+Low] [+Low]

#ta # a # yeti# #a # yeta # ya#

'and 3PS said...' '3PS said that,'

'ta yeti' [ta jeti] 'and he said' 'a yeta' [a jeta]'he said that'

The stem vowel *[i]* of the preceding word maps to *[+High]* and the stem vowel *[a]* of the subsequent word also maps to *[+Low]* in both (1ai & ii) respectively. The preceding word vowel could not spread to the subsequent word vowel *[a]*. Rather the subsequent word vowel *[a]*spreads *[+Low]* features to *[i]* in the preceding word to delete *[+High]* features at (c) to repaired the violated conditions of the principle of No-Crossing of Association Lines (Odden, 1996:p456). This again gives us a (right -to -left,) spread. The active *[+Low]* features of *[a]* exhibited regressive or anticipatory to effect a total assimilation of *[i]* in the preceding word to become *[ta jeti]* and *[a jeta]* respectively. In Nankarɛ, [+high] vowel is deleted when it precedes a [-high] vowel. This is generalised as below.

P3 [+high] →CVø/ — [-high]

The statement means that a high vocalic segment deletes in the environment it precedes a low vowel segment.

4.6.3 **Nasalised Vowels**

A nasal vowel is underlyingly specified for nasality and occurs in phonological representation (Abakah, 2003:p60). Nasal segments are inherently phonological and exhibits phonemic properties. In a situation where an oral segment acquires nasal features based on the environment is nasalized and only exhibits phonetic without phonemic properties. There are two types of nasalisation: the homorganic nasal and the nasalisation of oral vowels and other oral sounds (Yul-Ifode, 1999:p146) cited in (Akpan, 2006). Nankarɛ exhibits unidirectional and bidirectional Nasalisation but we will look at the latter.

(36) Nasalisation: Bidirectional Assimilation

1ai VH tier [+Nasal] ii [+Nasal]

Segmental tier #e□ɛ# 'do' #i□a# 'body'

b. Map, VH tier: [+Nasal] [+Nasal]

Segmental tier: #e□ɛ# 'do' #i□a# 'body'

c. Spread VH tier: [+Nasal] [+Nasal]

Segmental tier: #e□ɛ# 'do' #i□a# 'body'

d. Derived VH tier [+Nasal] [+Nasal]

#ĩ□ɛ̃# 'do' #ĩ□ã# 'body'

eŋɛ[ĩŋɛ)] 'do' iŋa[ĩŋã] 'body'

This data in particular is bidirectional involving nasal consonant either in the word (preceding or succeeding) the oral vowel. There is a complete contiguous assimilation.

4.6.3.1 Homorganic Nasal Assimilation

Homorganic nasal assimilation according to Yul-Ifode (1999:p146) cited in (Akpan 2006: p29) 'is a regressive type of assimilation, which assimilates a nasal consonant to the place of articulation feature with the conditioning sound. In Nankarɛ, labialisation and palatalization which is consonant assimilating vowel features and consonant assimilating consonant features with vowel assimilating vowel features is evident but we will not tackle the former for lack of space. Let us look at assimilation of consonant feature by consonant in compounding below;

(37)Assimilation of Consonant Feature by Consonant

1ai Place tier: [+Dorsal][+Labial] ii [+Dorsal][+Labial]
Segmental tier #ataŋ# pɔka# #ataŋ# bi:re#
'a name' 'woman' 'a name' 'small'

b. Map, Place tier: [+Dorsal][+Labial] [+Dorsal][+Labial]
Segmental tier: #ataŋ# pɔka# #ataŋ# bi:re#
'a name' 'woman' 'a name' 'small'

c. Spread Place tier: [+Dorsal][+Labial] [+Dorsal][+Labial]
Segmental tier: #ataŋ # pɔka# #ataŋ# bi:re#
'a name' 'woman' 'a name' 'small'

d. Derived Place tier: [+Labial] [+Labial]
#atam# pɔka# #atam# bi:re#
[atampɔka] [atambi:re]
'a Woman's name' 'a man's name'

The processes in data (54) can be captured in the phonological rule below.

P4 $\begin{bmatrix} +\text{Con} \\ +\text{Nasal} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha\text{Place} \end{bmatrix} / \_\_\_\_ \begin{bmatrix} \alpha\text{Place} \end{bmatrix}$

This statement means that a nasal consonant is realized with the same place of articulation of the consonant it precedes.

Conclusion

The study sought to establish phonological processes in Nankarɛ and account for constraints identified. Some of phonological processes identified and accounted for in this paper are some assimilatory processes involving [αATR] Harmony in monosyllabic, disyllabic and across morpheme boundary.

i. All consonants except [r] were found to occur in word positions especially the initial position.
ii. Only the bilabial nasal consonant /m/ could end a Nankarɛ word.
iii. Equally established findings are [r] and /d/ playing complementary distributive roles during compound words formation
iv. While /g/ and /ɣ/, /k/ and /g/ being free variance.
v. Also found was /n/ do not precede /e/ /ɛ/ /o/ in word initial position and never precedes /ʊ/ at all.
vi. /f/ and /s/ preceding back/front vowel respectfully become /h/.

vii. /gb/ and /kp/ precede only [-Back] vowels in the dialect.
viii. It is evident from data that, Navrongo Nankarɛ, when voiceless velar plosive *[k]* precedes the [-Back] vowel, it is palatalised.
ix. It is further clear that, the voiced velar plosive [g] is palatalised when preceding [-Back] vowel.
x. In addition, the voiceless alveolar fricative [s] palatalised when preceding [αBack] vowel.
xi. And yet again, the voiced fricative [z] is palatalised when preceding [αBack] vowel.
xii. The dominant ATR harmony in Nankarɛ is in detailed.
xiii. Cross high vowel harmony was in dominant operation
xiv. Vowel harmony is seen across word boundaries

Below are some generalisations;

P1 $[+\text{nasal}] \rightarrow \begin{bmatrix} \alpha\text{Labial} \\ \beta\text{Coronal} \\ \text{ɣ Dorsal} \end{bmatrix} / \_ \begin{bmatrix} \alpha\text{Labial} \\ \beta\text{Coronal} \\ \text{ɣ Dorsal} \end{bmatrix}$

P2 [+ATR] →[-ATR]/_ [-ATR]

P3 [+High] →CVø/ — [-High]

P4 $\begin{bmatrix} +\text{Con} \\ +\text{Nasal} \end{bmatrix} \longrightarrow \begin{bmatrix} \alpha\text{Place} \end{bmatrix} / \underline{\quad} \begin{bmatrix} \alpha\text{Place} \end{bmatrix}$

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