The vowel system of Ndam

James Roberts ⓘD
SIL International
james_s_roberts@sil.org

Recommended citation:
Roberts, James. 2025. The vowel system of Ndam. *Afrika und Übersee* 98. 63–80.

The vowel system of Ndam

James Roberts

SIL Chad

james_s_roberts@sil.org

Abstract

Ndam (Eastern Chadic, ISO [ndm]) displays an array of seven or nine surface vowels. However, the distribution and behavior of these vowels, as evidenced from morphophonemic data, shows that the inventory can be reduced to two basic vowels, /ə/ and /a/, if the operation of two prosodies is also admitted. These prosodies, labialization and palatalization, are distinctive units in the phonology of the language, as well as the two basic vowels; together, they account for the full range of surface vowels and their alternations, as shown in this article. The prosodic analysis, a hallmark of the analysis of Central Chadic languages, provides another example of an Eastern Chadic language which exploits prosodies in its phonology (see Roberts 2009). The article concludes by claiming that Chadic vowel systems are all rectangular, with a fundamental dichotomy between high and non-high vowels. The conclusion also warns of the dangers of confusing the two vowels [ɨ] and [ə] in the transcription of Chadic languages.

Keywords: Eastern Chadic, prosodies, palatalization, labialization

1 Introduction

The nature of the underlying vowel systems of Chadic languages has been under scrutiny for a long time. Despite a plethora of surface vowels, numbering as many as eight, nine, or more, most analysts have found it possible and desirable to reduce the number of underlying vowels in these languages to a bare minimum, and in the most extreme case, to a single underlying vowel /a/. Most recently, Wolff (2024, forthcoming) has proposed that the underlying vowel system of Proto-Chadic was indeed of such a minimal nature, and that a set of prosodies was responsible for producing the array of surface vowels in present-day Chadic languages. Synchronic analyses

of this sort have become commonplace for languages of the Central
Chadic branch (Wolff 1981, Barreteau 1987, Roberts 2001, etc.), but
such approaches have not been at all consensual for the Western,
Eastern, and Masa branches of the family. Eastern Chadic languages
of the Guéra group, for example, almost all display robust "classic"
five-vowel systems which are reckoned to be typologically the most
common vowel systems around the world (Maddieson 1984). None-
theless, Roberts (2025) has pointed out vestiges of a minimal vowel
system in a few of these Chadic languages: Somrai, Kabalay, Gabri
from the Eastern branch, and Herdé (Zimé Pala) from the Masa
branch. The present article adduces evidence for a minimal vowel
system in Ndam, another Eastern Chadic language, and proposes an
integrated perspective for the vowel systems of all Chadic languages.

2 Surface phonology of Ndam

Ndam (ISO [ndm]) is spoken in the East Tandjilé region of Chad,
on the south bank of the Chari river, by at least 10.000 speakers. It
has been classified in the Chari-Logone branch (group A of Newman
2013) of the Eastern Chadic family, and has not received much atten-
tion from linguists. One simple monograph by Michael Broß exists
for the Dik dialect, dating from 1988. More recently, a missionary-
linguist William Cray has produced a limited amount of data and
field notes on the language (2012a, 2012b). I was also privileged to
work briefly with a team of four Ndam speakers in 2021 and 2022[1]
in order to hammer out a practical writing system for the language.
Several hundred words and a few morphological paradigms were col-
lected, and two stories were recorded and transcribed. Such are the
data on which the present analysis is based.

An initial surface inventory of the consonants[2] of the language
can be presented as in (1), and that of the vowels in (2). Segments in
parentheses are clearly non-phonemic.

---

1 On both occasions, we worked in the compound of the Association Tcha-
dienne d'Alphabétisation, Linguistique et Traduction de la Bible in Moundou, Chad.
The four Ndam speakers were Abderamane Kadi Djimet, Ahmat Saleh, Nadjara Sab-
our, and Younous Saleh.

2 Transcriptions in this article follow the conventions of the International Pho-
netic Alphabet (IPA), with two exceptions: [j] represents the palatal plosive/affricate,
and [y] the palatal glide.

(1)　　p　　t　　c　　k　　(ʔ)　　　　(2)　　i　　ɨ　　u

　　　　b　　d　　j　　g　　　　　　　　　　　e　　ə　　o

　　　　ɓ　　ɗ　　ʄ　　　　　　　　　　　　　　　a

　　　　　　s　　(ʃ)　　　h

　　　　m　　n　　ɲ　　ŋ

　　　　　　l

　　　　　　r

　　　w　　　　y

The four native speakers of the language that I worked with reckon that each of these seven vowels needs to be retained in a practical alphabet for the language. In addition to these simple vowels, there are two diphthongs which occur with some regularity in the various transcriptions: [ya]/[ye] and [wa]. It may be worth noting that Boyeldieu (1985), in his analysis of the neighboring Niger-Congo language Niellim, posits these same two diphthongs as unit vowels; they also occur in another neighboring language, the isolate Laal, where Lionnet (forthcoming) again treats them as units. In any case, these diphthongs will prove to function on a par with the simple vowels in Ndam, so I add them to the vowel chart, shown in (3):

(3)　　i　　ɨ　　u

　　　　e　　ə　　o

　　　ya　　a　　wa

Vowel length is probably not distinctive in Ndam. In each of my three data sources (Broß 1988; Cray 2012a, 2012b; and my own research), there is a very limited number of lexemes transcribed with a long vowel, but that vowel is always [aa]. Further research will be needed to determine the exact status of such occurrences.

In addition, I note that there are a number of discrepancies in the transcription of certain vowel qualities across the three sources of my data, and an attempt to reconcile them constitutes a significant part of the present analysis. Specifically, these inconsistencies are in

the variation between [ɨ] and [ə], and also between [i] and [ɨ], and finally between [e] and [ə], shown graphically in (4):

(4)   i ⟷ ɨ   u

              e ⟷ ə   o

              ya   a   wa
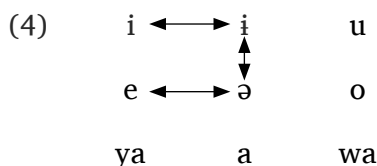
Apart from any discrepancies in transcription, though, there are several phonetic influences that pull a vowel's quality in different directions. The front vowels [i] and [e], for example, tend to centralize to [ɨ] and [ə], respectively, when they occur in closed syllables; examples of this are shown in (5).

(5)   *ɓɨg* 'to pour', *ɨs* 'to cover', *kɨl* 'belly'
       ɗəs 'to sneeze', *pəl* 'to breathe', *əg* 'to pound'

In fact, the closed (C)VC structure is the most common for Ndam lexemes. As a result, the front vowels may only retain their front position phonetically in open syllables, especially at the end of a word, shown in (6).

(6)   *pi* 'to marry', *ni* 'to fail', *li.gər* 'to roll up'
       ce 'to cut', *pe* 'to measure', *ma.le* 'to weed'

A counterbalance to the centralizing influence seen in the closed structures of (5) is the fronting influence of the palatal consonants [c, j, ʄ, ɲ, y]. These consonants occur more frequently next to front vowels [i] and [e] than to central vowels [ɨ] and [ə]. The palatals more commonly act regressively to affect a preceding vowel (rather than a following vowel), as we see in (7).

(7)   *piye* 'to pour', *ɓireɲ* 'to break the neck', *dijim* 'to suck'

In contrast, the back vowels do not undergo phonetic influences, as a rule. Nonetheless, there is one interesting effect: the labial-velar glide [w] is never followed by the central vowel [ɨ]. In some cases it is clear that what should have been the vowel [ɨ] has been rounded by [w] to [u], as in (8):

(8)   *wɨra* → [wura] 'walked (PST)'

3 Evidence from morphophonemic alternations

Despite the potential confusion produced by all these influences, it is possible to determine the actual identity of each vowel and its relationship to the others when one considers the behavior of Ndam vowels in regular morpho-phonological alternations, of the sort that Jungraithmayr (1977) would call apophony. In my data, there are two cases of morpho-phonological alternation that are particularly helpful, one from the nominal system, and the other from the verb system. Both sets of morpho-phonological data show the same vowel alternations.

The markers of inalienable possession are suffixed directly onto the noun root, and display nine distinctions of person, in common with most Eastern Chadic languages. The paradigms of Table 1 show that the vowel [a] of the noun root changes to [ɨ] when the possessive suffixes are added:

Table 1. Inalienable possessive forms of Ndam nouns with /a/

	bad	'hand'	*dagɨl*	'foot'
1sm	*bɨd-an*	'my hand'	*digil-an*	'my foot'
2sm	*bɨd-am*	'your (m.) hand'	*digil-am*	'your (m.) foot'
2sf	*bɨd-ay*	'your (f.) hand'	*digil-ay*	'your (f.) foot'
3sm	*bɨd-aw*	'his hand'	*digil-aw*	'his foot'
3sf	*bɨd-at*	'her hand'	*digil-at*	'her foot'
1ex	*bɨd-anu*	'our (ex.) hand'	*digil-anu*	'our (ex.) foot'
1in	*bɨd-anan*	'our (in.) hand'	*digil-anan*	'our (in.) foot'
2pl	*bɨd-aɲen*	'your (pl.) hand'	*digil-aɲen*	'your (pl.) foot'
3pl	*bɨd-ak*	'their hand'	*digil-ak*	'their foot'

The second example of vowel alternation comes from the verb system. Verbs in Ndam display a modest amount of morphology, principally achieved through suffixation. The citation form of the verb is its base, used directly as the nominal "infinitive" form, or else as a conjugated form which is unmarked for tense and aspect. In common with all Eastern Chadic languages, each Ndam verb has just one lexical vowel; Frajzyngier (1983: 125) takes the same position. Inflected forms involve suffixation onto the base, and in certain cases, a change in the root vowel accompanies the addition of a suffix. This is the case of the past tense form, which is compared with the base

form in Table 2: in the past, the suffix *-a* is added to the base, but the lexical vowel [a] is also changed to [ɨ]:

Table 2. Base form and past form of verbs with vowel [a]

Base form of verb	Past form of verb
kal 'see'	*(ɨn) kɨl-a* '(I) saw'
gad 'scratch'	*(ɨn) gɨd-a* '(I) scratched'

This alternation of [a] with [ɨ] is identical to the alternation observed in Table 1. In the rest of this paper I will examine principally the verb data such as that in Table 2, and most notably verbs of structure CVC, the most common lexeme shape in the language.

The next alternations concern the two other central vowels of (4). The verbs of Table 3 have [ɨ] in their base form, and those in Table 4 have base vowel [ə].

Table 3. Base form and past form of verbs with vowel [ɨ]

Base form of verb	Past form of verb
gɨd 'bite'	*gɨd-ə*
lɨm 'braid'	*lɨm-ə*

Table 4. Base form and past form of verbs with vowel [ə]

Base form of verb	Past form of verb
məg 'bury'	*mɨg-ə*
ɓəm 'damage'	*ɓɨm-ə*

In both data sets in Tables 3 and 4, the past form again has the high vowel [ɨ] in the root, and the suffix consistently has the mid vowel [ə], rather than the low vowel [a] seen in Table 2. I noted earlier that it is not easy to see whether the central vowels seen on the surface in Table 3 and 4 are the same as the underlying vowels of these verbs, because of the centralizing influence of the closed syllable structure CVC in these lexemes. Before concluding anything on that score, let us continue our examination of the other vowels that occur in verbs.

Tables 5 and 6 show the behavior of the front vowels [i] and [e] in the base form, respectively:

Table 5. Base form and past form of verbs with vowel [i]

Base form of verb	Past form of verb
yig 'accept'	*yig-ə*
ʃir 'tighten'	*ʃir-ə*

Table 6. Base form and past form of verbs with vowel [e]

Base form of verb	Past form of verb
ɲen 'lack'	*ɲin-ə*
ʃed 'tear'	*ʃid-ə*

Once again, the root vowel in the past always appears as a high vowel, here the front vowel /i/. I will claim for the time being that the underlying vowels of these verbs are /i/ and /e/, respectively, and that the initial palatal consonant protects the vowel from any centralizing influence of the closed lexeme structure CVC. As we saw in Tables 3–4, the suffix also takes the shape of the mid vowel [ə].

When we turn our attention to the back vowels, we find a parallel situation. The examples in Table 7 show the behavior of the lexical vowel /u/, and in Table 8 the behavior of /o/.

Table 7. Base form and past form of verbs with vowel [u]

Base form of verb	Past form of verb
wuj 'urinate'	*wuj-o*
gul 'touch'	*gul-o ~ gul-ə*

Table 8. Base form and past form of verbs with vowel [o]

Base form of verb	Past form of verb
rog 'ration'	*rug-o*
ɗol 'hear'	*ɗul-ə*

As before, the vowel of the verb in the past form is a high vowel, this time the back vowel [u] because the base vowels /u/ and /o/ are likewise back and round. There is some variation in the quality of the suffix vowel; often we find the central vowel [ə] as before, but sometimes it is [o] – at the same height as [ə], but back and round in harmony with the preceding vowel.[3]

Finally, we examine the diphthongs *ya* and *wa* which were added to the vowel chart in (3). Their behavior in the verb paradigm is very interesting, and confirms their place in the vowel system. Consider Tables 9[4] and 10:

---

3 In the neighboring language Mulgi, the past suffix is also subject to rounding assimilation (Maria Gustafsson, p.c.), but in that language there is no variation; the vowel is always the back round [o].

4 It should be noted that words with the diphthong [ya] (variant [ye]) are not nearly as frequent as words with the common diphthong [wa].

Table 9. Base form and past form of verbs with vowel [ya]

Base form of verb	Past form of verb
lyag 'be equal'	*lig-a*
kyad 'scrape'	*kid-a*

Table 10. Base form and past form of verbs with vowel [wa]

Base form of verb	Past form of verb
jwar 'lose weight'	*jur-a*
ɗwag 'throw'	*ɗug-a*

In the past form, we find a simple high vowel of the same quality as the glide element in the diphthong, and the suffix vowel is once again /a/. This alternation confirms my earlier assertion that the diphthong behaves as a single vowel, since it corresponds to a simple short vowel in the past form.

To further support the treatment of the two diphthongs as units, we return to the forms for inalienable possession in the nominal system. In Tables 11 and 12 we see the same alternations as in Tables 9 and 10.

Table 11. Alternation of [ya/ye] with [i] in nouns

Noun	my …	Gloss
dyer	*dir-an*	'arm'
kya-[5]	*kir-an*	'grandmother'

Table 12. Alternation of [wa] with [u] in nouns

Noun	my …	Gloss
kwad	*kud-an*	'neck'
pwag	*pug-an*	'shoulder'

---

  5 This example, taken from Broß (1988: 82), is evidently a bound root, and is somewhat irregular; nonetheless, the behavior of its root vowel conforms exactly to the patterns established here. The fact that affixation directly onto a noun is limited to inalienable possession (Cray 2006: 8), along with the reduced frequency of the diphthong [ya/ye], explains why there are not a lot of examples of vowel alternation to draw from in the nominal system.

4 Operation of prosodies

How, then, are these vowel alternations observed in the verbal paradigm to be analyzed? Do we allow all nine vowels of (3) as underlying vowels for the language? And how do we best account for the very regular patterns of vowel alternations in the past forms of the verb? I begin by examining that past form.

First, I propose that the suffix vowel in the past form is indeed an underlying /ə/, the quality that we observe in the vast majority of those forms. The suffix vowel shows up as [-a] only when the vowel of the verb root is [a] or a diphthong involving [a].

Secondly, it is important to note that the vowel found in the past form of the verb root is always a high vowel, whether [ɨ] or [i] or [u]. And the specific quality of this high vowel always corresponds to the horizontal position of the vowel in the base form of the verb: [ɨ] when the base vowel is [ɨ], [ə], or [a]; [i] when the base vowel is [i], [e], or [ya]; and [u] when the base vowel is [u], [o], or [wa]. So the quality of the vowel of the stem in the past form is always predictable, and there is no longer anything distinctive about its quality. For this reason I claim that in the past form, the verb's underlying vowel has simply been deleted, and is filled in on the surface with an epenthetic high vowel of the appropriate quality.

If that be the case, then, how do we ensure that the proper front or back quality of the vowel is achieved in the surface form of the past? Consider the example of (9), repeated from Table 8. The morphological process of past formation will add the suffix |-ə| and delete the root vowel [o]. But if the root vowel disappears, there is no means of determining the backness of the epenthetic high vowel that is supplied in the surface form.

(9) Base form   Past formation   Surface form
     ɗ o l →   ɗ Ø l - ə →   [ɗɨlə]? [ɗilə]? [ɗulə]?

This situation leads us to propose that the base vowel [o] of (9) is composed of at least two features:

(a) a feature of height (mid-ness in the case of [o]), and
(b) a feature of backness and roundness, which I will call LABIALIZATION (or simply LAB).

When the vowel of the verb is deleted, then, it is only its height feature that is deleted. In (9) the labialization feature remains, and that

feature is what ensures that the epenthetic vowel supplied in the past form is [u], so that the correct form [ɗulə] will be obtained. In parallel fashion, front vowels such as [i], [e], and [ya] are characterized by a feature of PALATALIZATION (abbreviated PAL), in addition to the feature that specifies their height. The derivations of Table 13 show a revised conception of the process, and the quality of the epenthetic vowel in the past form is correctly specified.

Table 13. Derivations of past form of verbs containing PAL and LAB

Base form		Past formation		Surface form
s ᴾᴬᴸe ɗ	→	s ᴾᴬᴸØ ɗ - ə	→	[ʃidə]
ɗ ᴸᴬᴮo l	→	ɗ ᴸᴬᴮØ l - ə	→	[ɗulə]

I point out here that the two features PAL and LAB are the same as the prosodies that have been posited in the analysis of numerous Chadic languages (Wolff 1981, Barreteau 1987, Roberts 2001), in particular for languages of the Central branch. Roberts (2009, 2025) also shows that they also operate in a limited way in some Eastern Chadic languages. The present analysis shows that Ndam can be added to the list of languages that rely on prosodies in the operation of their vowel system. A prosody in Chadic languages is a distinctive suprasegmental feature which associates to certain morphemes as a whole. The realization of the prosody varies widely from language to language, according to language-specific rules (Roberts 2001). In some languages, the prosody spreads to most or all syllables of the word, and often starts from a specific docking point. In others, the effect of the prosody does not usually extend beyond a single syllable, as in Mawa (Roberts 2009). In any case, though, no more than one instance of the prosody is allowed per morpheme. For Ndam, I will assume that the domain of PAL and LAB is the whole word, although their principal effect is on the vowel of the first syllable.[6] In the case of LAB, which seems to be the stronger of the two prosodies, its effect optionally continues beyond the root to round the suffix vowel, as seen in the past tense forms of the verbs in Tables 7 and 8.

Now we turn again to the mid vowels [e] and [o]. I am proposing that each of these is characterized by two principal features, either LAB (in the case of [o]) or PAL (in the case of [e]), and also a feature

---

6 I signal one effect of the PAL prosody on consonants, nonetheless. A lexeme which contains the fricative /s/ and the pal prosody will realize /s/ as its allophone [ʃ], as in [ʃed] the first example of Table 13, or [leʃ] 'to cover', past form [liʃə].

of mid-ness. Without entering into a detailed debate of the feature system that most appropriately characterizes these vowels, I will simply represent "midness" by the central vowel /ə/, which I will henceforth consider to be an underlying vowel of the Ndam system.

The low vowels in the system, as we have presented it, are three: [a], plus the two diphthongs [ya] and [wa]. I now claim that the two diphthongs are simply the realization of the underlying vowel /a/ when associated with the features PAL and LAB, respectively, that we have already argued for in the case of the mid vowels.

As for the three high vowels [i], [ɨ], and [u], I claim that they are not underlying vowels of the system at all, but are rather epenthetic. The consequence of this position is that certain lexemes of the language simply have no vowel at all in their underlying structure. This leads to a rather abstract conception of the vowel system and of the underlying structure of Ndam lexemes, it is true. Nonetheless, this conception allows us to take many regularities and characteristics of the language into a unified account.

A final word is necessary with respect to the suffix vowel of the past form of the verb, which evidently changes to [a] when the root vowel involves the low vowel /a/. One way to account for this vowel is to claim that the vowel [a] carries a feature [+low], which spreads from the stem to the suffix vowel. In the process of past formation, the stem vowel is deleted, but its low height spreads to the suffix. The surface vowel [a] in the past tense forms of [kɨla, gɨda] in Table 2 is simply the realization of the [+low] feature which replaces the mid height of the underlying vowel [ə], and is displayed graphically in Fig. 1.

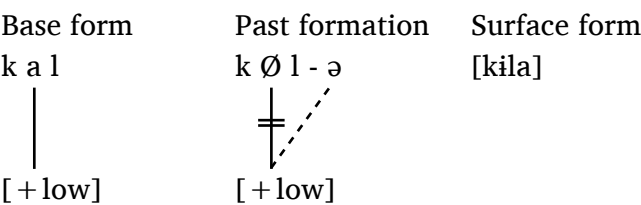| Base form	Past formation	Surface form
k a l	k Ø l - ə	[kɨla]

[+low]   [+low]

Figure 1. Specification of the suffix vowel [a]

Consider now the complete array of the verb paradigms that we have been examining. The first set of verbs, whose derivations are shown in Tables 14 and 15, is the most straightforward and involves no prosodies. The three verbs chosen have each of the three possibilities in the vowel position in the root: no vowel (Ø), /ə/, and /a/. In each

case the abstract underlying form is shown, along with the processes involved to produce the surface form. Table 14 shows the derivation of the base form of each of the verbs; the only phonological process observable here is the epenthesis of the high vowel [ɨ] into the verb that has no underlying vowel.

Table 14. Derivation of the base form of verbs with no prosodies

	Base	Base	Base
Abstract form	g Ø d	m ə g	k a l
Epenthesis	g ɨ d	—	—
Surface form	[gɨd]	[məg]	[kal]
	'bite'	'sneeze'	'see'

The derivation of the past tense forms of these same verbs is shown in Table 15. As indicated before, the past is constructed by adding the suffix -ə, shown in the initial abstract form, and by deleting the stem vowel. Before the stem vowel is deleted, however, verbs with the vowel /a/ cause the suffix vowel to lower. At this point, all three verbs have no vowel in the root, so again the vowel [ɨ] is epenthesized to allow them to be pronounced.

Table 15. Derivation of the past form of verbs with no prosodies

	Past form	Past form	Past form
Abstract form	g Ø d – ə	m ə g – ə	k a l – ə
Lowering	—	—	k a l – a
Deletion	—	m Ø g – ə	k Ø l – a
Epenthesis	g ɨ d – ə	m ɨ g – ə	k ɨ l – a
Surface form	[gɨdə]	[mɨgə]	[kɨla]

The verbs of the second set, shown in Table 16 with the corresponding past forms in Table 17, all have the underlying prosody of labialization, but are otherwise completely parallel to the previous set. The only complexity is the phonetic realization of the prosody as it fuses with the root vowel, creating [u] from [ɨ], [o] from underlying /ə/, and the diphthong [wa] from /a/.

Table 16. Derivation of the base form of verbs with the LAB prosody

	Base	Base	Base
Abstract form	LAB g Ø l	LAB d ə y	LAB ɗ a g
Epenthesis	LAB g ɨ l	—	—
Surface form	[gul]	[doy]	[ɗwag]
	'touch'	'read'	'throw'

Table 17. Derivation of the past form of verbs with the LAB prosody

	Past form	Past form	Past form
Abstract form	LAB g Ø l – ə	LAB d ə y – ə	LAB ɗ a g – ə
Lowering	—	—	LAB ɗ a g – a
Deletion	—	LAB d Ø y – ə	LAB ɗ Ø g – a
Epenthesis	LAB g ɨ l – ə	LAB d ɨ y – ə	LAB ɗ ɨ g – a
Surface form	[gulə]	[duyə]	[ɗuga]

The final set, displayed in Tables 18 and 19, again shows the behavior of the three root vowels /Ø, ə, a/, but this time when the prosody of palatalization is present. This prosody creates [i] from the epenthesized [ɨ], [e] from the mid vowel /ə/, and the diphthong [ya] from /a/.

Table 18. Derivation of the base form of verbs with the PAL prosody

	Base	Base	Base
Abstract form	PAL k Ø n	PAL s ə d	PAL l a g
Epenthesis	PAL k ɨ n		
Surface form	[kin]	[ʃed]	[lyag]
	'release'	'tear'	'be equal'

Table 19. Derivation of the past form of verbs with the PAL prosody

	Past form	Past form	Past form
Abstract form	PAL k Ø n – ə	PAL s ə d – ə	PAL l a g – ə
Lowering	—	—	PAL l a g – a
Deletion	—	PAL s Ø d – ə	PAL l Ø g – a
Epenthesis	PAL k ɨ n – ə	PAL s ɨ d – ə	PAL l ɨ g – a
Surface form	[kinə]	[ʃidə]	[liga]

A more radical analysis of the past tense form is to claim that its suffix vowel is simply an empty V slot, and that the verb's underlying root vowel, either /ə/ or /a/, is transferred to fill that slot before

that vowel is deleted in its position in the stem. Then, as before, to make the word pronounceable, an epenthetic [ɨ] must be inserted, which is further subject to modification by LAB or PAL, if one of those prosodies is present. The complication with this analysis is for verbs which have no vowel to begin with; in those cases there is no vowel to transfer to the suffix V slot. These verbs have a suffix in the past tense form nonetheless, whose quality is [ə]. To follow this analysis, one would have to assume that the quality of this empty vowel is filled with [ə] as a default. This conception is graphically represented in Fig. 2, which shows the derivation of the past tense form of each of the three verbs of Table 15. The absence of a vowel, represented by Ø (where the vowel has been deleted), is filled by the epenthetic [ɨ], and the empty vowel slot, represented by V, is filled by a default [ə] if its quality is not specified in any other way.

Past formation   Past formation   Past formation

g Ø d – V   m V̸ g – V   k V̸ l – V
                        ‡   ‡
                        ə   a

ɨ   ə   ɨ   ɨ
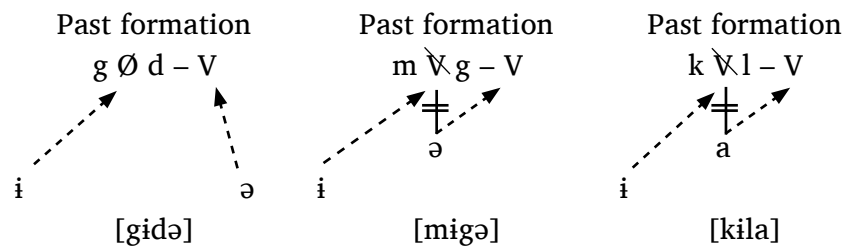
[gɨdə]   [mɨgə]   [kɨla]

Figure 2. Derivation of the past form by transfer of the root V to the suffix

However, because of the complications involved in this latter analysis, I retain the earlier analysis, as presented in Fig. 1 and in the derivations of Tables 14–19.

5 The Ndam vowel system in a wider Chadic perspective

I conclude by summarizing my understanding of the underlying vowel system of Ndam, then considering the implications of this analysis for Chadic vowel systems in general. A final note warns of the dangers of confusing the vowels [ə] and [ɨ] in the transcription of Chadic languages.

5.1   The underlying vowels of Ndam

The result of all the preceding analytic operations leaves us with the following understanding of the underlying vowel system of Ndam, shown in (10):

(10)   LAB   PAL

                ə

                a

There are only two underlying vowels, /ə/ and /a/. The two prosodies LAB and PAL, while not vowels, must also be recognized as distinctive underlying phonological units in the language. Together these basic units can explain the complete range of the nine surface vowels of language, originally presented above in (3). They also make sense of the complex morpho-phonological alternations that we observe in the verbal and nominal systems. I should add that although the paradigms from the possessive nouns are not presented in full in this paper, it can be shown that they follow the same patterns that we have observed in the verb data.

5.2   Vowel height in Chadic languages

The findings in Ndam confirm a generalization about the phonological levels of height that is respected by all Chadic vowel systems. It can be stated that all Chadic systems recognize only two fundamental levels, high and non-high. High vowels are either epenthetic and completely non-phonological, as we have seen in Ndam, or else they are severely limited in their distribution and in their phonological range of operation. This is particularly true of languages which have been analyzed as having /a/ as the only underlying vowel. Non-high vowels, on the other hand, have real phonological status: they are full phonemes, and their behavior is quite distinct from that of the high vowels. In languages like Ndam, we are forced to recognize two levels of non-high vowels, represented by the mid vowel /ə/ and the low vowel /a/, but the basic divide between high and non-high vowels remains. This claim of two fundamental levels of height can be substantiated in numerous Central Chadic languages, but also in a number of Eastern Chadic languages, namely Ndam, Somrai, Mulgi, Mukulu, Migaama, Mubi, and others; see also Wolff forthcoming and Roberts 2025.

    I suspect that the development of a height distinction among the non-high vowels in some Eastern Chadic languages like Ndam may be a relatively recent development. There is evidence that some languages of the Guéra region like Dangaleat and Sokoro, for example, may be starting to phonologize a distinction between [e] and [ɛ] and

between [o] and [ɔ]. Nonetheless, they still keep all of those non-high vowels quite distinct from the high vowels.

All Chadic vowel systems are rectangular in nature, as opposed to Bantu systems, for example, which are normally triangular. The display of (11) shows the basic grid for many languages which clearly need only two levels; this includes many languages of the Guéra group in Eastern Chadic, as well as those of the Masa and Central Chadic branches. The display of (12) is appropriate for those languages which have developed a secondary distinction among the non-high vowels, like Ndam. In both types, however, a strict division is maintained between the high vowels and the non-high vowels, represented by the thick bar between the two levels.

(11)   Vowel system with two height levels

(i)	(ɨ)	(u)
e / ɛ	a	o / ɔ

(12)   Vowel system with three height levels

(i)	(ɨ)	(u)
e	ə	o
i̯a / ɛ	a	u̯a / ɔ

5.3   The ambivalent use of <ǝ>

In closing, I find it necessary to comment on a long-standing tradition in Chadic linguistics, namely the use of the schwa symbol <ǝ> which is often seen in phonetic and phonological transcriptions. In many cases, it is clear that the schwa is intended to represent a high central vowel, which would be [ɨ] according to the IPA. In other cases it is not clear whether the intended vowel is the high [ɨ], or else a mid vowel, which is the approved use of the symbol [ə] according to the IPA. There are numerous languages in the Eastern branch of Chadic languages, like Ndam, in which both the high vowel [ɨ] and the mid vowel [ə] are found on the surface, and the two behave very differently. In these cases we cannot afford to be ambiguous in the use of symbols for transcription. It is possible that earlier researchers could not hear the difference between [ɨ] and [ə], and if that were the case, it would spell disaster for their analysis of languages like

Ndam, where the two vowels both occur, but with radically different statuses: [ə] is a "real" phonemic vowel, whereas [ɨ] is merely epenthetic and non-phonemic. In many Central Chadic languages there is only one non-low central vowel, and one could reckon that the use of the schwa symbol to represent it is tolerable. Nonetheless, even if there is phonetic variation in the realization of the vowel transcribed with <ə>, the essential question, as I note above, is whether the vowel belongs phonologically to the high set, or to the non-high set. I know it is difficult to change long-standing habits, but henceforth I would encourage all Chadicists to adhere as closely as possible to IPA standards in phonetic transcription, in order to avoid any possible confusion.

References

Barreteau, Daniel. 1987. Du vocalisme en tchadique. In Daniel Barreteau (ed.), *Langues et cultures dans le bassin du lac Tchad.* Paris: ORSTOM. 161–191.

Boyeldieu, Pascal. 1985. *La langue lua ("niellim").* Paris: SELAF.

Broß, Michael. 1988. *Materialien zur Sprache der Ndam von Dik (Republik Tschad).* Marburg: Philipps-Universität Marburg Master's thesis.

Cray, William. 2006. *A grammar sketch of Ndam.* N'Djaména: AIM. Ms.

Cray, William. 2012a. *Lexique Dam-Français.* Ms.

Cray, William. 2012b. *Ndam verb inflections.* Ms.

Frajzyngier, Zygmunt. 1983. The underlying form of the verb in Proto-Chadic. In Herrmann Jungraithmayr (ed.), *The Chad languages in the Hamitosemitic Nigritic border area.* 123–143.

Jungraithmayr, Herrmann. 1977. Apophony and grammatical tone in the tense system of Chadic languages. *Afrika und Übersee* 60. 79–82.

Lionnet, Florian. forthcoming. *The phonology of Laal.* Ms.

Maddieson, Ian. 1984. *Patterns of sounds.* Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511753459

Newman, Paul. 2013. The Chadic language family: classification and name index. Mega-Chad Research Network: Electronic publication. https://www.cepam.cnrs.fr/megatchad/publications/Newman-2013-Chadic-Classification-and-Index.pdf

Roberts, James. 2001. Phonological features of Central Chadic languages. In Ngessimo M. Mutaka & Sammy B. Chumbow (eds.), *Research mate*

in African linguistics: Focus on Cameroon. Köln: Rüdiger Köppe Verlag. 93–118.

Roberts, James. 2009. Palatalization and labialization in Mawa (Eastern Chadic). In Eva Rothmaler (ed.), *Topics in Chadic linguistics V: Comparative and descriptive studies*. Köln: Rüdiger Köppe Verlag. 129–140.

Roberts, James. 2025. Palatalization and labialization in the Chadic languages of Chad. *Afrika und Übersee* 98. 41–62.

Wolff, H. Ekkehard. 1981. Vocalisation patterns, prosodies, and Chadic reconstructions. In William Ronald Leben (ed.), *Précis from the Twelfth Conference on African Linguistics*. Los Angeles: Department of Linguistics, UCLA. 144–148.

Wolff, H. Ekkehard. 2024. *Lexical reconstruction in Central Chadic: a comparative study of vowels, consonants and prosodies*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781009346375

Wolff, H. Ekkehard. forthcoming. Typology and evolution of minimal vowel systems in Central Chadic (Afroasiatic). In Natalia Kuznetsova, Cormac Anderson & Shelece Easterday (eds.), *Rarities in phonetics and phonology: evolutionary, structural, typological and social dimensions*. Berlin: Language Science Press.