CHAPTER 5

MORPHOPHONEMICS

5.0 Introduction

Burquest (2001:81) states that "when the sounds of morphemes vary as a result of being adjoined to other morphemes, the pattern is referred to as morphophonemics." Burquest distinguished three types of morphophonemic alternation: phonologically conditioned alternation, lexical alternation, and morphologically conditioned alternation." In Falam, there may not be a direct correspondence to Burquest's theories, but there are phonologically conditioned alternations and lexical alternations which will be described in Sections 5.1 and 5.2.

5.1 Phonologically conditioned alternations

Phonologically conditioned alternations in Falam can be divided into two groups: major word classes and minor word classes. The major word classes include the alternations of nouns and verbs. The minor word classes include the alternations of adverbial, possessive, and locative morphemes.

5.1.1 Phonologically conditioned alternations in major word classes

The major word classes in this phonologically conditioned alternations include the alternations of noun stems and primary verb stems.

5.1.1.1 Noun stems

In Falam, any open syllable, whether verb or noun[25], is underlyingly (or phonemically) long. There is a process that shortens long vowels. When a common noun syllable that is open becomes the first syllable in a compound word its vowel length becomes short as in (47):

[25] Excluding agreement markers (or possessive markers).

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(47) /VV/ →/V/__, in a compound word

a. /paa^{21}/ 'male'

paa^{21} + tsaŋ^{44} → **pa^{21}** .tsaŋ^{44} 'a man'

male + old

paa^{21} + fiim^{23} → **pa^{21}**.fiim^{23} 'a clever-man'

male + clever

b. /t̤ii^{44}/ 'water'

t̤ii^{44} + waa^{23} → **t̤i^{44}**.waa^{23} 'river, stream'

water + go

t̤ii^{44} + k^{h}uu^{52} → **t̤i^{44}**.k^{h}uu^{52} 'vapor'

water + smoke

c. /fuu^{23}/ 'sugar cane'

fuu^{23} + tsaaŋ^{23} → **fu^{44}**. tsaaŋ^{23} 'segment of sugar cane'

Sugar cane+ step

fuu^{23} + m̤uan^{21} → **fu^{44}** .m̤uan^{21} 'sugar cane (farm)'

sugar cane+ farm

d. /saa^{52}/ 'animal or meat'

saa^{52}+ wɔm^{23} → **sa^{21}**.wɔm^{23} 'bear'

animal+ kind

saa^{52}+ bɛk^{21} → **sa^{21}**. bɛk^{21} 'rabbit'

animal + kind

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As an exception, this rule does not apply for some common nouns such as /naa^{44}/ 'buffalo', and /tsɔɔ^{44}/ 'cow' as in (48):

(48) a. /naa^{44}/ 'buffalo'

naa^{44} + saa^{52} → naa^{44}.saa^{52} 'buffalo meat'

buffalo + meat

naa^{44} + pii^{44} → naa^{44}.pii^{44} 'female buffalo'

buffalo + big

b. /tsɔɔ^{44}/ 'cow'

tsɔɔ^{44} + saa^{52} → tsɔɔ^{44}.saa^{52} 'cow meat'

cow + meat

tsɔɔ ^{44} + paa^{21} → tsɔɔ ^{44}.paa^{21} 'bull'

cow + male

A common noun with a final diphthong also coalescences when it becomes the first syllable of a compound word as in (49):

(49) a. /ɾua^{23}/ 'bamboo'

ɾua^{23} + kuuŋ^{44} → ɾɔ^{44}.kuuŋ^{44} 'bamboo tree'

bamboo + tree

kua^{21} 'hole'

kua ^{21} + pii ^{44} → kɔ^{21}.pii ^{44} 'big hole'

hole + big

b. /sia^{23}/ 'mithan'

sia^{23} + pii ^{44} → sɛ^{44}pii ^{44} 'mithan (female)'

mithan + big

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The following table displays a summmary of lexical alternation of noun stem compounds.

Root syllables			Compound syllables		
Tones	**Rhyme structure**	**Examples**	**Tones**	**Phonological alternation**	**Examples**
21	CVV (long vowel)	paa^{21} 'male'	21	CV (shortening)	pa^{21}tsaŋ^{44} 'man'
	CVV (diphthong)	kua^{21} 'hole'		CV (coalescence)	kɔ^{21}pii^{44} 'big hole'
44	CVV (long vowel)	t̪ii^{44} 'water'	44	CV (shortening)	t̪i^{44}waa^{23} 'river, stream'
23	CVV (diphthong)	ɾua^{23} 'bamboo'	44	CV (coalescence)	ɾɔ^{44}kuuŋ^{44} 'bamboo tree'
52	CVV (long vowel)	saa^{52} 'animal,	21	CV (shortening)	sa^{21}bɛk^{21} 'rabbit'

Table 11. A summary of phonological alternations in noun stem compounds

As in Table 11, phonologically conditioned alternation of noun stems is limited to common nouns that have an open syllable when they occur as the first syllable of a compound word. The vowel length is shortened to a single vowel and the vowel is coalesced if it is a diphthong. There is no alternation of noun stems for closed syllables.

5.1.1.2 Primary verb stems

A primary verb stem formation has a relationship with grammatical conditions, yet it has a relationship with phonological conditions. This section will turn only on phonologically conditioned alternations. The primary verb stem formation will be demonstrated in Section 5.2. Verbs in open syllables also have shortening of their vowel length values and coalescence of diphthongs in connected speech as in (50). Verbs with high tone have no shortened form.

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(50) a. /saa^{23}/ 'to be hot'

a^{21} sa^{44} tuk^{44}

be hot very

It's very hot.

b. /sii^{52}/ 'be, it is'

a^{21} si^{44} law^{21}

we be neg.

No, it is not.

c. /ṭii^{21}/ 'to say'

a^{21} ṭi^{44} law^{21}

He say neg.

He didn't say.

d. /bia^{52}/ 'to talk, to speak'

ka^{21} bɛ^{44} ḍiŋ^{52}

I talk will

I will talk to....

The following table displays a summary of phonologically conditioned alternations of primary verb stems.

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Root Syllables			Syllables in connected speech		
Tones	**Rhyme structure**	**Examples**	**Tones**	**Phonological alternation**	**Examples**
21	CVV (long vowel)	ţii^{21} 'to say'	44	CV (shortening)	a^{21} ţi^{44} law^{21} He didn't say.
	CVV (diphthong)	ţia^{21} 'same side'	no alternation		wuj^{23} ţia^{21} a^{21}sii^{52} It is big as an elephant.
44	CVV (long vowel)	paa^{44} 'to be thin'	no alternation		a^{21}paa^{44}mii^{52}pɔɔl^{23} The thin ones...
	CVV (diphthong)	hua^{44} 'to hate'			an ^{44}hua^{44} ɔɔ^{52} They hate each other.
23	CVV (long vowel)	saa^{23} 'to be hot'	44	CV (shortening)	a^{21}sa^{44} law^{21} It is not hot.
52	CVV (long vowel)	k^{h}aa^{52} 'to be bitter'	44	CV (shortening)	a^{21}k^{h}a^{44} paam^{44} It's quite bitter.
	CVV (diphthong)	bia^{52} 'to talk'		CV (coalescence)	ka^{21} bɛ^{44} ḍiŋ^{52} I will talk to..'

Table 12. A summary of phonologically conditioned alternations in primary verb stems

As shown in Table 12, like noun stems, the phonological alternation of verb stems occurs only with open syllables. The vowel length is shortened and diphthongs are coalesced. This verb stem alternation occurs in primary stem forms in main clause with focus, absolutive, imperative, and declarative when verb finals of these clauses are followed by any syllable in connected speech as in (50). Verbs with closed syllables have no alternate forms of primary stems.

5.1.2 Phonologically conditioned alternations in minor word classes

The minor word classes in phonologically conditioned alternation include the alternations of adverbial, possessive, and locational morphemes.

There are some phonological processes which find their motivation in the notion of syllable structure. This analysis considers the following types of these processes: fortition, linking, deletion, and vowel coalescence.

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5.1.2.1 Resyllabification

Minor word classes undergo resyllabification in connected speech, as can be seen in example (52) in which the glides /w/ and /j/ spread to the onset of the following syllable and thereby undergo the rule of conditioned free variation (see Section 2.1.2.2) and may appear as allophones [v] and [z] respectively as in (51):

(51) /law^{44} in^{23}/ → [law^{44} vin^{23}]

field from

from the field

/k^{h}uj^{23} in^{23}/ → [k^{h}uj^{21} zin^{44}]

where from

where from

In example (51), the second example undergoes rising tone sandhi rule (see Section 4.1.3). In rapid speech the coda the first syllable can be deleted: [la^{44} vin^{23}]; [k^{h}u^{21} zin^{44}].

5.1.2.3 Deletion

There is another process which has the effect of changing the structure of the syllable itself, that is, deletion[26]. Falam also has a deletion pattern in which the initial vowel of adverbial, possessive, and locative morphemes.

The adverbial morpheme /in/ is fully pronounced in careful speech, but the segment /i/ of the adverbial morpheme is deleted in connected speech as in (52).

(52) /kan^{44} jaa^{21} ţɛɛ^{44} in^{23}/ → [kan^{44}.jaa^{21}.ţɛɛn^{44}]

1Pl. all-Dim. Adv.

all of us

[26] In most cases of deletion, the motivation is to preserve or restore a syllable or word pattern which is acceptable within the phonotactics of the language (Burquest 1998:169).

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/a^{21} si^{44} naa^{44} in^{23}/ → [a^{21}. si^{44}.naan^{44}]

it be though Adv.

but/however

/ka^{21} pa^{52} t̪^{h}ɔɔ^{44} in^{23}/ → [ka^{21}. pa^{52}. t̪^{h}ɔɔn^{44}]

1Sg. father with Adv.

with my father

As seen in example (52), not only the segment [i] of the adverbial morpheme is deleted but the segment [n] is also combined with the preceding syllable and the tone of an adverbial morpheme is totally lost.

In possessive morpheme deletion the glottal final of the possessive morpheme /iʔ^{44}/ is deleted and the remaining segment [i] may optionally becomes a palatal glide final in connected speech as in (53):

(53) /bɔɔj^{52} paa^{52} iʔ^{44} t̪aa^{23}/ → [bɔɔj^{52} paa^{52} i^{44} t̪aa^{23}] ~ [bɔɔj^{52}paaj^{44} t̪aa^{23}]

lord man Poss. thing

the Lord's thing (thing of the Lord)

/ka^{21} nuu^{52} iʔ^{44} t̪aa^{23}/ → [ka^{21}nuu^{52} i^{44} t̪aa^{23}] ~ [ka^{21}nuuj^{44} t̪aa^{23}]

1S mother Poss. thing

my mother's thing (thing of my mother)

/kɛj^{52}-maʔ^{21} iʔ^{44} t̪aa^{23}/ → [kɛj^{52}.maʔ^{23} i^{44} t̪aa^{23}] ~ [kɛj^{52}.maaj^{23} t̪aa^{23}]

I-self Poss. thing

My thing (mine).

The locative morpheme /iʔ ^{44}/is fully pronounced in careful speech, but the phoneme /ʔ/ of the locative morpheme is deleted in connected speech as in (54):

(54) /wan^{21} iʔ^{44} sii^{21} in^{23}/ → [wan^{21}. i^{44}. siin^{23}]

heaven Loc. place from

from heaven

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/k^{h}uj^{23} i?^{44} sii^{21} in^{23}/ → [k^{h}uj^{21}.i^{44}.siin^{23}]

where Loc. place from

from where

Sometimes the locative morpheme /i?^{44}/ and the indicating place morpheme /sii^{21}/ in examples (55) can totally be deleted. Thus, the syllable structure becomes simpler as [wan^{21}.in^{23}] 'from heaven' and [k^{h}uj^{21}.in^{44}] 'from where' (see rising tone sandhi rule in Section 4.1.3, example 50).

This deletion rule with locative morpheme also occurs when it is preceded by demonstrative pronouns. An initial vowel in the locative morpheme is deleted and loses its syllabic status and the glottal stop is deleted as in (55):

(55) /k^{h}aa ^{44} i?^{44}/ → [k^{h}aaj^{44}] 'that'

that Loc.

/tsuu^{44} i?^{44}/ → [tsuuj^{44}] 'that (abstract matter)'

that Loc.

Slightly different from (55), the final glide /j/ disappears or even the whole morpheme /i? ^{44}/ disappears in a syllable after deletion if the demonstrative syllable has a front high vowel /i/ as in (56):

(56) /hii ^{44} i?^{44}/ → [hii ^{44}] 'this'

this Loc.

/k^{h}ii ^{44} i?^{44}/ → [k^{h}ii ^{44}] 'there'

there Loc.

It is assumed that the absence of final /j/ in (56) is conditioned by the vowel-like correspondence of the glide /j/ to the vowel /i/.

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However, there is also a pattern that allows one to pronounce /iʔ^{44}/ different from the deletion rules mentioned as in (53)-(56). This is a glottalization that only affects vowel length as in (57):

(57) /bɔɔj^{52}paa^{52} iʔ^{44}/ → [bɔɔj^{52}pajʔ^{44}] 'of the Lord'

/ka^{21}nuu^{52} iʔ^{44}/ →[ka^{21}nujʔ^{44}] 'of my mother'

/kej^{52} maʔ^{21} iʔ^{44}/ → [kej^{52}.majʔ^{44}] 'of mine'

/k^{h}aa^{44} iʔ^{44}/ → [k^{h}ajʔ^{44}] 'that'

/tsuu^{44} iʔ^{44}/ → [tsujʔ^{44}] 'that of unseen'

/hii^{44} iʔ^{44}/ → [hiʔ^{44}] 'this'

/k^{h}ii^{44} iʔ ^{44}/ → [k^{h}iʔ ^{44}] 'there'

Examples in (57) might be because of the difference between a careful and normal speech or one dialect to another.

5.1.2.4 Vowel coalescence

Coalescence is a term used to refer to the coming together of linguistic units which were originally distinguishable (Crystal 2003:78) or a pattern of merging two segments to become another distinct segment. This rule is called "vocalic alternations" by Osburne (1975) in her Zahao studies and is also called "a diphthong reduction rule" by Chhangte (1989) in her *Mizo syntax*. The pattern of coalescence occurs when diphthongs are followed by another syllable with a consonantal onset[26].

Coalescence rule 1: /ua/ → [ɔ]

This rule occurs when:

(a) a compound noun is composed of a noun + noun sequence as in (58).

(58) /rua^{23} kuuŋ^{44}/ → [rɔ^{44}.kuuŋ^{44}] 'bamboo tree'

bamboo tree

[26] These coalescence patterns mirror the vowel shortening rules in Sections 5.1.1.1 and 5.1.1.2.

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(b) a compound noun is composed of a noun + adjective sequence as in (59).

(59) /k^hua^{23} pii^{44}/ → [$k^h\mathfrak{o}^{44}.pii^{44}$] 'city'

village big

This coalescence rule also occurs when a primary stem with diphthong /ua/ appears in its secondary stem form (see Section 5.2.1.5). (See also vowel shortening rule in Sections 5.1.1.1 and 5.1.1.2).

Coalescence rule 2: /ia/ → [ɛ]

This rule occurs when:

(a) a compound noun is composed of a noun + adjective sequence as in (60).

(60) /sia^{23} pii^{44}/ → [$s\varepsilon^{44}pii^{44}$] 'female mithan'

mithan big

This coalescence rule also occurs when a primary stem with diphthong /ia/ appears in its secondary stem form (see Section

5.2.1.5 Vowel coalescence). (See also vowel shortening rules in Section 5.1.1.1).

Coalescence rule 3: /aw/ →[ɔ]. In his generative phonology, Sanford (1973:55) called this type of rule a coalescence of vowel and consonant. This rule occurs when a negative word is followed by an adverbial particle as in (61). This can be said to be a combination of coalescence and deletion because the /aw/ in a negation word is reduced and the phoneme /i/ in adverbial suffix is deleted.

(61) /$t^h\varepsilon j^{21}$ law^{21} in^{23}/ → [t^hej^{21} $l\mathfrak{o}\mathfrak{o}n^{23}$] 'not knowing'

know Neg. Adv.

Besides, this rule mainly occurs when a primary stem with /aw/ appears in its secondary stem form (see Section 5.2.1.5).

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5.2 Lexically conditioned alternations

In order to study lexically conditioned alternations, it is necessary to know that Falam verbs have two stems, like other Chin languages such as Zahao (Osburn 1975, Yip 2003), Lai (Hyman and Van Bik 2002), Tiddim (Henderson 1965), Daai (Hartman-So 1989), and K'Cho (Kee Shein Mang 2006). Nouns do not have two stems. This analysis will use the terms "primary" and "secondary" to refer to the two different verb stems. Out of 200 verb stems 115 verb stems (57.5%) have their secondary stem forms. The primary verb stem form is found primarily in topic focus (Osburne 1975), independent (Chhangte 1993) or main clauses and the secondary verb stem form is found in non-focus (Osburne 1975), dependent (Chhangte 1993) or subordinate clauses. In an independent clause, a predicate with an absolutive subject is realized as primary stem as in (62) and a predicate with an ergative subject is realized as secondary stem as in (63) as also described in Lai by Kathol and Vanbik (2002).

(62) ka^{21} nuu^{52} tsuu ^{44} ɾɔɔl^{23} a^{21} **suaŋ^{44}** (primary)
my-mother-Abs- food-3S- cook
My mother cooks/is cooking food.

(63) ka^{21} nuu^{52} in^{52} ɾɔɔl^{23} a^{44} **suan^{21}** (secondary)
my –mother-Erg.-food-3S-cook
My mother cooks food.

The relative clause marker /mii^{52}/ other suffixes such as nominalizer /naak^{52}/, causatives /tɛɾ^{23}/, benefactive /sak^{21}/, associative /pii^{23}/ and other compound verb suffixes require the secondary verb stem as in (64):

(64) m̥uu^{52} (primary) /m̥uʔ^{21} (secondary) 'to see'
ka^{21}-**muʔ^{44}**-mii^{52} 'what I saw' (relative clause)
1S-see-one

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hua^{44} (primary)/ huat^{52} (primary) 'to hate'

huat^{52}-ɔɔk^{52}-naak^{52} 'mutual hatred' (nominalized verb)

hate-ref-nom.

tlaa^{52} (primary)/tlaak^{52} (secondary) 'to fall'

tlaak^{52}tɛr^{23} ' cause to fall' (causative clause)

fall-cause

suaŋ^{44} (primary)/suan^{21} (secondary) 'to cook'

suan^{21}sak^{21} 'cook for somebody' (benefactive clause)

cook-for

it^{21} (primary)/ iʔ^{21} (secondary) 'to sleep'

iʔ^{21}.pii^{23} 'sleep along with' (associative clause)

sleep-with

The secondary verb structures are also found before adverbial particles, /lɛɛ^{52}/ 'if', /n̥uu^{44}.aʔ^{21}/ 'after', /l̥an^{21}.aʔ^{21}/ 'before', /wɛɛk^{52}.in^{23}/ 'since', / r̥aŋ^{21}.aʔ^{44}/ 'because', and /t̥ik.aʔ^{21}/ 'when' in subordinate clauses, as in (65):

(65) raa^{23} (primary) - rat^{21} (secondary) 'to come'

na^{21}-**rat^{44}**-law^{21} lɛɛ^{52} ka^{44}-t̥^{h}in^{21} a^{21}-hɛɛŋ^{52}-jɛt^{21}-d̥iŋ^{52}

you-come-neg. if my-heart-it-angry-very-fut

If you don't come, I'll be very angry.

suaŋ^{44} (primary) - suan^{21} (secondary) 'to cook'

rɔɔl^{23} a^{44}-**suan^{21}**- l̥an^{21}-aʔ^{21} puan^{44} a^{21} sɔɔp^{52}

food he-cook-before, clothes he-wash

He did laundry before he cooked (dinner).

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The secondary verb stem is also found in a passive sentence as in (66):

(66) suaŋ^{44} (primary) - suan^{21} (secondary) 'to cook'

ɾɔɔl^{23} tsuu^{44} **suan**^{21} a^{21} sii^{52}

food Ab. cook it be

Food is cooked (by someone).

The following table provides a summary of the Falam verb stems, primary and secondary.

Clause Type	Primary Stem	Secondary Stem
Main Clause	Focus	Non-focus
	Clause with absolutive	Clause with ergative
	Imperative clause	Clause with causative
	Declarative clause	Clause with associative
	Clause with Y/N question	Clause with benefactive
		Passive sentence
		Sentence with indirect object
Subordinate clause		Relative clause
		Nominalized clause
		Adverbial clause
		Indirect object

Table 13. Primary and secondary verb stem distribution

The occurrence of these stems is governed by grammatical conditions, yet they are phonologically related; this relationship is not fully researched here as the focus of this thesis is phonological. The two sets of stems are always phonologically related, and regular patterns of alternations are observed. In the Falam verb stems, some stems remain unalternated with only their pitch pattern alternating in the secondary stems. According to this analysis, low tone syllables ending in sonorants alternate when they appear in a secondary stem but other tone syllables ending in sonorants do not alternate. Rising tone syllables with final stops never alternate in secondary stem form. A primary stem with falling tone that has a short nucleus and ends with a sonorant never alternates in secondary stem form.

As the Falam primary and secondary verb stem formation is already stated above, the following section will discuss segmental alternation in secondary stems and

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tone alternations in secondary stems. Unlike other Chin languages, Falam has tertiary[27] verb stems.

5.2.1 Segmental alternations in secondary verb stems

This section presents segmental alternations in secondary stems including nasal alternation, stop alternation, glottalization, vowel shortening, and vowel coalescence.

5.2.1.1 Nasal alternation

This alternation is between a final velar nasal with the primary stem and an alveolar nasal with the secondary stem. This is called nasal assimilation by Connie Champeon[28] (2005:9) in her resolution and data of Falam orthography as in (67). She asserts, "when the root ends in /ŋ/ the ending changes to /n/ when it is followed by a suffix beginning with a nasal (m, n) that requires a rule: /ŋ/→/n/__m, n."

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[27] The tertiary verb stem occurs when there is an indirect object in a subordinate clause. This form normally occurs with verb stems with closed syllables with diphthongs, /ua/ and /ia/, and the diphthongs are coalesced as follows (see also Appendix V):

suaŋ^{44} (primary) - suan^{21}/sɔn^{52} (secondary) 'to cook'

rɔɔl^{23} na^{44} **suan^{21}** law^{21} lɛɛ^{52}

my you cook not if

If you don't cook food,.....

ka^{21} nuu^{52} rɔɔl^{23} na^{21} **sɔn^{52}** law^{21} lɛɛ^{52}

my mother food you cook not if

If you don't cook food (for my mother),.....

[28] Connie Champeon is one of the Bible consultants who have been helping the preparation of Falam writer's handbook.

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(67) tsiiŋ^{23} (primary)- tsiin^{21} (secondary) 'to grow'

waaj^{21}nim^{44} ka^{44} **tsiin^{21}** mii^{52} a^{21} taw^{21}

maize I grow one it springs out

The maize I grow springs out.

waaj^{21}nim^{44} ka^{44} **tsiin^{21}**-naak^{52} lɛj^{44}lung^{44} a^{44} t^{h}aa^{21}

maize I grow-nom. soil be good

The soil of the maize I grow is good.

As shown in example (67), Falam may seem to have nasal assimilation in a predictable environment but there are still more examples of complex environments of this nasal alternation that contradict the nasal assimilation rule proposed by Champeon, as in (68):

(68) tsiiŋ^{23}(primary) – tsiin^{21} (secondary)'to grow'

waaj^{21}.nim^{44} nan^{44} **tsiiŋ^{23}** mɔɔ^{21} (primary)

maize you (Pl) grow Qp

Do you grow maize?

waaj^{21}nim^{44} kan^{44} **tsiiŋ^{23}** naan^{44} (primary)

maize we grow but

we grow maize but....

waaj^{21}nim^{44} na^{44} **tsiin^{21}** k^{h}al^{21} lɛɛ^{52} (secondary)

maize you grow even if

even if you grow maize...

waaj^{21}nim^{44} na^{44} **tsiin^{21}** huam^{21} ṭik^{44}aʔ^{21} (secondary)

maize you grow want time at

when you want to grow maize....

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Thus, it can be concluded that Falam has no predictable nasal assimilation pattern but only has stem alternation. More examples of nasal alternation are provided in (69):

(69)	Primary stem	Secondary stem	Gloss
m̥aŋ^{23}		m̥an^{21}	'to use, to spend
siaŋ^{23}		sian^{21}	'to allow'
jaaŋ^{44}		jaan^{21}	'to run'
suaŋ^{44}		suan^{21}	'to cook'

As seen in (69) this nasal alternation is associated with rising tone and high tone but not low tone and falling tone.

5.2.1.2 Stop alternation

Moira Yip (2003:18), in her *Phonological markedness and allomorph selection in Zahao*, one of the dialects related to Falam, states that "all vowel final primary stems add a final /-t/ in the secondary stem". Falam also has final addition, although some verb stems, /sii^{52}/ 'it be', /t̥ii^{21}/ 'to say' have no addition of final stops, and /-k/ also appears in secondary stems. These stop alternations are called Epenthesis[29] in Osburne's (1975) analysis of Zahao. Final /-t/ additions are shown in (70):

(70)	Primary stem	Secondary stem	Gloss
t^{h}aa^{21}		t^{h}at^{21}	'to be good'
tia^{21}		tiat^{52}	'to put on the same side'
t^{h}ii^{23}		t^{h}iit^{52}	'to sew, to marry'
ɾaa^{23}		ɾat^{21}	'to come'
hua^{44}		huat^{52}	'to hate'
paa^{44}		paat^{52}	'to be thin'

[29] Burquest (1998) states that epenthesis is most common with vowels, where a vowel is inserted to break up a consonant cluster, specifically by placing the clustering consonants into different syllables.

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As seen above, the final /-t/ addition is related to low, high, and rising tones, but the final /-k/ addition is related to falling tone as in (71):

(71)	Primary stem	Secondary stem	Gloss
wua^{52}		wuak^{52}	'to beat'
bia^{52}		biak^{52}	'to speak'
maa^{52}		maak^{52}	'to divorce'
ɾuu^{52}		ɾuuk^{52}	'to steal'
pɛɛ^{52}		pɛɛk^{52}	'to give'

Also a primary verb with vowel final can instead have a glottal stop in its secondary stem form as in (72):

(72)	Primary stem	Secondary stem	Gloss
t̪^{h}ii^{23}		t̪^{h}iʔ^{21}	'to die'
n̪ii^{23}		n̪iʔ^{21}	'to laugh'
m̪uu^{52}		m̪uʔ^{21}	'to see'

The primary verb stems with final stops /p, t, k/ also alternate with a glottal stop in their secondary stem forms as in (73):

(73)	Primary stem	Secondary stem	Gloss
t̪^{h}at^{21}		t̪^{h}aʔ^{21}	'to kill'
t̪^{h}ɔk^{21}		t̪^{h}ɔʔ^{21}	'to start, to begin'
kaap^{52}		kaʔ^{21}	'to shoot'
luut^{52}		luʔ^{21}	'to enter'
p^{h}iat^{52}		p^{h}iaʔ^{21}	'to erase, to rub out, to sweep'
suak^{52}		suaʔ^{21}	'to come out'

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To say that Falam has final epenthesis means there has to be a consistent rule. But the insertion of final /–t/ or /–k/ or /ʔ/ is not clearly predictable. Looking at all examples, (70), (71), (72), and (73) show that Falam has no consistent epenthesis rule but has only stop alternations. The simplest generalization is that a falling tone syllable with vowel final allows the final /k/ addition, while high and rising adds a final /t/, and low sometimes adds /t/, sometimes /ʔ/. Besides, vowel length in primary stems becomes short when the glottal stop is added or when syllable finals are glottalized in the secondary stem forms. However, primary verb stems with diphthongs can survive without alternating their vowel qualities in secondary stems. The glottal final addition and the final glottalization (see below) in secondary stem occurs with primary verb stems that have low and falling tones.

5.2.1.3 Glottalization

Glottalization is a general term for any articulation involving a simultaneous glottal constriction, especially a glottal stop. In Falam, a primary verb stem with low tone that ends with a sonorant final /w, j, r, l/ is glottalized in its secondary stem form as in (74):

(74)	Primary stem	Secondary stem	Gloss
daaj^{21}		daj?^{21}	'to be cold'
kaaw^{21}		kaw?^{21}	'to be wide'
baal^{21}		bal?^{21}	'to be dirty'
taar^{21}		tar?^{21}	'to be trapped, to be stuck'

As seen in (74), glottalization never allows a long nucleus in secondary stem forms. Also glottalization is associated with low tone syllables with non-nasal sonorant finals. Rising tone syllables (/sar^{23}/ 'to pick up'), falling tone syllable (/bal^{52}/ 'to destroy'), and high tone syllable (/lɛj^{44}/ 'to buy') are not glottalized in their secondary stem forms.

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5.2.1.4 Vowel shortening

As seen already in 5.2.1.2, all of the secondary verb stems affected by glottalization also undergo vowel shortening. Another rule of shortening vowels occurs when a low tone syllable with a nasal final that has a long nucleus in primary stem appears in the secondary stem form as in (75):

(75) Primary stem	Secondary stem	Gloss
tsuum^{21}	tsum^{52}	'to pound, to beat'
baaŋ^{21}	baŋ^{52}	'to be tired'
baan^{21}	ban^{52}	'to reach'

As seen above, vowel shortening in secondary stem is associated only with low tone because no other tones have any alternations as in (76):

(76) Primary stem	Secondary stem	Gloss
t̰laaw^{23}	t̰laaw^{21}	'to be lost, to drop'
sɔɔm^{23}	sɔɔm^{21}	'to invite'
saaw^{44}	saaw^{21}	'to be long'
fiiɾ^{44}	fiiɾ^{21}	'to steal, to rob'

5.2.1.5 Vowel coalescence

Primary verb stems with diphthongs, nasal finals and low tones are coalesced in their secondary stem forms as in (77):

(77) Primary stem	Secondary stem	Gloss
lian^{21}	lɛn^{52}	'to be wealthy'
nuam^{21}	nɔm^{52}	'to enjoy, to have fun'
fiaŋ^{21}	fɛŋ^{52}	'to give way'

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As shown above, vowel coalescence rule occurs only with low tone. Other tones with diphthongs never have coalesced forms as in (78):

(78) Primary stem	Secondary stem	Gloss
jual^{23}	jual^{21}	'to roll up'
tuam^{44}	tuam^{21}	'to scrap'
suak^{52}	sua?^{21}	'to get out'

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Primary stem				Secondary stem				
Tones	**Rhyme structure**	**Types of nucleus and codas**	**Examples**	**Tones**	**Rhyme structure**	**Types of nucleus and codas**	**Phonological alternation**	**Examples**
Low [21]	VV	long vowel	t^haa^{21} 'to be good'	no alternation	VC	short vowel, stop final	vowel shortening, stop insertion	t^hat^{21} 'to be good'
	VV	diphthong	ţia^{21} 'same side'	Falling [52]	VVC	diphthong	no alternation	ţiat^{52} 'same side'
	V(V)C	short/diphthong, [+nasal] final	jum^{21} 'to believe'	Falling [52]	VC	short vowel [+nasal final]	vowel shortening /coalescence	jum^{52} 'to believe'
	V(V)C	short/long vowel, [+sonorant] final	nɛj^{21} 'to have'	no alternation	VC?	short vowel, [+sonorant]+ glottal final	vowel shortening, glottalization	nɛj?^{21} 'to have'
	VC	short vowel, [+obstruent] final	tsak^{21} 'to be strong'	no alternation	V?	short vowel, ? final	glottal insertion	tsa?^{21} 'to be strong'
	V(V)?	short vowel /diphthong, glottal final	fɛ?^{21} 'to go'	no alternation	V(V)?	short vowel /diphthong	no alternation	fɛ?^{21} 'to go'
High [44]	VV	long vowel /diphthong	ḷaa^{44} 'to be far'	Falling [52]	VVC	long vowel, stop final	stop insertion	ḷaat^{52} 'to be far'
	V(V)C	[-sonorant] final	ŋɔɔk^{44} 'to snore'	Low [21]	V(V)C	long vowel, stop final	no alternation	ŋɔɔk^{21} 'to snore'
	V(V)C	short/long vowel, [+sonorant] final	ɾaŋ^{44} 'to be fast'	Low [21]	V(V)C	short/long vowel, nasal final	nasal alternation	ɾan^{21} 'to be fast'
	VC	short vowel, [+son,-nasal] final	ţɛl^{44} 'to participate'	Low [21]	VC	short vowel, [+son,-nasal] final	no alternation	ţɛl^{21} 'to participate'

Table 14. A summary of morphophonemic alternations in verb stems

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Primary stem				Secondary stem				
Rising [23]	VV	long vowel	$t^{h}ii^{23}$ 'to sew'	Falling [52]	VVC	long vowel, stop final	stop insertion	$t^{h}iit^{52}$ 'to sew'
	V(V)C	long vowel sonorant [-]	$suup^{23}$ 'to reduce'	Low [21]	VVC	no alternation	no alternation	$suup^{21}$ 'to reduce'
	V(V)C	[+nasal] final	$kɛŋ^{23}$ 'to bring'	Low [21]	V(V)C		nasal alternation	$kɛn^{21}$ 'to bring'
	V(V)C [j, w, l, r]		kaw^{23} 'to call'	No alternation	no alternation	no alternation	no alternation	kaw^{23} 'tocall'
Falling [52]	VV	long vowel /diphthong	$k^{h}aa^{52}$ 'to be bitter'	No alternation	VVC	long vowel /diphthong	stop insertion	$k^{h}aat^{52}$ 'to be bitter'
	VV	long V	$m̥uu^{52}$ 'to see'	Low [21]	V?	short vowel, glottal final	glottal insertion, vowel shortening	$m̥u?^{21}$ 'to see'
	V(V)C	long vowel/ dipththong [obstruent] final	$waak^{52}$ 'to crawl'	Low [21]	V?	short vowel /diphthong, glottal final	vowel shortening, glottal insertion	wa? 'to crawl'
	VVC	long vowel, [obstruent] final	$kɔɔk^{52}$ 'to scold'	no alternation	VVC	long vowel, [obstruent] final	no alternation	$kɔɔk^{52}$ 'to scold'
	VC	short vowel, [+nasal] final	$t̥lɛŋ^{52}$ 'to exchange'	no alternation	VC	short vowel, [+nasal] final	no alternation	$t̥lɛŋ^{52}$ 'to exchange'

Table 14. A summary of morphophonemic alternations in verb stems (cont.)

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As shown in Table 14, the following generalization can be summarized. Falam has no predictable nasal assimilation pattern but has nasal alternation. Nasal alternation is associated with rising tone and low tone but not low tone and falling tone as in (69). Falam also has final /-t/ and final /-k/ additions in secondary stems. Final /-t/ addition is related to low, high, and rising tones as (70). Final /-k/ addition is related to falling tone as in (71). Also a primary verb with vowel final can instead have a glottal stop in its secondary stem form as in (72).

In Falam, a primary verb stem that ends with a sonorant final /w, j, r, l/ is glottalized in its secondary stem form. The primary verb stems with final stops /p, t, k/ are also alternated to the glottal stop in their secondary stem forms. Glottalization never occurs with a long nucleus in secondary stem forms but may occur with a diphthong. Also glottalization is associated with low tone syllables with sonorant finals (but not nasals) (74) and with falling tone syllables with stop /p, t, k/ finals as seen in Section 6.2, example (88). Most of vowel shortening rules in secondary verb stems are associated with glottalization (see Section 5.2.1.3). Another rule of shortening vowels occurs when a low tone syllable with a nasal final that has long nucleus appears in the secondary stem form as in (75). Primary verb stems with diphthongs and nasal finals are coalesced in their secondary stem forms. The vowel coalescence rule is related only to low tone as in (77). Besides secondary stem formation, Falam has verb stems that require two forms in their secondary stem forms, the second of which is called "tertiary[30]" in this thesis.

[30] There are not many stems that have two forms but few. This stem alternation happens to a syllable with a diphthong closed with velar final that has high tone or rising tone. Diphthongs in the syllables are coalesced and velar nasals alternate to alveolar nasals in secondary stem forms (see Appendix V).

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