CHAPTER 3
RESEARCH METHODOLOGY AND DESIGN

The overall objective of this research is to analyze current pre and post-harvest management techniques to produce (high-quality) mango (*Mangifera indica* Linn) in the Shan State, Myanmar and to identify levers to improve fruit quality and to increase the amount of marketable fruits. Once identified, it will allow formulating recommendations about how to improve pre-and postharvest management processes in mango production in one line with GAP recommendations.

In the following the research design, research methodology and instruments as well as the description of the research area are illustrated in more detail.

3.1 Overview of the research design and choice of research methodology

As the field of research has not yet been extensively developed, in this research, an explorative research design has been employed to uncover existing pre- and postharvest structures and practices. According to Damon et al. (2011) exploratory research is often used when the research problem is not particularly well defined and its real scope is unclear. Thus, *"this type (of research) is often aimed at clarifying concepts, gathering explanations, gaining insight, refining problems and ideas and forming hypothesis"* (Damon, Pedersen, & McEvoy, 2011). According to Fritz (1995), in early stages of a research process, an exploratory research design is particularly indispensable. Moreover, the explorative method promises in early research stages a sufficient degree of contextual and conceptual flexibility (Fritz, 1995).

According to McNabb exploratory research provides an overview but is not *"intended to serve as an in-depth look into all the factors related to the researched phenomenon"* (McNabb, 2010). Thus, a confirmatory research design, subsequent to this study, would be desirable. However, the investigative and examining parts have to be separated clearly. A second empirical verification cannot take place within this work due to research economic reasons. This work focuses on an exploratory design, to describe current mango production processes, identify ways to improve it and determine

whether further, descriptive research needs to be conducted. Thus, referring to the heuristic value (Dane, 2011) of exploratory research by stimulating further research.

According to Krishnaswamy et al. (2009), the following stages can be identified in most exploratory studies and form the basis of this study (Krishnaswamy *et al.*, 2009):

1. Analysis of secondary data including published information in research journals, conference proceedings, reports of institutions and company special reports
2. Obtaining information from knowledgeable persons with experience in the research area
3. Examination of analogous situations to gather information on common information and relationships.

3.2 Research Instruments – Mixed methods approach

In one line with the explorative research design, the primary objective of this research lies in gaining insights in the mango production in Myanmar, structure these insights and identify areas of further research to improve mango production in Myanmar.

The choice of instruments is crucial for a target-oriented planning of a research project. This basic decision depends on the origin of the applied data: Does valid data exist in an adequate amount to conduct a secondary research and formulate research questions or does the need exist for the researcher to raise primary data? As illustrated in chapter 1 are hardly data available about mango production in Myanmar.

In this study, secondary sources along with qualitative research (chapter 3.2.1) helped to guide and frame the research by identifying common pre- and post-harvest processes (chapter 2.3). Moreover, these processes form the basis of the empirical research.

The methods of primary data collection in explorative research are in general qualitative methods – nonnumercial analysis focusing on quality rather than quantity. (McNabb, 2010; Werani *et al.*, 2006). However, Dane (2011) stresses the importance of

descriptive statistics in explorative research concerning central tendencies or averages and dispersion of scores such as standard deviation (Dane, 2011).

Qualitative and quantitative methods in scientific research are often considered as separate spheres with little overlap (Shields & Rangarajan, 2013). In this study, mixed methods (qualitative and quantitative) have been applied to raise primary data in order to counteract disadvantages of single methods and to provide a structured and coherent analysis of the research problem. Thus, the complementary nature of both, qualitative and quantitative data collection and analysis is stressed in this master thesis as it provides a greater range of insights and perspectives, whereby the results can be triangulated or confirmed and improve the validity of the findings (Maxwell, 1998).

The major distinction between qualitative and quantitative research relates to the way how research problems are approached: sample size, ways of raising data and the representative nature of the findings. Qualitative research aims not at a representative sample size, rather at a representation of different perspectives. Important advantages of qualitative research methods are their openness and adaptability (Buber & Holzmüller, 2009). In contrast, quantitative studies stress the magnitude of the variation expressed in numerical figures. The gain in information lies in data reduction by means of a high degree of standardization, structuration and larger sample size (Damon *et al*., 2011; Dane, 2011).

In sum, the empirical part of this master thesis aims at providing a snapshot of the status quo of pre- and postharvest management processes and activities in mango production in the Shan State, Myanmar to derive assumptions concerning levers of how to improve fruit quality and the amount of marketable fruits. From a methodological point of view, in the following, the suitability of the methods for primary data collection will be illustrated in more detail.

3.2.1 Qualitative research - Semi-structured interviews

One of the most common ways to learn about a research field is to talk to experts with substantial scientific or practical background in a specific area. This can take many forms including interviews with a different degree of structuration with one person or a group.

According to Seidman (2013), *"the purpose of in-depth interviewing is not to test hypotheses, and not to "evaluate" as the term is normally used. At the root of in-depth interviewing is an interest in understanding the lived experience of other people and the meaning they make of that experience"* (Seidman, 2013). Thus, the choice of interview partners as well as the knowledge and experience of the interviewees is crucial for the quality of the raised data. During this study, 7 semi-structured one-to-one interviews with experts in the fields of mango production in Thailand and Myanmar, post-harvest treatments as well as GAP certification have been conducted during different phases of the research. In doing so, it has been assumed that the respondents have a favorably thorough understanding of their field and can add to the overall knowledge of the topic. A list of interview partners is illustrated in appendix 1.

Semi-structured interviews are in the middle between structured and unstructured interviews. They are based on a certain set of questions to guide the conversation and can be modified for each interview. Unlike structured interviews, semi or low-structured interviews allow the respondent a higher degree of freedom of speech and the conversation to flow more naturally.

Consequently, information and knowledge of the interviewees can emerge, that the researcher might not have thought of in advance. In such a case, using a semi-structured design allows exploring new topics that are relevant to the interviewee. According to Becher semi-structured interviews are commonly used in explorative studies (Becher, 2007). Despite of the high time requirement, in this study one-to-one semi-structured interviews have been chosen, as one-to-one interviews generally result in a more free exchange of information (in contrast to e.g. focus groups) and the opportunity to customize the guiding questionnaire to the field of expertise of the respondent (Neelankavil, 2007). Moreover, primarily open-ended questions have been used, that the respondents were able to reconstruct and elaborate their experience with the research topic. The timeframe of the interview varied between 45 minutes and 1 hour, depending on the knowledge and experience of the respondents.

In one line with Neelankavil (2007) and Mayring (2000), the qualitative interviews were conducted during different phases of the research process and helped to isolate and better describe key variables in pre- and postharvest management processes. After pretests of the interview questions, the interviews at the beginning of the research aimed in one line with the literature research at identifying and describing relevant processes in mango production (chapter 2.3). Interviews conducted in the latter phases of the research process aimed at scrutinizing and opening-up findings from the quantitative research and to identify hindrances and opportunities concerning pre- and postharvest management activities in mango production (chapter 4). Moreover, the sequential order and different points of time of the interviews acted like a feedback processes concerning the different factors and their elaboration (chapter 3.3).

Since within in-depth interviews, ideas can be explored in depth with a generally small sample size, the results cannot be projected to a wider population (Neelankavil, 2007). To counteract this disadvantage, a quantitative research has been included in the study (chapter 3.2.2).

3.2.1.1 Interview guide design

Already existing scientific studies, presented in chapter 2 provided vital background information to identify the state of the art of pre-and postharvest management processes for mango production in one line with GAP recommendations to ensure a high fruit quality. These findings, in combination with qualitative test interviews (feedback) and the results of the quantitative study, helped to design and refine the semi-structured interviews for the qualitative survey.

The major objective of the qualitative interviews was to collect information concerning:

1. Current pre- and postharvest practices in mango production
2. Levers to increase fruit quality and the amount of marketable/exportable fruits
3. Potential and hindrances of mango farmers in the Shan State to implement these measures in one line with GAP regulations concerning fruit quality
4. Role of different actors and farmer cooperation in the upstream value chain (focus mango production)

During the interviews, the sequence of questions was not imposed on the participants. In order to allow a natural flow of conversation the respondents had freedom to elaborate on their answers. However, answers were followed by general or focused questions to redirect the participant's attention towards matters, which were important to the objectives of the study.

The interview guideline were designed and structured in accordance to Magnusson and Marecek (Magnusson & Marecek, 2015):

1. Introducing the topic, purpose and general context of the interview:

1.1 General context: Master thesis at the University of Hohenheim, Germany and the Chiang Mai University, Thailand in the master program "Sustainable Agriculture and Integrated Watershed Management". Introduction of the cooperation with the Gesellschaft für International Zusammenarbeit (GIZ). Title of the research project: Potential to Comply with Good Agricultural Practices Standards by Mango Farmers in Southern Shan State, Myanmar.

1.2 Purpose of the interview: To analyze current pre and post-harvest management techniques to produce (high-quality) mango (*Mangifera indica* Linn) in the Shan State, Myanmar (against the backdrop of international GAP measures concerning fruit quality) and to identify opportunities, challenges and perspectives of mango farmers in the Shan State, Myanmar.

2. Information about the timeframe of the interview

2.1 The interviews were intended to last 30-60 min in accordance with the respondents knowledge and experience

2.2 Conversation like nature or the interview with open-end questions

2.3 Asking permission to audio-tape the conversation to better analyze the information

3. Remarks to confidentiality and anonymity of the interview

4. Moreover, the respondents were asked before getting started if they have questions.

5. Outline of the interview: In relation to the field of expertise of the interview partner, semi-structured interviews with different sets of questions were conducted. The questionnaire is illustrated in appendix 2.

6. All interviews have been conducted according to the above illustrated guideline in German or English in Thailand and Myanmar. The interview partners were contacted well in advance to establish an interview schedule.

7. The interviews were conducted between the November 2015 and May 2016. During the visits in Myanmar and Thailand, additional information and observations were collected to better describe and analyze the situation of mango growers in the Shan State.

3.2.1.2 Qualitative Content Analysis - Procedure and Data analysis

The raised qualitative data in this master thesis was analyzed according to Mayrings concept of content analysis (2000).

The basic concept of the qualitative content analysis according to Mayring serves to analyze texts (e.g. interviews) systematically using categories derived from theoretical findings (deductive) or establishing categories from the text material (inductive) (Mayring, 2002). The system of categories including sub-categories, definitions of categories and examples represents the starting point for the interpretation of the texts and the core piece of the analysis (Mayring, 2000).

The category system is based on a sequential content analysis model. At first, the units of analysis are defined and the texts (interviews) are broken down to text passages, which are then assigned to the defined categories. In particular, this rule system makes the approach of Mayring comprehensible and traceable. However, the concrete steps to establish categories as well as the number of categories and their structure depends on the research topic and research questions. Basically there are two ways to establish categories – the inductive and deductive method (Mayring, 2000).

The choice between the inductive and deductive method depends on the availability of data. In this master thesis the deductive method is applied as the GAP-Guidelines concerning fruit quality and scientific studies about mango production and post-harvest handling (chapter 2.3) provide a sound basis for the establishment of categories to analyze pre-harvest and post-harvest management processes in mango production in Myanmar. Figure 6 illustrates the sequence of the deductive content analysis model.

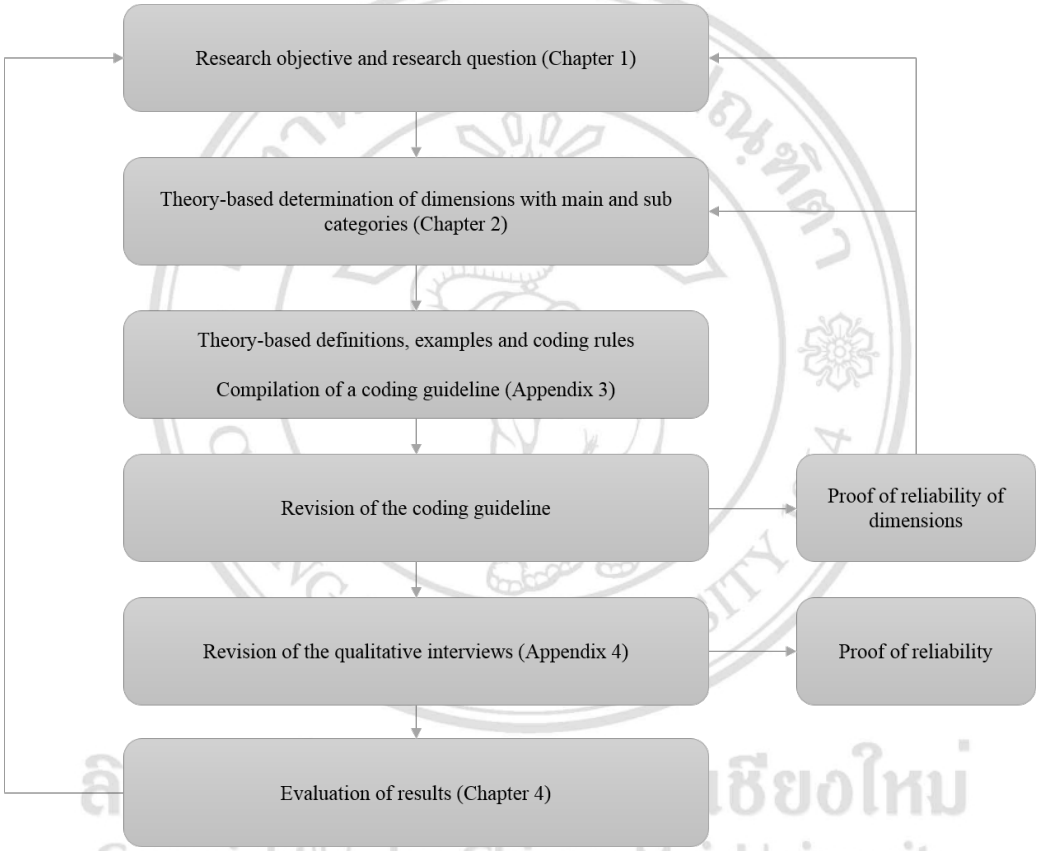

Figure 6 Content Analysis according to Mayring (deductive Method) (own, adapted from Mayring, 2000)

In contrast to the inductive method, which aims at establishing categories by text analysis, within the deductive method categories are defined, structured and coding rules are established according to theoretical findings (categories: foundation chapter 2; overview: chapter 3.3 Structure, Definition and coding rules: appendix 3). The term coding describes the allocation of text passages to the defined categories by analyzing all transcribed material (appendix 4). Coding rules help assign text passages to specific

categories. As all interviews were fully transcribed, statements (appendix 5) (one or more sentences) of the interview partners were considered as appropriate coding units. Moreover, according to Mayring it is valid to attribute more than one category to one text passage as a text passage can address more than one category. In the next step, the category system was applied to the texts (all text passages) and the category system was revised. By assigning text passages to the categories, individual statements can be generalized. Text passages are brought to a uniform language and shot grammatical version by a process called paraphrasing (appendix 4) (Mayring, 2000, 2002).

The common feature between the inductive and deductive method is that categories are revised iteratively. Due to text passages, which cannot be assigned to certain categories, new categories have to be established and the text material has to be tested again. Therefore categories are always developed, revised, adapted and controlled. Thus, during the last phase of the process, the qualitative method allows an interpretation of the results as well as quantitative evaluation steps (Mayring, 2000).

The advantages of Mayrings' content analysis are primarily their claim towards validity and reliability. The method provides a seamless traceability due to the inherent systematic and high documentation requirements. Validity refers in the context of this master thesis on the one hand to communicative validity. The results of the qualitative study were re-presented and discussed with the interview partners to ensure that the text passages and interpretation by the author are correct. On the other hand, the results of the qualitative study were used to confirm and open-up the findings from the quantitative survey. Thus, the qualitative findings were triangulated and have been cross-checked. However, Flick (2007) criticizes the reductive nature of the qualitative content analysis. Due to the focus on text passages, the focus on the whole picture can get lost. Qualitative content analysis is most suitable to reduce and summarize data concerning specific dimensions. Moreover, the quantitative evaluation of the results (Determination of frequencies of answers within categories) bears the risk to mix up importance and quantity und thus to reduce the value of individual experiences (Ramsenthaler, 2013).

3.2.2 Quantitative research

Little is known about the *status quo* in mango production in Myanmar. In relation to the current development of different value chains in Myanmar, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), [German International Cooperation] launched 2014, in cooperation with the Myanmar Fruit and Vegetable Producer and Exporter Association (MFVP), the Private Sector Development Program (GIZ project 2012.2451.8-001.00 „Capacity Strengthening for Private Sector Development“) to support small and medium sized enterprises (SME), focusing *inter alia* on strengthening value chains for the two commodities tea and mango in the Southern Shan State in Myanmar (Sanyu, 2013).

The MFVP was established in August 2006 and has today 8 branches, 39 clusters and more than 30000 members in Myanmar. Each cluster focuses on one crop such as mango, avocado, watermelon, coffee and tea (Interview B2). Members of the MFVP are actors along the entire value chain including fruit and vegetables farmers, traders, wholesalers, distributers and exporters. The objectives of the MFVP are to strengthen capacity building, cooperation and networking among the value chain actors (GIZ, 2016).

Together, the GIZ and the MFVP established a value chain committee for the mango development in Myanmar. Till 2019, the major goals are to (GIZ, 2016):

- Increase the yield for the variety Sein Ta Lone from 0.4 t /ha (2015) to 1.6 t /ha (2019)
- Increase the export volume of Sein Ta Lone mangos from 60 t (2015) to 6000 t per season (2019)
- Diversify export destinations for Sein Ta Lone mangos to China, Japan and Korea (30 %) and to Europe and the USA (53 %).

From February 2014 to Mai 2014, a broad baseline-survey in the Southern Shan State among one hundred fourteen mango farmer in the growing zones Taunggyi, Yatsauk, Pindaya, Nyaug Shwe and Siasai was conducted in Myanmar language (Burmese). The standardized questionnaire was composed of 47 closed questions and covered a wide range of topics along the mango value chain including mango farm characteristics, pre and post-harvest management practices and market/logistical data.

The author is grateful to Mr. Kyi Nyein Chan, Mr. Thant Zaw Soe, and Dr. Thida Win Ko Ko, the team from GIZ for collection of the baseline data in Southern Shan State and Mrs. Hsu Pyae Kyaw from GIZ for translating the data.

The author summarized, selected and analyzed the relevant data in relation to the goals of this master thesis and in accordance with Dane (2011) requirements of exploratory research: to identify central tendencies or averages and dispersion of scores (Dane, 2011). Moreover, the results have been graphically elaborated. The number of interviews with the farmers in each growing region in the Shan State corresponded to the size of the growing area and in total approx. mango farmers in relation to 7 % of the total growing area were interviewed.

3.3 Dimensions of research

In sum, figure 7 illustrates the dimensions which have been developed in accordance with the above described research design. The initial identification of dimensions has been done by literature research and the single dimensions have been iteratively refined by the results of the qualitative research.

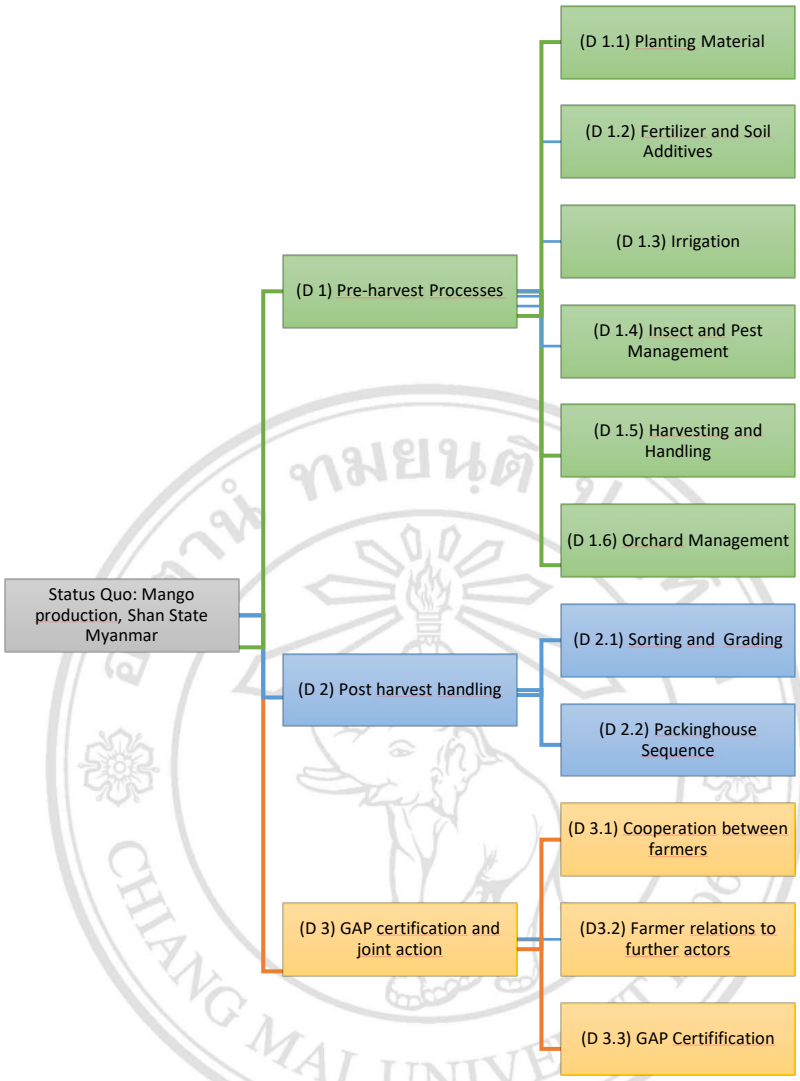

Figure 7 Dimensions of research (own)

The results and discussion of the qualitative and quantitative research concerning each dimension and are shown detail in chapter 4 and 5.

3.4 Study area

In Myanmar, mangos can be cultivated all over the country. However, growing areas of mango are located in Ayeyarwaddy, Bago and Yangon (southern Myanmar), Mandalay, Sagaing (Central Myanmar) and in the southern Shan State (high altitudes). More recently, an expansion of the planting area can be observed in central regions and at higher altitudes in the Shan State. (Mekong Institute, 2013b; Myat, 2012).

For this master thesis, the Shan State has been chosen as research area for different reasons:

- High potential for mango production development
- Current expansion of planting area
- Focus of the Myanmar Government to support local economic development in the Shan State
- An existing mango cluster group in the Shan State (Mango Cluster Group Shan State)
- Access to data and expert interviews

Within the Shan State, currently seven mango growing zones exist. These are Yatsauk (2833 ha), In Taw (425 ha), Taunggyi (1295 ha), Pindaya (405 ha), Hopone (60 ha), Nyang Shwe (182 ha) and Siasai (132 ha). In total mangos are cultivated on 5332 ha with Yatsauk being the largest zone with 2833 ha (GIZ, 2016).

Elevations in the Shan State range between 900 and 1400 meter above sea level. Weather data for the Shan State is scarce and only available for few cities. Weather data from Taunggyi are exemplified in figure 8 and 9. The mean average rainfall is 1758 mm (1468 mm between 1992 and 2001) (Egashira & Than, 2006). The driest month is January (3 mm rainfall) and most precipitation takes place in August (312 mm). The warmest month is April with average temperatures of 22.3 °C. Mean average temperatures range from 15.7° C to 28.9° C.

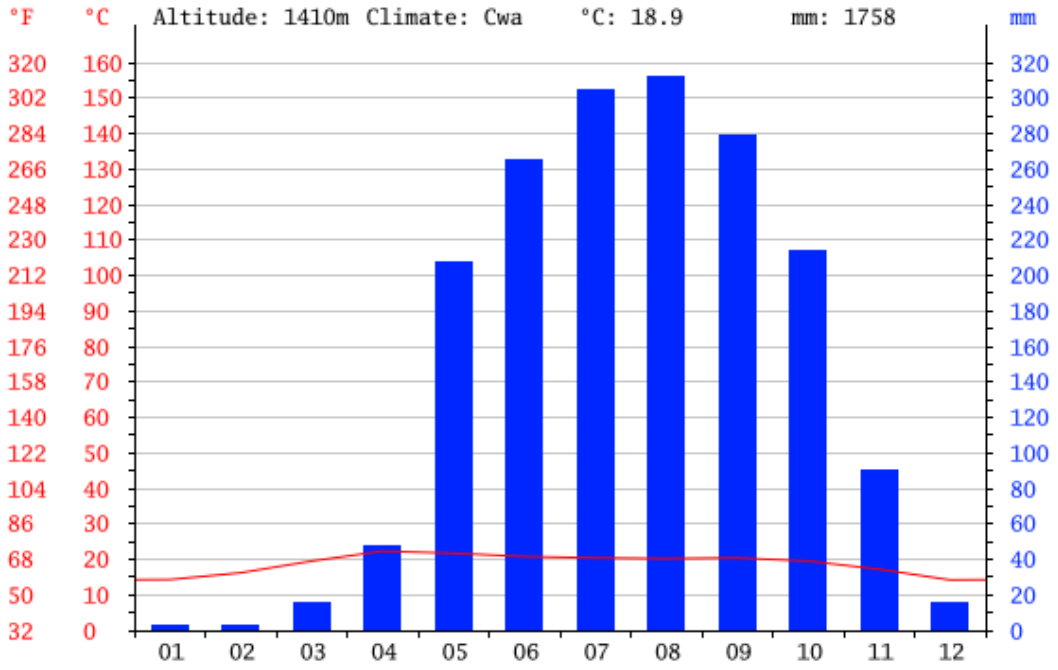

Figure 1 Annual Distribution of rainfall in Taunggyi, Shan State Myanmar

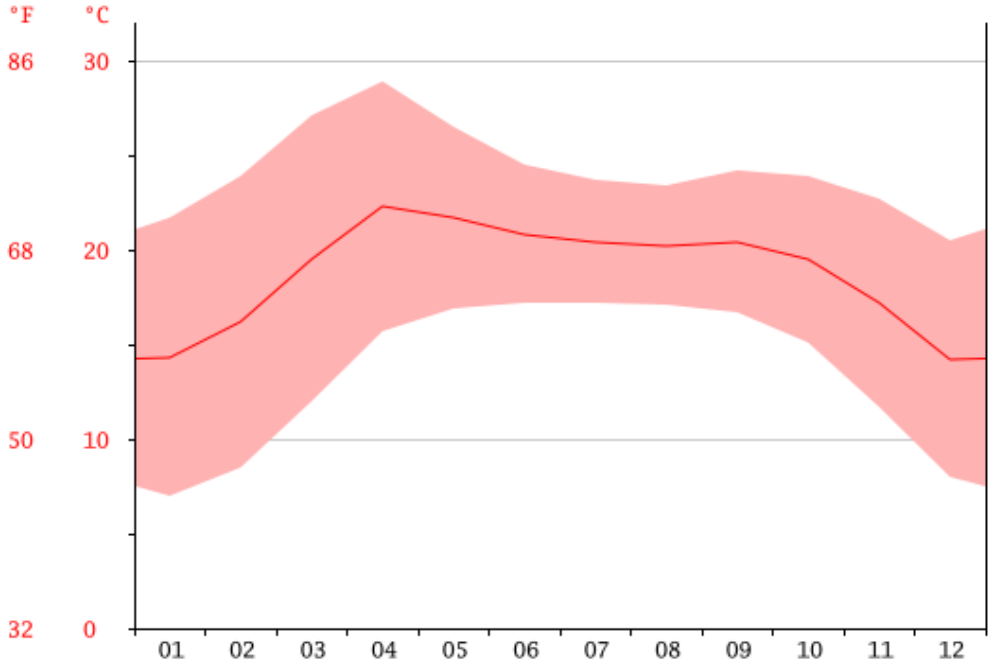

Figure 2 Annual Distribution of rainfall in Taunggyi, Shan State Myanmar

Figure 10 Map of Myanmar, elevation in the Shan State and the study area