

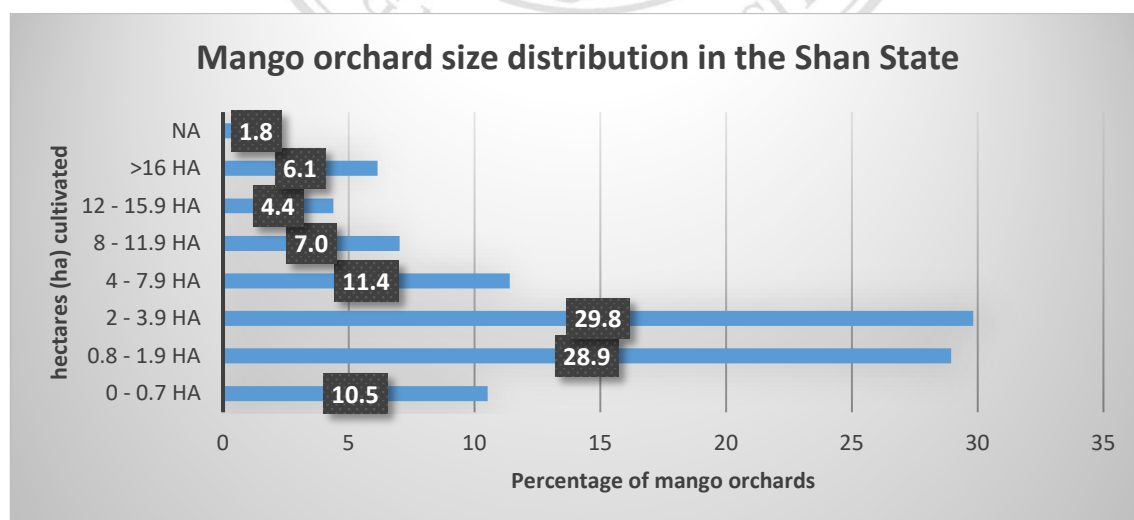
## CHAPTER 4

### RESULTS AND DISCUSSION – MANGO PRODUCTION IN THE SHAN STATE, MYANMAR

In line with figure 7 (chapter 3.3) the data analysis is divided in three steps. After outlining general mango orchard characteristics (chapter 4.1) in the Shan State Myanmar, the qualitative and quantitative results of the study concerning pre- and postharvest management practices (chapter 4.2) and farmer joint action, cooperation and GAP certification are presented (chapter 4.3). Moreover, a discussion of the results takes place in each section of this chapter to benefit from the linkages between the quantitative and qualitative data.

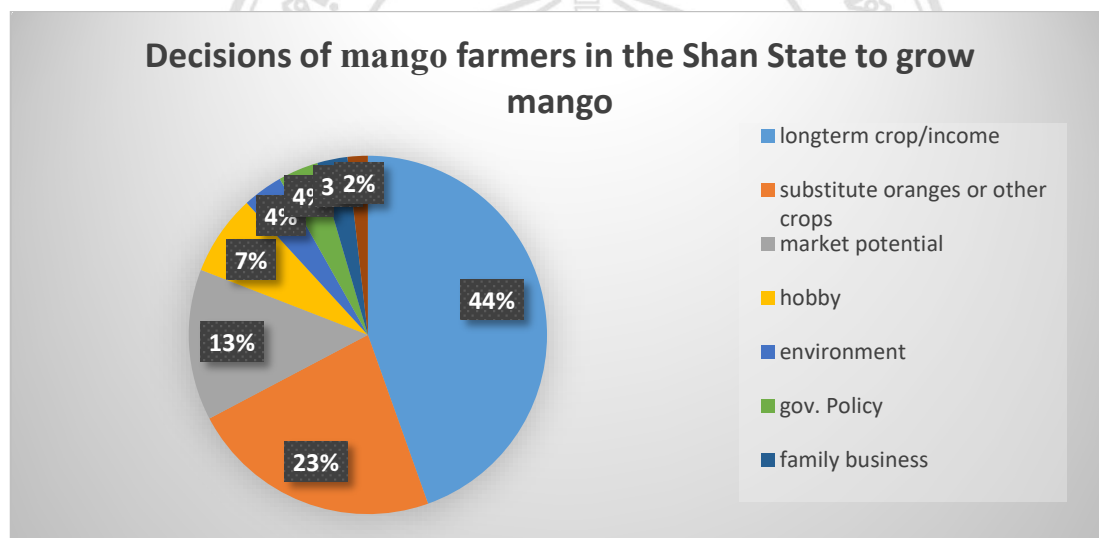
#### 4.1 Mango orchard characteristics in the Shan State Myanmar

The results of the quantitative analysis show, that the majority of mango orchards in the Shan State, Myanmar can be characterized as small sized orchards with mangos being cultivated on less than 4 hectares (69.2 %), and medium sized orchards with mangos being cultivated between 4 -16 hectares (28.9 %).



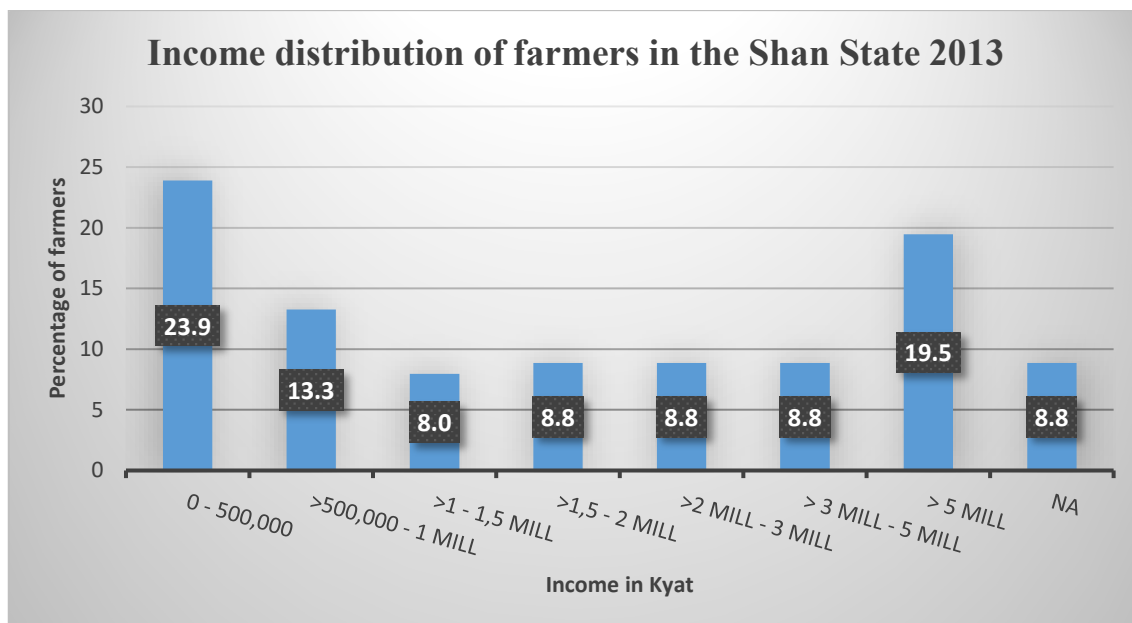
**Figure 11** Distribution of mango orchard size in the Shan State, Myanmar (own)

The average age of the mango trees in the orchards is between 6 and 10 years with an average yield of 0,48 tons per hectare in 2013. In Yatsauk average yields were highest (1 ton per hectare) and lowest in Si Sai (0.25 tons per hectare). Most of the farmers grow maize (28 %) or rice (16 %) and to a minor extend vegetables (10 %) as additional crops besides mango. 7.1 % grow no other crops besides mango. Most of the farmers focus on the variety Sein Ta Lone (87.8 %). To a minor extent the variety Yin Kwe (9.9 %) and further varieties (2.3 %) are cultivated. As figure 12 illustrates, the decisions of mango farmers to cultivate mango are primarily based on the long-term income opportunities and the market potential of mango in comparison to other fruits such as oranges. Currently 2 % of the farmers in the Shan State decided to grow mango because of export opportunities.



**Figure 12** Decisions of mango farmers in the Shan State to grow mango (own)

In average farmers are 48.7 years old and employ no seasonal (43 %) and no permanent workers (67.5 %). Most of the farmers are supported by family members (1-2 supporting family members: 47.4 %). The average income distribution in 2013 from mango (in Kyat) is illustrated in the following figure.



**Figure 13** Income distribution of mango farmers in the Shan State 2013(own)

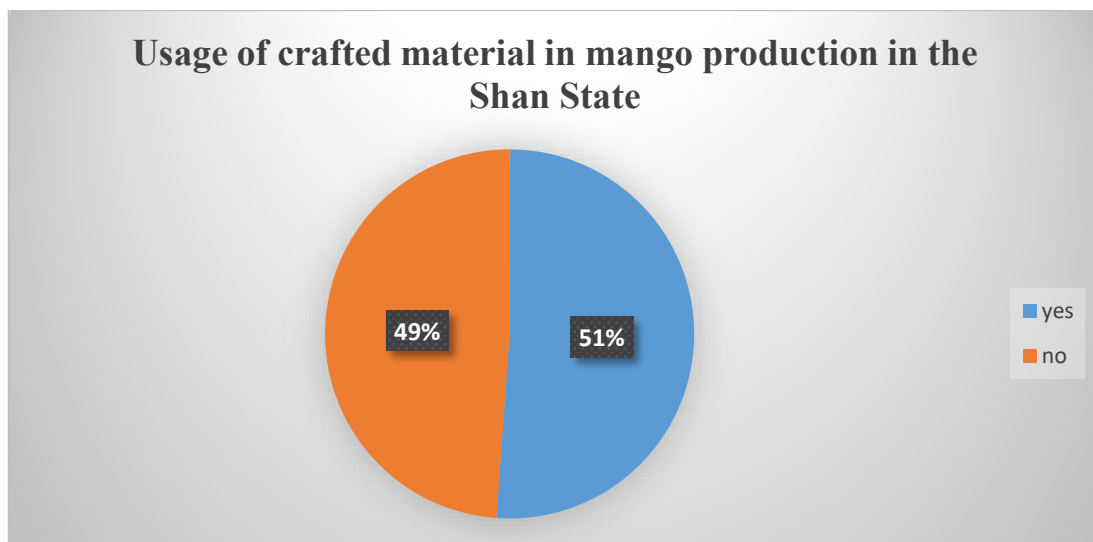
In average 23.9 % of the farmers earn less than 375 Euro, 67.3 % of the farmers earn between 375 Euro and 3750 Euro and 19,5 % of the farmers indicated to earn more than 3750 Euro per year from their mango orchards. 46.5 % of the farmers have no other income apart from mango production. To a minor extent, farmers generate additional income through growing other crops like maize and rice (14.9 %), or owning a small grocery (4.4 %) or retail shop (4.4 %). Moreover, 28.1 % of the farmers indicated that up to three people live from their mango business and 36 % said that up to six people depend on the income from their mango orchards.

#### 4.2 Pre-harvest and post-harvest practices in the Shan State, Myanmar

In the following, the status quo of pre and postharvest processes in mango orchards in the Shan State, Myanmar are outlined and discussed.

##### 4.2.1 Planting Material (D 1.1):

Currently 48.2 % of the farmers possess an own tree nursery whereby seeds come from Han Myint Mo, Taunggyi, Yatsauk or Mandalay and are sown in plastic bags, foliar and pesticides are sprayed and plants are later transplanted. 51.1 % of the farmers use crafted planting and 48.9 % grow mango trees from seeds.



**Figure 14** Usage of crafted material for mango production in the Shan State (own)

The results from the qualitative study reflect this trend and stress the importance of the genetic material for commercial mango production and genuine characteristics of the variety STL. In contrast, improving the quality of seedlings is not at the core of a GlobalGAP certification:

*“The genetic material for the variety you select to cultivate probably tops the chart as the most important. The reason is that the variety of mango is so important. Around the world, there are so many varieties of mango. Having a variety that you are able to market and sell and that grows in your local requirement is the most important factor”* (Interview B1).

*“One of the strength of the mango sector is our region. Mango is our royal fruit”* (Interview B 2).

*“Some of the varieties grown in Myanmar are very well developed and adapted to this area. The mango Sein Ta Lone are actually very superior mangos comparatively to the international market. [Concerning] the requirements as far as color, consistency, production, horticulture characteristics of the tree even more down to detailed things like seed size, flavor and disease resistance”* (Interview B1).

*“The seedlings of STL variety are coming mainly from Mandalay. Up to now, not everybody is using grafted material. Some use root seedlings. Concerning this, we*

*did quite a lot in Ghana. It took 3-5 years. However, I do not see the necessity in Shan State. It was also no request from farmer's side to improve the quality of the seedlings. It's not necessary for the GlobalGAP certification” (Interview B6).*

Table 4 summarizes the paraphrases (uniform language and grammatical short version of statements), established during the qualitative content analysis and referring to the importance and the development of the dimension planting material. In particular, the variety of different perspectives of the interview partners of the qualitative research are among the benefits of qualitative content analysis. The overall importance of this dimension has been evaluated with 4/5 and the current development with 3.3/5 in the qualitative research. A brief summary of the importance and present development of all different pre-harvest management dimension is illustrated in chapter 4.2.7.

**Table 4** Paraphrases concerning importance and development: Planting material

<b>Importance</b>	<b>Development</b>
<b>The genetic material is the most important factor to have a variety that grows locally and can be sold and exported</b>	Sein Ta Lone is a mango with superior characteristics
<b>There is no necessity to improve the quality of the seedlings in the Shan State</b>	Some Myanmar varieties are very well developed and adapted to the area
<b>Improve the quality of the seedlings is not necessary for GlobalGAP certification</b>	Mango production is limited specific varieties and primarily done by grafting
	Not everybody is using grafted material. Some use root seedlings
	Farmers did not request to improve the quality of seedlings
	Most of the seedlings are coming from Mandalay
	One of the strength of the mango sector is the region (Shan State)

#### 4.2.2 Fertilizer and Soil additives (D 1.2)

Concerning fertigation, quantitative findings state that 87.7 % of the farmers use fertilizer in their orchards. Predominantly armo compounds (15:15:15) (23.8 %), cow dung (15.9 %), urea (10.6 %), farm yard manure and bokashi (9.3 %) are used once a year.

The qualitative findings provide a more multi-faceted picture. On the one hand side, it shows that fertilizer is available (foremost) in urban areas. However, synthetic fertilizer is quite expensive and the choice is limited.

*“With general granular fertilizer, I have seen some with synthetic fertilizer here.”* (Interview B1)

*“They have TDP and Urea. Pretty much, there are two choices. They have a very limited fertilizer selection they are able to use.”* (Interview B1)

*“Synthetic fertilizer are very expensive.”* (Interview B1)

*“Such fertilizers exist. A lot of them are imported from Thailand or China, but then the question is, does it actually contain what is says? But yes fertilizers are available. Most of the time they are composite fertilizers. But there are also special fertilizers, micronutrients or Thio EUREA KNO<sub>3</sub>, which is the stuff you want to use for rich flower growth. The availability is not so bad if you go into the cities. I don't know about the situation in the countryside.”* (Interview B5)<sup>2</sup>

On the other hand side, the qualitative interviews illustrate that mango trees are frugal trees and that a targeted fertilization during phases of fruit growth or after pruning to promote vegetative growth is essential. Moreover, it becomes obvious that introducing well-composted material into the soil plays an important role due to the availability of nutrients. However, the interview partners noted that fertilization is conducted usually on a rule of thumb basis and determined that farmers need specific trainings regarding a systematic and targeted application of fertilizer.

*“However, you can say that mango trees are relatively frugal. If I look at soil samples then one important thing would be the availability of phosphates, which again is connected to the pH-value. That is, if there is even phosphate in the soil and is it available to the plant? The other important nutrients, like potassium and nitrogen for example, are so mobile, that it makes little sense to use soil analysis on them. Instead,*

*there are recommendations for the usage of fertilizers that are based solely on the fruit yield. [...] If I can do that, by using fertigation, then I can stretch over the fruit growth period, which is to say into the time period after the pruning, in order to specifically stimulate vegetative growth.*“ (Interview B5)<sup>3</sup>

*“Mostly the development stage of the farmers is that they are solely using compost one time a year. I was pushing the farmers to add an additional dose of well composted organic material to the ground an additional time to make it two times in one year.”* (Interview B1)

*“The development on fertilizer and proper fertilizing techniques I would give it a 2 because it is a combination of limited availability and limited knowledge.”*(Interview B1)

*“Yes. Here there are training needs. We did trainings with two Mango clusters and there was a lot of interest and discussion. There is also the question of how composting and natural fertilization can be included due to nutrient availability and the organic matter content in the soil. In the region [Shan State] there is room for improvement, no question. So far, everything is done on a rule of thumb basis..“* (Interview B 5)<sup>4</sup>

Table 5 summarizes the variety of paraphrases referring to the importance and the development of the dimension fertilizer and soil additives. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. The overall importance of this dimension has been evaluated with 2.7/5 and the current development with 2.5/5 in the qualitative research. A brief summary of the importance and present development of all pre-harvest management dimension is illustrated in chapter 4.2.7.

<sup>2</sup> Interview in German, own translation.

<sup>3</sup> Interview in German, own translation.

<sup>4</sup> Interview in German, own translation.

**Table 5** Paraphrases concerning importance and development: Fertilizer and soil additives

<b>Importance</b>	<b>Development</b>
<b>Pre-harvest practices like pest management, pruning, bagging, fertilization and irrigation have a significant influence on fruit quality</b>	Development of fertilization (fertilizer and techniques) is low due to limited availability and knowledge
<b>Fertigation is important to stimulate fruit growth and vegetative growth after pruning</b>	Fertigation is no common practice in mango production in the Shan State
<b>Irrigation and fertilization are important factors to influence mango fruit size and appearance</b>	Fertilization is done off the top of one's head. Trainings should be put in place
<b>Fertilization on is not so important for Mango production</b>	Synthetic fertilizer is expensive and farmers use compost one time a year
<b>Mango trees are frugal trees</b>	Good availability of fertilizer in urban areas
<b>Soil samples or yield can be used to assess the fertilization requirements</b>	The fertilizer selection is very limited in the Shan State
	No documentation takes place

#### 4.2.3 Water and Irrigation (D 1.3)

In contrast to the importance of irrigation illustrated in chapter 2.3.1 the results of the quantitative study show that most of the mango orchards are maintained under rain fed condition. 85.7 % of the farmers are not utilizing an irrigation system. This trend – the high importance of irrigation and relative low development in mango orchards in the Shan State Myanmar - has been reflected by the results of the qualitative study.

*“Irrigation is one of the largest management practices and is most important.”*  
(Interview B1)

*“Irrigation is very important and the development they have is very low.”*  
(Interview B1)

*“Irrigation is really in an initial stage.”* (Interview B6)



*“First the status quo. There is actually no irrigation project, in the Shan State, where I have worked. Generally speaking, the irrigation of non-rice crops is not very common in Myanmar.*

*For many farmers it is completely incomprehensible, to irrigate non-rice crops at all.” (Interview B5)<sup>5</sup>*

A more differentiated picture emerged when the interview partners elaborated upon implications of different irrigation techniques and their effect on fruit growth, fruit appearance and tree health. The results showed that mango trees are drought tolerant and dry periods are important for mango trees to maintain tree health. Concerning fruit quality, the qualitative findings pronounce the positive linkage between irrigation, fertigation and fruit size. However, in the Shan State (Myanmar) the periods of fruit growth, harvesting and the dry season overlap. Flowering takes place end of February followed by a phase of rapid fruit growth (end of March/April) and harvesting of fruits (May/June). The supply of water and nutrients during fruit growth is crucial to increase fruit size. In addition, the uptake of macronutrients, such as nitrogen for fruit growth during the dry season is considerably aggravated without irrigation. Thus, the lack of irrigation can result in smaller or shriveled fruits. Conversely, an over-irrigation of mango trees for example by flood irrigation can cause the trunk of the tree to rot.

*“In general, with mangos I think irrigation is a huge issue. With the rainfall changing irrigating at important times but also allowing the trees to dry out completely and allow them dry periods is very important for mango.” (Interview B1)*

*“Luckily enough for mangoes, they are very drought tolerant and actually like dry periods and dry periods actually help to extend the life of a mango tree. In cultivation for production, the live expectancy for mango trees is very short comparatively. 25-30 years often times. I think the main cause auf death eventually ends up of being diseases and those diseases more specifically being some sort of root pathogens.” (Interview B1)*

*Mango grown in clay and loamy soil often get pathogens and different kind of root rot due to overwatering. So, reducing watering during some periods is actually good for some mangos.” (Interview B1)*

<sup>5</sup> Interview in German, own translation.

*“Its irrigation at the right time. Not fully irrigated mangoes around the season. Irrigation during flower induction, fruit setting and fruit ripening. This has a big influence on quality.” (Interview B 6)*

*“With mangos it is important to water them, not because they need a lot of water but because of the nutrients. Most of the fruit growth takes place during the dry season. Now, if I fertilize the soil with nitrogen, and if I do not irrigate, then the nitrogen will not be absorbed by the tree during that fruit growth period. That is to say, I fertilize the most when the tree has vegetative growth. Besides that, if I have a good water supply during fruit growth, then of course I get bigger fruits and the fruit growth falls into the dry season in Myanmar.” (Interview B5)<sup>6</sup>*

*“In the Shan State the flowering of the mango trees begins at the end of February and at the end of March/April you have a phase of rapid fruit development and rapid fruit growth. During April or even at the end of April, there may already be enough rain, but that is not necessarily so and this situation goes well into May. Normally there is a slight time delay to the harvest compared to us [Thailand] which is in late May. And if you have dry season, it can make your mangos become wrinkled or small. That's why you should irrigate all the way until the end of the season. The mango fruit does not stop growing, according to our results, at least not until it falls from the tree.” (Interview B5)<sup>7</sup>*

Moreover, in the expert interviews, micro sprinklers and drip irrigation systems were recommended as irrigation techniques because flood irrigation can negatively impact tree health. Notwithstanding the importance of irrigation, appropriate technology such as micro sprinklers or drip irrigation (if farmers lack access to electricity) are hardly available (or of minor quality) and have to be imported.

*“Flood irrigation often times creates a mounts around of the trees causing the trunk of the tree to rot. Especially with clay soils. So the water moves in the flood irrigation in the trough that is created and the soil build up the at the base of the tree above the flare root of the tree causing the base of the tree to rot.” (Interview B1)*

*“Drip or micro sprinkler. Micro sprinklers all the way. Micro sprinklers are easier to use, because you can see how much water is discharged and they have fewer problems with clogging. We have set up some low-pressure systems now, where we use*

<sup>6</sup> Interview in German, own translation.

<sup>7</sup> Interview in German, own translation.

*gravity, because many farmers do not have access to electricity. In such cases, drippers are the systems you want to use.” (Interview B5)<sup>8</sup>*

*“I think micro irrigation needs to be pressed more in the country and supported by suppliers and brought in more.” (Interview B1)*

*“No they are not. That's a catastrophe. For our project we specifically imported parts from Thailand. We bought PE hoses on site. They were of very bad quality. You do not have sufficient access to good material for your irrigation projects. There are only PVC pipes and one type of sprinklers available. But then again that one is something in between normal sprinklers and micro sprinklers. You can irrigate your garden with those but a well-planned irrigation is not possible.” (Interview B5)<sup>9</sup>*

Table 6 summarizes the variety of paraphrases referring to the importance and the development of the dimension water and irrigation. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. The overall importance of this dimension has been evaluated with 4.3/5 and the current development with 2.2/5 in the qualitative research. A brief summary of the importance and present development of all pre-harvest management dimension is illustrated in chapter 4.2.7.

<sup>8</sup> Interview in German, own translation.

<sup>9</sup> Interview in German, own translation.

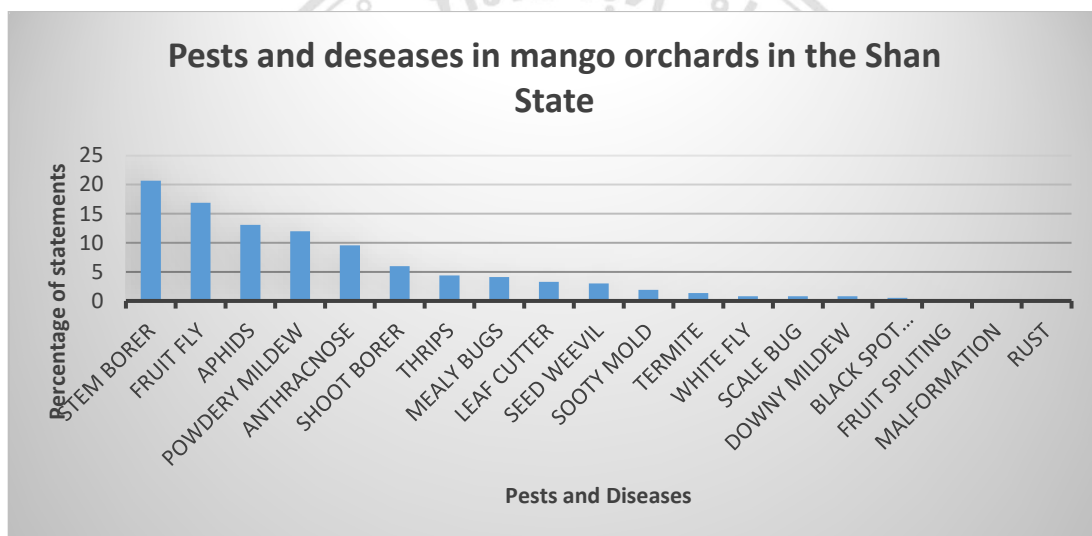
**Table 6** Paraphrases concerning importance and development: Water and Irrigation

Importance	Development
<b>Irrigation belongs to the most important management practices for mango</b>	Irrigation is really in an initial stage
<b>Pre-harvest practices like pest management, pruning, bagging, fertilization and irrigation have a significant influence on fruit quality.</b>	Most mango orchards are not irrigated
<b>Irrigation and fertilization are important factors to influence mango fruit size and appearance.</b>	Irrigation is important but development in Myanmar is low
<b>Irrigation is a huge issue and in particular in development stages crucial for fruit development</b>	Irrigation technology is not easily available to farmers in Myanmar and available equipment of poor quality
<b>Irrigation of mango trees is important to supply nutrients in particular in dry seasons and during fruit growth</b>	Micro sprinkler or drip irrigation should be implemented
<b>Irrigation is important during late March/ April and in Mai (fruit growth) in case of no rain</b>	Micro irrigation needs to be pressed by suppliers
<b>Flood irrigation can negatively impact tree health</b>	Myanmar farmers are far behind in irrigation and rely on rainfall or use flood irrigation
<b>Dry periods are also important for mango trees.</b>	No documentation takes place
<b>Mango trees are drought tolerant</b>	
<b>Over irrigation can harm mango trees</b>	

#### 4.2.4 Insect and Pest Management (D 1.4)

Regarding fruit quality, the quantitative and qualitative findings emphasize the importance of pest and disease management as pest and diseases restrict the amount of marketable fruits considerably. Currently approximately 38 % of all post-harvest losses are due to pest and diseases. As figure 15 illustrates major pests in mango orchards in the Shan State include *inter alia* stem borer, fruit flies, seed weevils and aphids. Like

fungal disease, anthracnose and mildew are prevalent. In this context, the practice of fruit bagging (against fruit flies), the application of agrochemicals and pruning (chapter 2.3.1) play a major role. These management techniques are already practiced in mango orchards in the Shan State. 49 % of the farmer's bag their fruits to protect them against fruit flies. Moreover, 36 % of the farmers use pesticides and fungicides and more specifically, 13 % use the fungicide Mencozeb and 19 % the multi-use insecticide Cyper. However, in relation to GAP certification, it can be assumed that agrochemicals are not applied optimally as 70 % of the farmers do not keep records about application date and dosage.



**Figure 15** Pests and diseases in mango orchards in the Shan State (own)

The importance and practice of insect and pest management for exporting mango was underlined by the qualitative findings. Apart from descriptions of effects of pests and diseases on fruit quality, tree health and import restrictions, the interview partners criticized the un-coordinated usage of agrochemicals in mango orchards in the Shan State. Yet, the choice of agrochemicals in Myanmar is limited and they are usually imported from neighboring countries such as Thailand, lacking labels in Myanmar language (Burmese). The qualitative findings emphasized a substantial need for training concerning a systematic and integrated pest and disease management.

*“Most farmers try to archive the goal of the perfect mango. [...] In Myanmar, the pest and insect management is very important to have the perfect fruit.”* (Interview B1)

*“I would say the insect pest management practices such as spraying fungicides and bagging are very labor intensive and in Myanmar they are widely practiced.”* (Interview B1)

*“Pest and Disease Management is an important point because we have different disease and pest infestations, which damage the mangos, so that they can no longer be marketed.”* (Interview B5)<sup>10</sup>

*“These include Pulp Weevils or Seed Weevils. Then there's the Mealy bug which occurs relatively frequently. These are mealy bugs, which are placed on the trees by ants and form a white 'veil' and make the mangos unsuitable for sale. Then of course, there are leaf hopper which causes damage to the tree itself and cause more fruits to drop. Generally, I would say that the most problematic pest is the fruit fly. They lay eggs on the mangos, which you cannot detect with the naked eye at an early stage. After that, a larva develops inside the fruit, often during transport, and so you package a good mango and they unpack a rotten mango.”* (Interview B5)<sup>11</sup>



**Figure 16** Mango pests and diseases (left picture: mealy bug (Sein Ta Lone); right picture: anthracnose (Nam Dok Mai) (Spreer)

<sup>10</sup> Interview in German, own translation.

<sup>11</sup> Interview in German, own translation.

*“We start now trainings to cope with the seed Weevil. This is currently a problem in Yatsauk area. There we have to be really careful as it is related to the ban of the fruits. We started with the plant protection department to do a survey within Shan State and give recommendations for future trainings. IPM has become priority. For plant protection, we have to do more trainings.” (Interview B6)*

*“They just apply on regular basis without observing the field conditions. As you observe field conditions, this requires to have a better understanding about something like IPM. They can learn during training.” (Interview B7)*

*“I would like see more products available in Myanmar. I don’t see farmers all have access to everything they would like. They are limited to what the agricultural extension agencies bring in. They are limited to a few chemicals in Myanmar.” (Interview B1)*

*“The farmers themselves have appropriate strategies on how to use pesticides. However, one must assume that those strategies are not always optimal, because the farmers have little education themselves. The agrochemicals used are often imported from Thailand and have no Burmese labeling. That means, that, very often, the farmers can’t read in detail what they are handling. Which means you can just assume that the application of the pesticides is not very well planned.” (Interview B5)<sup>12</sup>*

Table 7 summarizes the variety of paraphrases referring to the importance and the development of the dimension insect and pest management. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. The overall importance of this dimension has been evaluated with 4.3/5 and the current development with 2.5/5 in the qualitative research. A brief summary of the importance and present development of all pre-harvest management dimension is illustrated in chapter 4.2.7.

**Table 7** Paraphrases concerning importance and development: Insect and Pest Management

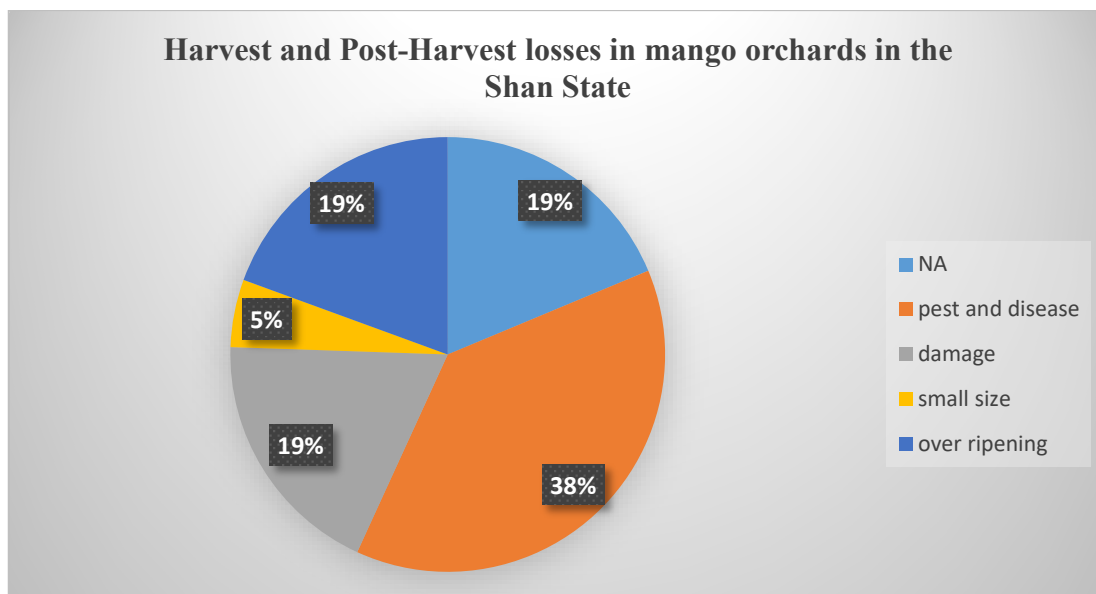
<b>Importance</b>	<b>Development</b>
<b>Pre-harvest practices like pest management, pruning, bagging, fertilization and irrigation have a significant influence on fruit quality</b>	IPM is practiced widely
<b>IPM is very important in Myanmar and agrochemicals are used excessively</b>	IPM has started to become priority for trainings
<b>Pest and disease management are important to reduce losses</b>	Agrochemicals are used against Pest and Diseases
<b>There are lots of Pest and Diseases that reduce fruit quality and damage mango trees in Myanmar</b>	Trainings started to cope with Seed Weevils
<b>Chemical IPM is necessary for export due to consumer preferences</b>	Un-coordinated usage of agrochemicals due to the lack of labels in Myanmar language
<b>Fungus like Anthracnose is a major problem</b>	Availability of chemicals is limited
	No documentation takes place

#### **4.2.5 Harvesting and Handling (D 1.5)**

Mango harvesting in the Shan State, Myanmar is primarily conducted in June (64.4 %) and July (16.9 %). Thus, mango farmers in the Shan State can benefit from the late maturity of fruits. 49 % of the farmers harvest only once per season (17.3 % three times per season). Most farmers experience substantial harvest and post-harvest losses. 24.8 % of the farmers have losses between 5-10 % and 16.8 % of the farmers between 11 – 20 %. 7.1 % experience losses exceeding 40 % of their harvest. The reasons are manifold. Apart from losses due to pest and diseases (38 %), damaged fruits (19 %), overripe fruits (19 %) and small sized fruits (5 %) are prevalent as figure 17 illustrates.

<sup>12</sup> Interview in German, own translation.





**Figure 17** Harvest and Post-Harvest losses in mango orchards in the Shan State (own)

Most of the damaged fruits are thrown away (20.2 %). To a minor extent, the damaged fruits are sold at the local market (13.2 %), consumed at home (17.5 %), used for seedlings (7 %) or compost (4.4 %). Only a small percentage of the farmers (4.4 %) use the damaged fruit for further processing such as dried mango, mango leather or frozen mango.

The results of the qualitative study emphasize that a careful handling of the fruit as well as secured harvesting are important particularly for the export market. Currently the mangos are harvested and handled (packed) insufficiently resulting in high harvest losses. Secured harvesting describes the practice of marking bagged mangos at the same maturity level to ensure a uniform maturity at harvest. Thus, several harvests per season are necessary.

*“You need to handle your fruit very well in order to have a good product. If the fruits are bruised, you will lose a lot of fruit. The farmers here understand that any damage to the fruit will cost them money.”* (Interview B1)

*“The harvesting is still done with stick baskets, by hand and they do lose a lot of fruit in that way. The development with harvesting and handling is very far behind. A lot of farmers still bag them instead of boxing them as well. When you have mangos in a sack and drop them, they roll over my bruise the mangos. Superior methods would be*

*boxing and stacking them in different ways. Hopefully Myanmar will improve development in harvesting and postharvest handling.” (Interview B1)*

*“Those who produce for the export market make sure that they have what is called secured harvesting. This is generally done in Thailand too. So you also have an eye on it during bagging. The mangos are bagged when they are the size of eggs and the bags are then marked so that you know, during harvest, that these are the ones that have the same maturity. This is also done in places where bagging is practiced. This practice is currently widespread.” (Interview B5)<sup>13</sup>*

Table 8 summarizes the variety of paraphrases referring to the importance and the development of the dimension harvesting and handling. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. The overall importance of this dimension has been evaluated with 4.3/5 and the current development with 2.7/5 in the qualitative research. A brief summary of the importance and present development of all pre-harvest management dimension is illustrated in chapter 4.2.7.

**Table 8** Paraphrases concerning importance and development: Harvesting and handling

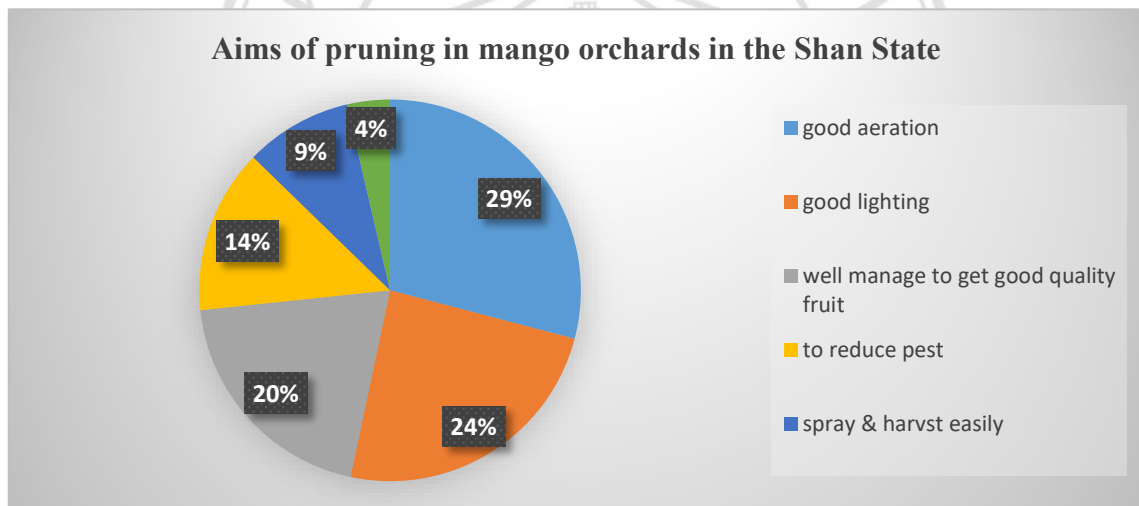
<b>Importance</b>	<b>Development</b>
<b>Handling of fruits is important to have a good product</b>	Harvesting and handling is far behind in Myanmar
<b>The challenge of a continuous mango supply has been recognized.</b>	Usage of secured bagging to harvest fruits with same maturity is applied in Myanmar by farmers producing for export markets
<b>Late season mangos in the Shan State enable higher prices</b>	Off-season production by flower induction is practiced in the Shan State
	There is a lack of collecting spaces, packing houses
	No documentation takes place

<sup>13</sup> Interview in German, own translation.

#### 4.2.6 Orchard Management (D 1.6)

Discussions within the qualitative interviews concerning orchard management focused on spacing between trees, pruning and hygiene. In this context, the results of the qualitative findings show that most of the orchards were planted with a spacing between 4.5 x 4.5 m and 6 x 6 m. 21.4 % of the orchards had a 4.5 x 4.5 m spacing, 19.8 % 5.4 x 5.4 m and 23.7 % a spacing of 6 x 6 m.

Weeding between the trees is primarily done manually (65.2 %) and machines are rarely used (8.7 %). As figure 18 illustrates pruning is conducted regularly to improve aeration (29 %), enhance light incidence (24 %), to reduce pests (14 %) and to improve the ease of spraying and harvesting (9 %).



**Figure 18** Aims of pruning in mango orchards in the Shan State (own)

The qualitative interviews emphasized the importance of pruning to improve the quality and quantity of marketable mangos. Pruning in early developmental stages of the mango trees increases the number of flowers (terminal buds), maintains tree health and ensures a more stable flowering cycle. Moreover, pruning with sterilized tools reduces fungus outside and inside the fruit due to better aeration and a higher light incidence improves fruit quality. Moreover, due to singling, fruit size can be influenced. Without hygienic tools, diseases can spread fast and easily. Particularly in commercial orchards with a high planting density, (4 x 4 m) pruning is essential but higher yields in

shorter times can be achieved. The interview partners agreed that orchards management techniques in the Shan State are already pretty evolved.

*“When I visited mango farms here in Myanmar they were very nicely pruned very nicely planted. Most of the farmers were aware of the intense cropping and traditional cropping with plant spacing between the trees. The spacing varies and depends on the farmer and the work they want to put in. The intensive farmers will plant about 4 meters and about 7 meters for traditional cropping. Intense farming is more work on maintenance but they can have a higher yield and shorter time. They maintain the tree shorter.”* (Interview B1)

*“Pruning is very important on mango trees. Pruning mangos both by using heading and thinning cuts will increase the number of branches and the number of flowers you will get. So starting the pruning process when the tress is young is crucial for mango production. Pruning also increases the number of terminal buds on a mango tree. But not only increase the number of flowers you will get in the future when the mango tree is growing but it is also proven that it distributes the hormones within the tree. That will allow the tree to have the proper amount of hormones within the tree to maintain a healthy, stable flowering cycle without use of any growth regulator.”* (Interview B1)

*“Next, there are practices such as the pruning. On one hand, this involves measures with a phytosanitary effect, for example on Fungus. With good ventilation, there are also fewer fungi. On the other hand, you get better fruit with the higher level lighting. The fruit size can also be influenced by the fact that you do ‘singling’ i.e. that you do not keep all the fruit on one panicle but only 1-2.”* (Interview B5)<sup>14</sup>

*“When you are pruning your trees and using the same tool without sterilizing between each tree you can spread this disease very easily and fast.”* (Interview B1)

*“For mango, the development in Myanmar is surprisingly evolved.”* (Interview B1)

*“Here we are doing quite a lot. Pruning, Hygiene, Protection”* (Interview B6)

<sup>14</sup> Interview in German, own translation.

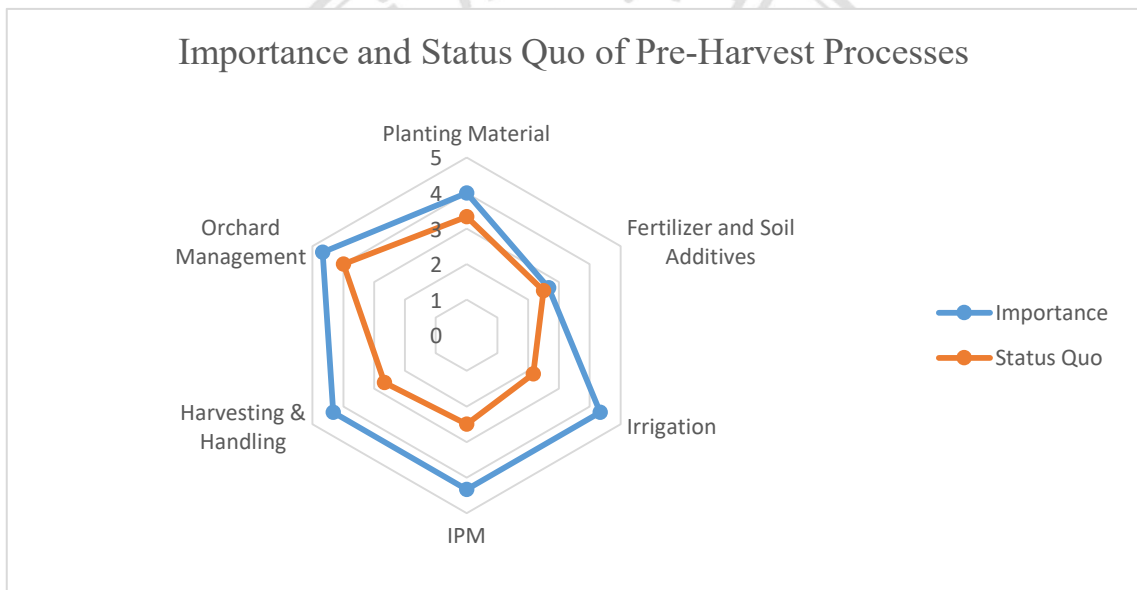
Table 9 summarizes the variety of paraphrases referring to the importance and the development of the dimension orchard management. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. The overall importance of this dimension has been evaluated with 4.7/5 and the current development with 4/5 in the qualitative research. A brief summary of the importance and present development of all pre-harvest management dimension is illustrated in chapter 4.2.7.

**Table 9** Paraphrases concerning importance and development: Orchard management

<b>Importance</b>	<b>Development</b>
<b>Pre-harvest practices like pest management, pruning, bagging, fertilization and irrigation have a significant influence on fruit quality</b>	Orchard Management is pretty evolved
<b>Pruning is important to reduce fungus, aeration, light incidence and fruit size (singling)</b>	Anthracnose is problematic
<b>Pruning, starting in early tree developmental stages is very important to increase the number of flowers (terminal buds), maintain tree health and a stable flowering cycle</b>	Good orchard management practices like pruning are practiced in Myanmar
<b>Using sterile tools is important</b>	
<b>Trainings in orchard management (pruning, hygiene and plant protection) are crucial for fruit quality</b>	
<b>Importance of mango for the livelihood of the farmers</b>	

#### 4.2.7 Evaluation of Pre-harvest Processes in the Shan State Myanmar

Figure 19 illustrates the evaluation of importance and status quo of pre-harvest processes in mango orchards in the Shan State, Myanmar by the interview partners of the qualitative research. The results are not representative, however they help to identify training requirements in relation to pre-harvest processes to produce high quality mango. Despite of the different fields of experience and origins of the respondents, the minimum and maximum values for the importance and the status quo were close together and differed by 1 point on the Likert Scale (from 1-5) at the most.



**Figure 19** Importance and Status Quo of Pre-Harvest Processes in the Shan State (own)

The interview partners identified a large scope for improvement within the dimensions irrigation, insect and pest management, harvesting and handling of mangos. Moreover, the interview partners agreed that mango farmers in the Shan State already reached an advanced level with regard to orchard management practices.

#### 4.2.8 Current post-harvest management practices and marketing

Regarding post-harvest management, the empirical findings show that corresponding practices are at an early stage of development. After the harvest, mangos are transported to outdoor collecting spaces. More than 98 % of the farmers have no adequate facility for post-harvest processing and 90 % of the farmers indicated that they do not have trained and skilled staff for post-harvest processing. Currently almost half of the farmers merely cover the harvested mangos with paper and put them into a basket. Approximately 15 % separate small and big sizes before wrapping the mangos with paper. This practice corresponds to actual market requirements where the size of the fruits and, to a minor extent, ripeness and packaging are demanded. The qualitative findings support these results and indicate, that farmers who are producing for export markets mark bagged mangos already in early stages to ensure similar degrees of ripeness when harvesting the fruits. Nonetheless, the lack of hygienic collecting spaces and systematic packinghouses to perform a targeted post-harvest management was underlined. The interview partners from the qualitative survey evaluated the current post-harvest handling in average with 2 out of 5 points.

Apart from discussion and descriptions of the current post-harvest handling processes, in particular sorting and grading, the interview partners emphasized the high awareness of farmers concerning the importance of post-harvest treatments and how field packinghouses or packinghouses should be constructed. Short-term suggestions for improvements targeted primarily appropriate packaging to reduce the impact of bumpy roads and a lack of infrastructure in general. Moreover, the suggestions included the establishment of hygienic field-packinghouses with a solid floor and separated areas for processing (sorting, grading, desapping and hot water treatment) to protect the fruit from fruit flies and fungus such as anthracnose.

*“They are often harvested into bamboo baskets. Then brought to a collection point, which is partly open-air, partly indoors but it is mostly just an unprotected space. Then they will be graded there and wrapped with paper and packed in disposable plastic crates and shipped to China.” (Interview B5)<sup>15</sup>*

<sup>15</sup> Interview in German, own translation.

*“The road is very bumpy. You have to teach them how to do better packing. Now there is a transportation problem in the country. Infrastructure is one main problem for domestic. We can solve this problem by packaging. Now they use baskets. They do not use plastics and transport takes many hours.”* (Interview B3)

*“There is currently high awareness of the farmers. About 90 % of the growers are aware of needs of hotwater treatment, grading, sorting etc. But only a few producers are able to do this sorting and grading with machines. Farmers do sorting and grading manually.”* (Interview B2)

*“As a bare minimum, the collection site should be hygienic. With a fixed support which is cleaned regularly. Then you have to have areas that are separated. Places where mangos are handled must be separated from common areas, from workers, from animals or from places where people are eating. So that you have appropriate hygienic standards. When the mangos are handled for more than 2 hours, you also need areas that are protected from fruit flies. Then you just have to have facilities to do some decent desapping, which means cutting the stems so that the latex sap flows out in a controlled manner and the mango is also immediately cleaned in slightly chlorinated water. Optimally with warm water around 55° in temperature, which also counteracts anthracnose.”* (Interview B5)<sup>16</sup>

The interview partners, who have been working closely with mango farmers, elaborated on recent developments in pioneer farmer groups installing field-packing houses. The results show that first, installing packinghouse sequences alone is not sufficient as the quality of fruits can only be maintained and not be improved by post-harvest handling processes. Thus, pre-harvest processes in mango production to produce high quality fruit and post-harvest handling processes require considerable attention in the Shan State. Secondly, it becomes obvious that installing field packinghouses with pioneer farmer groups and ownership by the farmers represents a first stepping-stone to a full packinghouse sequence. Finally, developments in the post-harvest handling have been initiated and currently take on momentum. However, these developments are currently in an initial stage and financing these developments is still a huge issue.

<sup>16</sup> Interview in German, own translation.



*“As we were starting our activities in the mango value chain, the biggest request from all farmers was: We need a packinghouse and all our problems will be solved. I was thinking maybe this is a little bit early. We are starting the value chain from the back. At first, we have to improve quality at the production level and maybe later on we can decide how we can improve the post-harvest handling. If you have low quality at the field level, you cannot improve it at the packing house. This was a longer way for lessons learned for them. We followed this path.” (Interview B6)*

*“Then the farmers realized that the focus shifted to quality and yield at first. Nowadays the momentum is coming. There is a group of leading farmers who say, we need the packinghouse now. This intervention needs time and maybe now is the moment. It may be part of our activities to facilitate the process.” (Interview B6)*

*“We have finally the first field-packing house under construction in Hopong and it is a group of 10-15 farmers that would like to use it together and combine it with Avocado. I think this is a good business case. The construction is done by them and we are supporting with inter alia a boiler for hot water treatment. The investment is coming almost fully by them and this is important for ownership. I would say that we plan 2-3 further field packinghouses in different areas. Hopong is a quite young mango farmer group. They even said that they would like to be recognized as a mango production area. They created direct linkages with traders coming directly to Hopong and even to the field-packing house to buy from there. This is now a very interesting process. It is quite young but like many things in Myanmar they are really coming up and now we can start and facilitate this process.” (Interview B6)*

*“Washing, sorting, grading, packing. My colleague was yesterday there. I think they prepared to set up the hot water treatment. They would like it to use it for this harvesting season already. There is power behind it. I am sure they will finalize it until the harvesting season.” (Interview B6)*

*“We started the process a couple of steps backwards. We said lets have some field packinghouses at first. This could be in future some satellites supplying the full packinghouses with cool storage and so on.” (Interview B6)*

Further suggestions for the development of post-harvest activities addressed ways to use fruits, which are rejected in the cross border trade with China to produce puree, juice and mango leather in processing facilities close to the Chinese border (yet to be established).

*“We want not only to increase quantity but also to get the same price as with international markets. Currently we have to rely on the cross border trade. We also want to increase the processed mango in Myanmar like mango juice, mango puree, and mango leather. So, in the cross border trade there is a lot of waste due to delays and the marketing power of the buyer. So we try to establish facilities to directly make the puree and bring it back to the middle of Myanmar.”* (Interview B2)

*“The trade volume compared to melon is only 40000 tons per year. Therefore, in the next coming 5 years we want to increase the export by at least three times. So this means also to increase productivity and quality of the product. In terms of quality product, we will focus on pre- and postharvest handling and also to reduce post-harvest losses to increase productivity volume.”* Interview B2)

Thus, in order to produce and process mangos for export in one line with GAP requirements, the imperative of installing facilities for the above illustrated packinghouse sequence (Chapter 2.3.2) becomes apparent. Moreover, quality and quantity of mango production needs to be increased and post-harvest losses reduced. According to the results of the quantitative study, 80 % of the farmers are willing to invest in their orchards to improve their mango production.

Table 10 summarizes the variety of paraphrases referring to the importance and the development of the dimension post-harvest management. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. Statements of interview partners from Thailand were assigned to describe the importance of the dimension. The current development of the post-harvest management in the Shan State has been evaluated with 2/5 in the qualitative research.

**Table 10** Paraphrases concerning importance and development: Post-harvest management

<b>Importance</b>	<b>Development</b>
<b>Improve quality and quantity of marketable fruits by pre- and post-harvest handling is crucial.</b>	Current post-harvest handling includes harvesting in bamboo baskets and transportation of the produce to outdoor collecting spaces. Then they are wrapped with paper and send to China.
<b>The road is very bumpy. You have to teach them how to do better packing.</b>	Post-harvest management is at an early stage and structures have to be developed.
<b>Packing-houses are a precondition for mango export</b>	Pioneer farmer groups request packinghouses and training
<b>Activities in the field packing house include washing, sorting, grading, packing</b>	There is a lack of hygienic collecting spaces and packing houses
<b>Pests and diseases are not a major problem in Thailand for export to Japan and Korea due to appropriate post-harvest treatments</b>	Improvement of post-harvest handling by hygienic collecting spaces and a packing house sequence is necessary in the Shan State.
<b>Improve fruit quality before considering packing houses as the quality level of the fruit can only be maintained not improved with packing house sequences</b>	No standards for post-harvest treatments and GAP are in place due to 28 years of isolation of Myanmar
	High awareness of the importance of post-harvest handling (hot water treatment, grading, sorting etc.), however manual sorting and grading.
	A dynamic development process in post-harvest handling started
	A first field packing house is currently under construction in Hopong financed by a farmer group. This might have spillover effects
	First Field packing houses should be installed and then a complete packing house sequence.
	Investors of packing houses are needed

### **4.3 Farmer joint action, cooperation and GAP certification**

Market and distribution data of the mango farms in the Shan State show that most of the farmers (> 69 %) sell mangos to foremost one customer coming from Yangon, Shan State or Muse for the border trade with China. In general, the mangos are transported in open trucks to the market and sold or handed over. 21 % of the farmers sell their produce directly at the farm gate. 57 % have no access to recent price information and 53 % of the farmers are not able to negotiate the price for their produce resulting in low farm gate prices. Moreover, 40 % of the farmers have no experience in collaborating with other farmers (for example collective marketing) and marketing strategies to approach new customers. 33 % of the farmers transport their produce together with other farmers. Nonetheless, more than 30 % of the farmers aim at diversifying their sales channels by export, engaging in cluster groups or farmer associations and direct sales to Muse and wholesale markets thus skipping middle men (figure 1, chapter 2.1.2).

In order to identify possible development strains in the qualitative research, different ways of farmer cooperation in one line with chapter 2.4.1 have been discussed for the Myanmar context. Moreover, results from qualitative interviews conducted in Thailand helped to enrich the picture with a glance at the development trajectory of the export mango sector in Thailand.

#### **4.3.1 Joint action and cooperation among farmers (D 3.1)**

Currently cooperation among farmers and between farmers and further actors (chapter 4.3.2) in the mango value chain plays a marginal role in the Shan State, Myanmar. Notwithstanding, the results of the qualitative study show that cooperative activities and structures start to evolve in pioneer farmer groups. The interview partners illustrated different examples highlighting the benefits and surpluses of organized cooperation. These include the collective purchase of quality inputs and related group discounts, collective trainings concerning pre- and postharvest management practices and cooperation in collecting and selling fruits. Moreover, one farmer group started to introduce a revolving fund to counteract the shortage of financial support that most of the farmers face. In sum, all interview partners agreed upon the important role of strong

farmer groups to strengthen the farmers bargaining power and position in the upcoming value chain.

*“The MFVP has a total of 31 clusters where experience is exchanged and where people train together. No, this takes place right at the beginning (for example at the joint purchase of inputs).*

*This is just a basic form of organization, so that the farmers, or the packers in some cases, can be set up together. All the other services and who can provide what service, that is all being discussed.” (Interview B4)<sup>17</sup>*

*“Let us say, these are young plants. We have a cluster group Southern Shan State that is quite well organized. There is a secretary and they have a structure. They are getting an office soon and there is exchange and collaboration. At the last stakeholder workshop there was a forum for instance with input suppliers. This was a request from them and this was a perfect workshop in that case. We developed together a list of inputs, which are necessary for export to Europe. We invited input suppliers to the forum who are importing quality inputs like Bayer, BASF. There we could create a link. The farmers realized that they can get better prices and discounts and I think two groups started to negotiate and buy already inputs. I would say this is the first step. This I would like to strengthen for the future. Here you can see a surplus to be organized and not to do everything on their own. I think that’s a good lesson learned. There are others examples already but it’s quite in an early stage when you compare it to Thailand.” (Interview B6)*

*“Yes, in some groups. In the southern Shan State there are 6 mango grower groups. Like the Hae Ho grower group. Some groups are very active by buying together from one input supplier and also collecting fruits and selling collectively. Trading collectively.” (Interview B2)*

<sup>17</sup> Interview in German, own translation.

*“Within a farmer group, the farmers have a revolving fund for smaller investments. Everybody pays something and they [the farmer group] decide who will get some money for investments. This is a structure I think it’s very good and this is something I would like to support somehow to strengthen it. This is really coming from the group. From my point of view, organizational development, strengthening of the group is one of the important activities.” (Interview B6)*

*“Farmers get higher prices, earn more and are in stronger positions if they join the group.” (Interview B3)*

With regard to the two options of GAP certification – individual and group certification (chapter 2.2) farmers in the pilot farmer groups opt for an individual certification despite of the advantages of the group certification such as lower certification costs. The reasons are the tough requirements of the internal control system and the potential loss of ownership to a donor who is financially supporting the certification process. In this context the interview partners referred to the high financial burdens related to a GlobalGAP certification and related investments in farm infrastructure. For the future, group certifications were considered as a viable and reasonable option for mango farmers in the Shan State.

*“Some growers have very good mechanisms for this [cooperation], some have not. Some stay with their old individual approach.” (Interview B2)*

*“No. This is a big gap here in the country. We discussed it several times and I hope that we can develop in future together with the public sector somehow a program to provide some financial assistance in this case. It is really important. For the certification, for irrigation investment, for inputs and for whatever.” (Interview B6)*

*“I see in future a chance for a group certification if the farmers know what it means and how to do it. I think they are afraid of the internal control system and to install it. This was one of the discussions that they say that they do not have the capacity or we need somebody.” (Interview B 6)*

*“That’s why it was a good approach to have the exporter included in this case. They participate and a trustful relationship could grow. It is a step by step learning*

*process. The farmer decided no we don't like to have a group certification because this is owned by the exporter and we would like to be independent. This was the first statement. It's ok. Then let us go for single certification but then of cause the part of the export company was reduced.” (Interview B6)*

*“Probably in future maybe in 2-3 years’ time it would be possible to have group certificates in some of the groups. Other mango zones requested additional trainings for GlobalGAP. There is a process starting.” (Interview B6)*

Table 11 summarizes the variety of paraphrases referring to the importance and the development of the dimension joint action and cooperation among farmers. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. Statements of interview partners from Thailand were assigned to describe the importance of the dimension.

**Table 11** Paraphrases concerning importance and development: Joint action and cooperation among farmers

<b>Importance</b>	<b>Development</b>
<b>Both farmer organization and/or cooperation with external actors are important.</b>	Farmer cooperation is at an initial stage in the Shan State
<b>Strong farmer associations are needed within the clusters to “protect” the farmers’ rights</b>	There are several surpluses of being organized. Advantages of farmer cooperation in a pioneer farmer group include buying inputs together, lower prices and greater bargaining power.
<b>Farmers get higher prices, earn more and are in stronger positions when joining a farmer group</b>	Some grower groups started to buy inputs together and jointly collect fruits and sell them
<b>Farmers lack access financial resources</b>	One pioneer farmer group established an evolving fund for smaller investments.
<b>Pilot Plots with market access can have a multiplication effect.</b>	Pioneer farmer groups request packinghouses and training
<b>Support of pilot groups can trigger spillover effects</b>	Farmers are very receptive to external knowledge as they benefited a lot from it so far.
<b>In Thailand many clusters are organized as cooperative, not all</b>	A first field packing house is currently under construction in Hopong financed by a farmer group.

#### 4.3.2 Cooperation with further actors (D 3.2)

The interview partners from Myanmar confirmed the actors and actor relationships illustrated in figure 1 and indicated that today only few exporting companies exist. In contrast, to the farmers' concerns about ownership (chapter 4.3.1) the interviews in Thailand emphasized the vital role of the exporters and the cooperation between farmer groups and exporters that developed during the past two decades in Thailand.

Thai mango grower groups evolved gradually and in 2008 the Thai Mango Growers Association was established. Currently 20 grower groups throughout the country exist. Each group is managed by a committee to set up policies and coordinate activities of the group. Some of the groups are organized as cooperatives, others as community business groups. The farmer groups have a strong position and bargaining power within the value chain. Moreover, in order to guarantee a year-round mango supply, the mango grower groups coordinate mango harvesting throughout the country benefiting from different climate conditions within Thailand.

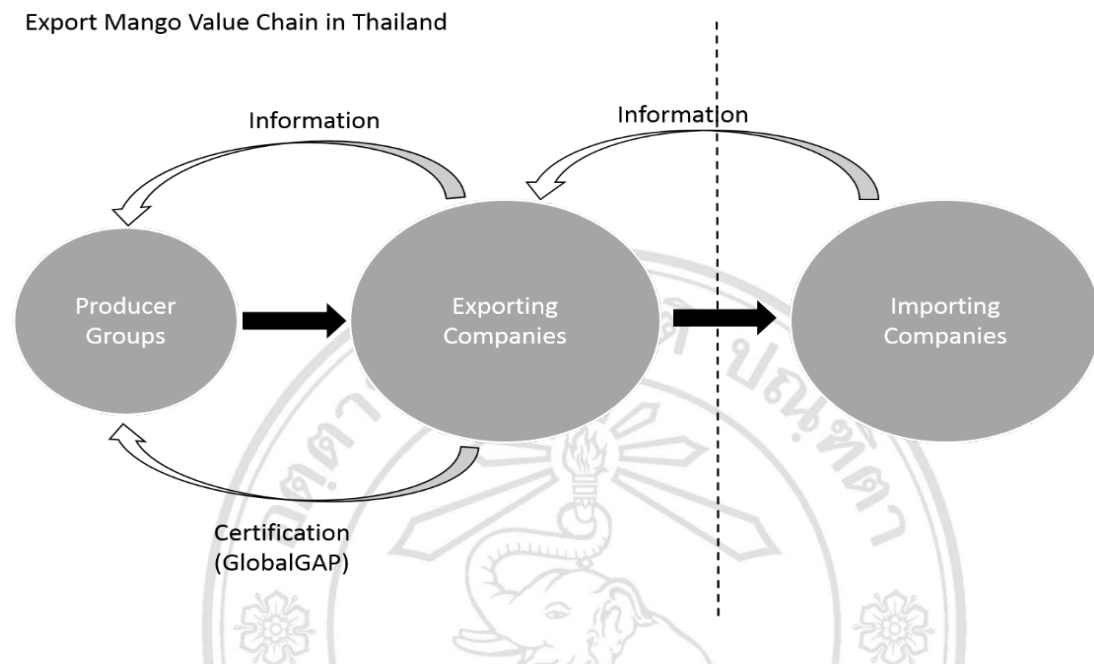
*“They share the profit. The Association of mango farmers are quite strong. They have power because they can talk to every cluster in Thailand for exporting. Now there is a very good information exchange between the cluster and the exporter. Mango should be an example for a lot of crops. It's the best at the moment.”* (Interview B3)

*“They [grower groups] are spread all over the country. In the East, in the northeast and in the north. So many group of mango growers. There is a difference in climate at different places in Thailand. We can harvest mango now in the northeast than the harvest moves to Angthong and Phitsanulok and then to Chiang Mai. Chiang Rai is the last harvesting. We have mango grower association for mango grower and exporter. They have a meeting every year. They discuss the mango production.”* (Interview B3)

Figure 20, which was developed in one interview sketches the export value chain of Thai mangos and the importance of the information flow concerning regulations and quality requirements as well as the supporting function of exporting companies. In this construct the local exporting and foreign importing companies act as



intermediaries forwarding information about quality preferences of the consumers and supporting farmer groups by implementing activities to comply with these preferences.



**Figure 20** Flow of information in the export mango value chain in Thailand (own)

In case of (Thai) mango export to Japan, the exporters arrange post-harvest activities including sorting, grading, HWT, VHT, cooling, packaging and labeling. In addition, a close cooperation between mango groups and exporters (contract farming and sharing of information concerning legal agrochemical restrictions and certification requirements) ensures an efficient coordination of mango supply and demand. Costs for GlobalGAP certification and re-certification of grower groups are borne by the exporters and the grower groups targeting mango export are group certified. The interview partners emphasized that financing the GlobalGAP certification represents a significant burden for farmers, in particular as farmers that are not certified yet, are unable to benefit from higher prices for their produce. As illustrated in chapter 2.2.3 the support by exporters ensures the highest recertification rates. Moreover, the interviews on the actor structure in Thailand illustrated that the exporting companies emerged due to private investment and grew organically with an increasing international mango demand during the past decade.

*“Middleman kind of represent the qualitative preferences of consumers. They [exporter] care most about the taste of the product whether they can export the product or not.” (Interview B7)*

*“The knowledge, what the consumer needs is from the exporter. Therefore, the exporter says 3 fruits and the skin should have no bruise or scar. They were complaining at the beginning. Thai people eat mango from the basket having bruises and black spot. They were complaining and not many people joined with the company [exporter]. So the company [exporter] had to do clustering. They grouped the farmers together and do certifications like GlobalGAP.” (Interview B3)*

*“The companies [exporters] have stuff for training and pay third parties to certify. The company exporter pay for training and for the third party. The exporter know what is important and what the buyer needs. For example. the importers require certification, so the exporters organize certification.” (Interview B3)*

*“Yes, group certified.” (Interview B3)*

*“The exporters did the clustering and put money for certification. 100000 [Thai Baht] is at lot for farmers. Also in comparison to the mango price of 10 Baht. The farmers could not afford to pay for the certification.” (Interview B3)*

*“The activities the collecting, pre-grading is done from the farmers. The exporters to the desapping HWT, HVT. The sap has to be removed. Otherwise, the producer makes a mess on the fruit. Very sticky and after ripening is doesn't look good anymore. It should be clean, no scratch no black mold. Everything should be done here. The final treatment.” (Interview B3)*

*“Most of the export companies are private family businesses. Exporters became rich men during this development.” (Interview B3)*

In sum, today's competitiveness of the Thai mango value chain is considerably enhanced by a close collaboration of different stakeholders. This collaboration ensures an efficient product and information flow along the value chain.

During early stages of the development of the mango sector in Thailand price incentives set by the exporters stimulated farmer and farmer groups to improve the quality of their fruits and in the long run to diversify their marketing channels. The interviews highlighted, that missing market linkages and price incentives could end up in a downward spiral of low production quality resulting in low demand for the produce and a lack of incentives for farmers to improve their production (chicken and egg metaphor).

*“In general we export to Hong Kong at the beginning. Hong Kong, Singapore just our neighbors. Later on with the help of export companies. In fact, there was an association for fruit and vegetable for export that set up a system to export to Europe, Japan and the US. At this time, the EU was the most difficult market to export to because of the vast amount of regulation. The Thai had to understand about the regulation and rules of exporting to Europe. However, for Exporting to Singapore and Hong Kong is shorter distance and very loose regulation. At that time, we know almost nothing. So we just produced for our domestic consumption at the beginning. After exporting to Hong Kong and Singapore for some years the exporter were more experienced about Japan and Europe. The prices are triple not only double. You can imagine mango at that time in Thailand was 10 Baht a kilogram. So the exporter said, ok we make 35 Baht a kg. The farmers said we are not going to sleep in the house. We are going to sleep under the mango tree because some people might come and steal the mango. So they had to sleep under the mango tree because so expensive - 35 Baht.”*  
(Interview B3)

*“The best way for them is to have a consumer demand. Without having a good quality, they won't have a market demand. It's like chicken and egg. I saw this in the case of pomelo also. I was comparing the cases of 2 communities. One was exporting their pomelos to China. The other was selling their pomelo only domestically. The farmers were complaining. Because of the lack of market, they were not willing to improve their production. But without making such efforts, they cannot improve their quality in order to get better markets. Due to their past dependency, where they have been constrained by difficult economic conditions they are less likely to invest in their*

*production. So their production quality remains low, nobody would come to their community to export their products.” (Interview B7)*

In Myanmar, as illustrated in the previous chapter (chapter 4.2), farmers are willing to invest and started to improve their mango production and post-harvest handling processes. The interview partners stated that the mango cluster is one of the strongest clusters in the Shan State with strong linkages to the ministry of industry and trade promotion and the ministry of agriculture. Currently the number of exporting companies is limited but they start to evolve. Nonetheless, developing export markets represents a long-term process. With a developing value chain for mango it is likely that there will be a growing demand for GAP certifications, new technologies, post-harvest management facilities and cool chain systems. However, up to now it is open which actor(s) will fill this gap and how the value chain of mango in Myanmar will develop. In this context, the interview partners in Myanmar emphasized the great importance of strong farmer groups and the collaboration with exporting companies. Furthermore, it is necessary to strengthen existing local structures by establishing pilot projects with market linkages to generate spill-over effects and local role models for other farmer groups.

*“There are no strong associations that say we negotiate and we do lobbying. However, they do it in the structure of MFVP in Yangon. There are strong cluster groups. The mango cluster is one of the strongest in Shan State. There are linkages, they have quite good collaboration with the ministry of industry and trade promotion and with the ministry of agriculture. Now we have to strengthen the regional structures.” (Interview B6)*

*“The main problem is and that is of cause not easy to solve: How do they get the cost back for better price of GlobalGAP certified products. This is the weakest point in the discussion, even with the exporter. They are not providing high expectations that they get really a higher price. I think that needs time. This is market development, export market development. It is a learning process as well. But more or less this is a crucial topic for the producer. Do I get the invested money back?” (Interview B6)*

*“Well, I would rather approach the situation this way: Which structures are already there and are working? There is no standard model, the situation can look very differently according to the features of the cluster. There may be groups of farmers, who are relatively well organized but there may be other companies, larger companies, who are relatively well organized and include the farmers into the learning process. This is case by case.” (Interview B4)<sup>18</sup>*

*“Within Myanmar you have a very little number of exporters. We are collaborating with one company and one farmer group in Yatsauk, Shan State.” (Interview B2)*

*“To be successful the exporter and producer have to work together.” (Interview B3)*

*“For all we know it's best to have a few representative pilot projects somewhere and they should have market access integrated into them. Because if such a pilot project does work properly, it's easy to encourage a multiplication effect, because many farmers will find it interesting: ‘Look at what he has done and he has already landed on a given market. Can't we do something similar?’*

*And one should also be careful not to distort the market. So you should be aware of that and avoid subsidizing it too much. You should think carefully: ‘How do I choose my pilot projects? With whom should I work together, so that I can get into the market much easier? What service provider should I boost, if you have local partners, in order to diversify?’.” (Interview B4)<sup>19</sup>*

Table 12 summarizes the variety of paraphrases referring to the importance and the development of the dimension cooperation with further actors. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. Statements of interview partners from Thailand were assigned to describe the importance of the dimension to contrast the current development in the Shan State.

<sup>18</sup> Interview in German, own translation.

<sup>19</sup> Interview in German, own translation.

**Table 12** Paraphrases concerning importance and development: Cooperation with further actors

<b>Importance</b>	<b>Development</b>
<b>Strong farmer groups and clustering can help farmers to get higher prices and stronger positions in the value chain</b>	Clustering aims to foster cooperation between farmers and further value chain actors. The MFVP has 7 branches today
<b>Exporters strengthened clustering of farmers and farmers' groups in Thailand</b>	Pilot GlobalGAP certification with farmer group-exporter cooperation started with a pioneer group.
<b>Knowledge transfer from the exporter to the farmers is crucial</b>	The extension services are doing a good work in Myanmar
<b>Both farmer organization and/or cooperation with external actors are important.</b>	Establishment of PPP in Mango clusters is needed.
<b>Strongest cooperation for certification are group certifications with exporters</b>	Currently low number of exporters in Myanmar
<b>For export the Thai Farmers depended on financial assistance from exporters due to high costs for certification and recertification.</b>	Generally, no strong cooperation in Myanmar. The Mango cluster in the Shan State is one of the strongest clusters. It is important to strengthen regional structures.
<b>Middlemen like exporters represent the taste and preferences of consumers</b>	MFVP fosters exchange
<b>In Thailand clustering efforts from the exporters were efficient than from the DOA also in relation to cover certification costs.</b>	
<b>In Thailand advanced post-harvest treatments are conducted by the exporter</b>	
<b>In Thailand exporters evolved organically by growth of family businesses.</b>	
<b>In Thailand trainings and certification is organized by the exporters in cooperation with the farmers</b>	
<b>Strong farmer associations in Thailand. The price-premium for export is shared between farmers and exporters</b>	
<b>Strongest cooperation for certification are group certifications with exporters</b>	

#### 4.3.3 GAP Certification – Public and GlobalGAP in Myanmar (D. 3.3)

Currently 96 % of the farmers in the Shan State, Myanmar have no certification scheme in place and more than 70 % of the farmers keep no records of farm activities. The qualitative interviews highlight that in the short and long run it will be essential for mango farmers to implement GAP certification. Even though GAP certification does not primarily target the quality of specific fruits, training opportunities and better knowledge concerning necessary pre- and post-harvest processes and a more sustainable production are provided for farmers within GAP certification processes. However, better market opportunities and better prices for the certified produce have to outweigh the costs of certification.

*“The protocol of GAP recommendations is standardized for any crop. It is used for any crop under any condition based on a singular format. The GAP is not for the case-by-case mayors to improve the quality. It is more like a minimum sort of standard to avoid dangerous conditions that could adversely affect human health for example. It is not so much about to improve the quality of the produce. There is a possibility that even farmers get certified, they cannot sell well because of a low quality.”* (Interview B7)

*“Yes, if possible to do is better to install in any place I think. Certainly, farmers run something better. They can avoid of doing something redundant like overuse of pesticides or like misuse of pesticides. Therefore, I think it is certainly a good thing because GAP provides basically training opportunities for farmers, better knowledge. Normally, as far as my experiences are in Thailand and Malaysia farmers best interest is economic through GAP trainings or certifications they want to get a better price or more export opportunities after receiving the training or certification. Otherwise, they tend to see this as rather redundant or not very useful.”* (Interview B7)

Two interview partners elaborated on the changing export requirements and increasing quality awareness in the Chinese market. Today 95 % of the mangos are exported to China (chapter 2.1.1) and in the near future certification will be progressively required for the export to China. This in turn is likely to enable certified farmers from Myanmar to diversity and demand higher prices for border trade with China.

*“It becomes clear, quality is a must, even for the export to china. It is not like it was in the past. We had a very good discussion at the stakeholder workshop with Muse border traders as well. They say it’s not like in the past when China was taking everything. There is now a real quality awareness even for the Chinese Market. It’s a question of time that they are requesting certificates as well.”* (Interview B6)

*“The supplies to China would have to be lifted up to another level. If you consider that, the farm-gate-price in Thailand is 4 or 5 times higher for EU-Export mangoes than for border trade prices to China, people think that’s an interesting potential that you can leverage. But you can, without dreaming too far, raise the selling price in China just by doing the right things.”* (Interview B4)<sup>20</sup>

*“It’s not like that there is a strategy that is implemented 1:1. What I said yesterday very clearly, there are three main challenges. Mango farmers export mainly to China. 40,000 tons or so go to China – which corresponds to 90 or 95% of exported volume. From the mangos, only a minimal percentage goes to Singapore. The sales price of farmers is totally low, as there are almost no market alternatives due to the lacking logistics, quality infrastructure and standards in place.”* (Interview B4)<sup>21</sup>

Moreover, this discourse is closely linked to the debate of the interview partners concerning the implementation of a public (Myanmar)GAP or GlobalGAP (chapter 2.2.3). The interview partners did not consider the two options of certifications as antagonists. A preliminary introduction of a public version of GAP with less strict compliance criteria was rather considered as a stepping-stone for a future GlobalGAP certification of farmers. On the one hand, certification costs of public GAPs are significantly lower than certification cost of GlobalGAP and thus representing lower entry barriers for small-scale farmers. On the other hand, test GlobalGAP certification with pioneer farmer groups showed the complex nature of GlobalGAP certification leading to delays and that only a small number of the farmers were able to correspond to the certification criteria. Concerning the export of mangos the interview partners emphasized to tackle the local market in Myanmar and Asian countries with lower import criteria at first before trying to export to markets with the highest requirements like Japan, Korea and EU. This agrees with the argumentation in chapter 4.2.8,

<sup>20</sup> Interview in German, own translation

<sup>21</sup> Interview in German, own translation



where a systematic post-harvest management, a precondition for mango export, has yet to be developed. Regarding local mango trade, the competitive advantage of the Shan State, namely late season mangos, has been emphasized

*“Of cause this [MyanmarGAP] is much cheaper than GlobalGAP.”* (Interview B6)

*“Is it still a long way to get the certification. It’s a learning process and a small number. I think 5 farmer are now ready to continue.”* (Interview B6)

*“These are two completely different things. GAP is a standard, that is, it is either a national GAP or an ASEAN GAP where its competent authority is the Ministry of Agriculture and GlobalGAP is a voluntary standard, where companies simply say they want to reach above the normal mandatory standard and set additional standards, such as GLOBALGAP, for almost all retail chains in Europe to distribute the product. They are two completely different things. The idea or concept is that it should be the case that a scaled-down version of GlobalGAP, like a national GAP version, should be equalized. National and Regional and then all who have that, can then get a global GAP certification much easier. In a country like Myanmar, GAP Certification won’t happen overnight for the majority of farms in one sub-sector or value chain. It is actually a long process, involving several public and private stakeholders.”* (Interview B4)<sup>22</sup>

*“Nevermind, I think this could be a first step for farmers who would like to go for export. Starting with Myanmar GAP and maybe the next step would be GlobalGAP. The benchmarking process takes time and nobody knows now about MyanmarGAP but I think it’s a good preparation for farmers to get an idea about what does it mean to get a certificate and then to continue later on for the export market.”* (Interview B6)

*“You have to diversify, but just thinking, that you should now supply Japan or Europe, without having previously assessed neighboring countries systematically, is in my opinion, risky. This is something that some, well-positioned companies might be able to do, who also have the financial capacity to do so, but I wonder whether it is realistic to think that in the next season, much of the Myanmar production can be delivered to Japan or Europe. You don’t need to start with the most difficult thing first.”* (Interview B4)<sup>23</sup>

<sup>22</sup> Interview in German, own translation

<sup>23</sup> Interview in German, own translation

Changing political agendas, the lack of a general roadmap for the introduction of GAP in Myanmar as well as the lack of financial resources were mentioned as major political hindrances for the introduction of GAP in Myanmar.

*“We also have to put in consideration that now the ministry of agriculture is changing ideas after election again to let us say promote MyanmarGAP now. It was in consideration but the former Minister did not put priority on that. We were already in a long discussion with Department of Agriculture, the DDG and DG, how to promote or how to emphasize a Myanmar GAP. Now this is getting step by step on a way as well and they started some trainings and some soil sample tests.”* (Interview B6)

*“There are several initiatives to do something involving GAP, coached by international organizations or even by universities or the Ministry. But there is no master plan or no unified understanding of who is responsible for which area. Usually the case is, that there is a so-called competent authority. There is now a very long discussion in the region: How can standards be accredited? How can standards be implemented? How can standards within ASEAN be unified so that trade between different countries is possible?”* (Interview B4)<sup>24</sup>

*“I think probably the lack of funding at a national scale. Farmers are poor but the government is also poor. For this project to be implemented you need human power. For which you need money. I think this will going to be a challenge.”* (Interview B7)

Table 13 summarizes the variety of paraphrases referring to the importance and the development of the dimension GAP certification. The paraphrases were developed from the statements of the interview partners of the qualitative research and express the variety of opinions of the interview partners. Statements of interview partners from Thailand were assigned to describe the importance of the dimension to contrast the current development in the Shan State.

**Table 13** Paraphrases concerning importance and development: GAP certification

<b>Importance</b>	<b>Development</b>
<b>Thailand exported at first to its neighbors and later to Japan and Europe due to high regulation requirements and with the help of exporters</b>	China is the major export market. ASEAN markets should be approached in the near future. Japan and Korea are currently too ambitious concerning market requirements.
<b>Strongest cooperation for certification are group certifications with exporters</b>	Farmers in the Shan State prefer single [GlobalGAP] certification due to ownership
<b>In Thailand farmers are group certified</b>	Farmer fear internal control system
<b>The question for farmers persists if they can recover high GlobalGAP certification investments with higher prices?</b>	GlobalGAP currently represents a blackbox for farmers in the Shan State
<b>Its beneficial to install GAP in Myanmar</b>	Training and introduction for Farmers to GAP are needed.
<b>Quality is not at the heart of a GAP certification.</b>	Pilot GlobalGAP certification with farmer group-exporter cooperation started with a pioneer group
<b>Korea and Japan are difficult markets</b>	First pilot certification for Farmers was planned in May/June 2016 but has been extended to 2017 due to complexity.
<b>MyanmarGAP is cheaper than GlobalGAP for farmers</b>	Long way to establish GlobalGAP certification in the Shan State
<b>MyanmarGAP represents a stepping stone to GlobalGAP certification.</b>	Currently exists no masterplan (roadmap) and political responsibility for GAP introduction in Myanmar.
<b>Also consider the local market as distribution channel</b>	Mango sales to China dominate the current export