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Gendered Division of Labour in Homegardens in Calakmul, Campeche, Mexico

Master Thesis

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1. Introduction

"Rural women are the main producers of the world's staple crops - rice, wheat, maize…"(UNEP 2011). Since the beginning of agriculture women have been managers of garden plots and fields (LASTARRIA-CORNHIEL 2006), but their role in farming was considered as being of little importance until the Rio Earth Summit in 1992. Although women are mostly responsible for making a living by cultivating plots, they are underprivileged in terms of having access to natural resources (HAMILTON 2006). The United Nation Organisation defined gender equality and women's empowerment as the third Millennium Development Goal (UNO 2010).

Gender relationships the influence organisation of farm work, they determine access to land and are the base for the management of assets, such as seeds (FARNWORTH and HUTCHINGS 2009). Concentrating on the gendered division of labour helps to understand gender differences and dynamics regarding gender relations (GOEBEL 2006).

In the last decades biodiversity has been reduced rapidly by human activities (UNESCO 2007), however a broad base of genetic diversity within domesticated species is fundamental for food security for humanity. Homegardens, which are defined as a typical type of traditional agroecosystems are considered as managed plots of high biodiversity, thus play a crucial role in the conservation of this biodiversity (HUAI and HAMILTON 2008). Due to their diversity, homegardens provide food and medicinal plants, fuel fibres and other plant resources to meet both "material and cultural needs" (HOWARD 2003: 4). Holding specialized knowledge about genetic resources women are *"…essential custodians of agro-bioversity"* (UNEP 2011).

This master thesis deals with the gender division of labour in two rural communities in Mexico. It gives an insight into how people make a living in this region and both women's and men's contribution to it. It focuses on the gendered decision-making power regarding homegarden management and the gendered responsibilities within the household.

This master thesis queues up with international organizations to point out women's role in small-scale agriculture worldwide and their importance for maintaining livelihood in rural areas.

1.1. Personal approach

Being interested in land use and agriculture I decided to study at the University of Natural Resources and Life Sciences in Vienna. By attending various lectures about organic farming, subsistence production and the like I came to the conclusion that small scale, high diverse organic agriculture is the way to ensure the survival of humanity.

During a seminar by Dr. Christian Vogl which dealt with agricultural and cultural ecology I plugged into the idea of focusing on a topic regarding local knowledge within my master thesis. After having read scientific articles I decided to write about gender relations in small-scale agricultural systems. In conversation with my supervisor Dr. Christian Vogl and my co-supervisor José Armando Alayón Gamboa I decided to base my master thesis on the issue of gendered division of labour in homegardens.

Thanks to the good relations between Christian Vogl and José Armando Alayón Gamboa I got the chance to carry out the fieldwork in Mexico. Retrospectively, I am glad about this great opportunity to work with people in Mexico and by doing so getting a deeper insight into their daily life.

As a woman I regard it as my duty to highlight women's achievements, which are often overlooked and ignored and to take a stand for gender equality and women's empowerment.

1.2. Problem definition

1.2.1. Women's role in farming and food production

"*Women's role in plant management and conservation may be as agriculture itself"* (GREENBERG: 2003: 51). However, women have been ignored as food producers and as those who maintain livelihood. Hence, women were often overlooked by politicians and excluded from land reform programs (HAMILTON 2001). Programs to support the commercialisation of products of small-scale agricultural systems are focused on male partners (HAMILTON 2001). Due to the fact that homegardens are rarely exclusively women dominated, and that scientific research is gender biased, researchers often overlook the role of women in homegardens (REYES-GARCIA *et al.* 2010).

VOGL emphasizes women's importance in the entire system of subsistence production. Beside tasks to be done in the kitchen, the upbringing of the children, the care of animals in the homegarden, women are also responsible for essential tasks to be realized in the homegarden. They decide on the zoning of the garden and where to cultivate which plants, they plant ornamental and medicinal plants and, are responsible for firewood.

To sum up: "*women play a silent but active role in food production and management of plant genetic re- sources"* (TSEGAYE 1997: 224).

1.2.2. Conservation of biodiversity

Worldwide, women predominantly manage most of the plant resources used by humans. That is why women hold a tremendous knowledge about plants and are primarily responsible for the *in situ* conservation of useful plants (HOWARD 2003b). Many crops have been domesticated in Mesoamerica. This region is considered a hot spot of genetic diversity (GREENBERG: 2003). Due to a shift from subsistence to cash economy and a change in food consumption, the food system changes. Thus the cultivation of traditional crops grown for domestic use and for sale decrease. As a result traditional crops become undervalued and are considered as 'minor' crops, secondary to major staple crops (HOWARD 2003b) and are considered as only fit for the poor (SOEMARWOTO and CONWAY 1992). In a subsistence economy, where there is mutual support and security, the appeal of traditional food crops is high and obvious, but changing to a cash economy and to the purchase of processed food alters the food system. Roles change and with them the type and amount of food grown for domestic use, for social use and for sale. Changes, however slight, may disrupt daily household routines. The domestic processing of traditional grains is labour intensive; when time is short women prefer wheat bread, rice or maize, which are easier to process. As agrobiodiversity is the part of biodiversity, which results from agricultural practice and food production, it depends on human action, both positive and negative (HENSHALL MOMSEN 2007).

Biodiversity is threatened by the globalise market which leads to a standardization and specialisation. It focuses on short-term earnings instead of considering the importance of an ecosystem (HOWARD 2003). Depending on both cultivated and wild plant resources for making a living, poor women in remote areas of the world are primary affected a loss of biodiversity (DANIGGELIS 2003). *"Indigenous women's welfare and social status is strongly related to their management of plant biodiversity and their plant related contribution to subsistence…"* (HOWARD 2003a: 27). Thus as a consequence of the loss of biodiversity gender roles are changing as well as women's social status.

As a refuge for crops homegardens are perceived as important locales for biodiversity conservation. Various authors have examined the species diversity in homegardens and highlighted their importance as a place for conservation of biodiversity (HENSHALL MOMSEN 2006, LEVASSEUR and OLIVIER 2000, SOEMARWOTO and CONWAY 1992, TRINH *et al.* 2003).

New varieties may increase yields, however they may not meet all needs, nor provide (by-) products used for handicrafts. Thus cultural practices are often abandoned and eventually

they get lost. HENSHALL MOMSEN (2007:2) connects genetic with cultural erosion and a change in women's roles: "*genetic erosion is tantamount to a form of cultural erosion that, ultimately, may result in loss of social status for women by reducing their ability to prepare traditional foods, and to make craft items"* .

1.2.3. Conservation of local knowledge

Local knowledge is at risk of vanishing as people change their traditional way of life and their traditional agricultural practices (BENJAMIN 2000). Knowledge such as ethno botanical or ethno biological knowledge varies between men and women and depends on several aspects, such as kinship, age, social status or ethnicity (HOWARD 2003a). The preservation of culture and the preservation of biodiversity go hand in hand. Non-documented traditional knowledge is transmitted from one generation to the next. As it is often not committed to paper, it will vanish if (young) people neither use their knowledge nor transmit it to their offspring.

1.2.4. Food security and subsistence production

Food security goes hand in hand with gender relationships and biodiversity. Dependence on few staple foods may result in serious socio-economic problems when it comes to major crop failure (SOEMARWOTO and CONWAY 1992). Generally women are responsible for food security (FARNWORTH and HUTCHINGS 2009, TSEGAYE 1997). Especially in rural areas, food security is a question of subsistence production (NICHTERL 2001). Being as old as human civilization and plant domestication (NIÑEZ1984a) homegardens are still of considerable importance to subsistence production (VOGL and VOGL-LUKASSER, 2002). Homegardens are in vivo gene banks, they contribute to food security and can potentially improve nutrition (CORZO MÁRQUEZ and SCHWARTZ 2008). For a long time the homegarden has been ignored as "legitimate area of research" (NIÑEZ1984a) and has not paid scientific attention. Since the issue household food security gained more and more importance, homegardens in tropical regions have come to be a subject of scientific interest (DRESCHER 1998).

1.3. Objectives and research questions

The following enumeration lists the aims and objectives of this thesis.

1.3.1. Objective 1: Brief description of investigated homegardens (location, size, appearance)

- What do the homegardens look like?
- What kind of different areas do homegardens consist of?
- Who designed them?
- Who uses them?

1.3.2. Objective 2: Description of the tasks to be realized in homegardens and the gender division of labour.

- What are the tasks to be realized in the homegarden?
- Which task has to be realized at what time of the year (seasonality of tasks?)
- Who is responsible for which task in the garden?

1.3.3. Objective 3: Documentation of the importance of homegardens for the subsistence production of their managers.

- Why do gardeners cultivate their homegardens?
- What are the homegardens used for?
- What are the garden products cultivated for?

1.3.4. Objective 4: Documentation of gendered spheres within the household

- What is women's role within the family?
- What is men's role within the family?

2. State of the art

2.1. Homegardens

2.1.1. General Definition

Homegardens, household gardens, backyard gardens, dooryard gardens, and kitchen gardens are terms for one of the oldest managed land use systems (KUMAR and NAIR 2004, SOEMARWOTO and CONWAY 1992). Although no definition of homegardens is universally accepted, several definitions are found in literature, which define them as "*intimate, multi-story combinations of various trees and crops*" (KUMAR and NAIR 2004: 135), often with some domestic animals or even with fish ponds (TRINH *et al.* 2003) around homesteads. DRESCHER (1998) highlighted the importance of a flexible definition of homegardens to avoid missing plots, which are homegardens, but not in the sense of a specific definition. Some authors emphasize aspects such as of the existence of trees, animal production and the place of the plot for defining what is a homegarden.

Homegardens are often considered to be more private than the house itself (VOGL 1998). They are areas of natural environment transformed into living quarters in order to meet the needs of the inhabitants (JIMÉNEZ-OSORNIO *et al.* 2003, SOEMARWOTO and CONWAY 1992). In many studies homegardens are described as subsystems within larger food procurement systems as part of the agricultural system (NIÑEZ 1984, VOGL and VOGL-LUKASSER 2003). However, there are also plots apart from homegardens, namely those where the family cultivates crops. Within such a system, homegardens are smaller in size, and due to the fact that they are located around the house they can easily be protected and taken care of. There exist local names for types of homegardens in several regions such as *Talun Kebun* and *Pekarangan* (Javain, Indonesia), *vuon nha* in Vietnam, *Shamba* and *Chagga* (East Africa) or *Huertos Familiares* (Central America) (NAIR 1993, SOEMARWOTO and CONWAY 1992, TRINH *et al* 2002). As an agroforest system, homegardens include people, animals and crops as structural and temporal components, each having a specific place and role in time and space (DE CLERCK and NEGREROS-CASTILLO 2000).

Even though we lack a general definition, homegardens as they are analyzed in the studies feature four main characteristics (MITCHEL and HANSTAD 2004):

- Homegardens are close to the house;
- Biodiversity is high in homegardens;
- Homegardens contribute to both the alimentation and the income of a family, but are generally not the main source for these elements of the household economy;
- Generally homegardens occupy a small area.

For FERNANDES and NAIR (1986:279) "*homegardens represent land-use systems involving deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and invariably livestock within the compounds of individual houses, the whole crop-tree-animal unit being intensively managed by family labour*".

Basic components found in homegardens are herbaceous crops, woody perennials and animals (BENJAMIN 2000). Depending on the regional history, the social and economic aspect, the intensity and diversity of cultivation can vary significantly in different regions of the world (SERENI MURRIETA and WINKLERPRINS 2003). Homegardens fulfil various functions and contribute to the household food security. Depending on their geographical position and their cultural background, homegardens show different structures. Climate conditions, soil and cultural features determine land use in a specific area and are the base of the appearance of homegardens (DRESCHER 1998).

Homegardens are considered as highly sustainable in biophysical and socio-economic ways. In this production system, the waste of one type of production provides inputs for other forms

of production in a cyclical way (TRINH *et al.* 2003). That is, by recycling household waste, productivity is fostered (SOEMARWOTO and CONWAY 1992) which again shows the energy-efficiency of homegardens (DRESCHER 1998).

The homegarden has a direct influence on the species diversity, the management practices and other factors within the *milpa*[1] and also may have an indirect influence on the processes of other systems, such as nutrient cycling, dynamics of succession, etc. Therefore, the homegarden is considered a biological and socio-economic buffer for the *campesino* production system (JIMÉNEZ-OSORNIO *et al*. 2003).

Homegardens fulfil several functions. They are important for the subsistence of the managing families concerning the supply of fresh vegetables and fruits throughout the whole year. Moreover small domestic animals are an important protein source, beside the fact that they are like a cash box for rainy days for the farmers. So they can be sold, if a sudden need for cash e.g. for medicine, arises (VOGL 1998). This expresses the role of homegardens regarding generating income. Furthermore, homegardens are known as places of high diversity and play a major role in the conservation of this biodiversity (HUAI and HAMILTON 2008). The cultivation of traditional crops and the use of wild plants, which are found in some plots of secondary vegetation growing in the garden (VOGL 1998), are two factors inherent to homegardens, which make them beneficial to humankind.

VOGL (1998) identified homegardens as home, place of work, production and recreation for the managing family. They demonstrate the art of living and the economic situation of their owners.

Homegardens are the place for social events both for family festivals and for meetings with neighbours. Benefits of homegardens: better diet because of the products, source of income, improving women's status (MITCHEL and HANSTAD 2004). Considering these aspects homegardens are highly important for maintaining the livelihood of poor families.

Lack of land and no access to water are limiting factors concerning the cultivation of a homegarden (DRESCHER 1998).

2.2. Global homegarden studies

Many studies have been carried out to homegardens. The majority of which were carried out in the tropics. Because of their intricacy, homegardens offer aspects for research for distinct disciplines. Botanists, anthropologists, sociologists, ecologists among others focus on homegardens from different points of view. Most of the available studies highlight the functional and utilitarian aspects of homegardens. Their potential regarding sustainable development as well as their ecological structure, their contribution to biodiversity conservation, and their value in subsistence oriented systems is well documented.

The role of homegardens concerning food security in Zambia and Zimbabwe emphasised by DRESCHER (1998). He investigated homegardens in urban, peri-urban and rural areas in these countries. The advantage of homegardens is the possibility to produce food in the immediate surroundings of the house. The cultivation of the homegarden depends on the vulnerability of the household. As a result the area of homegardens grows if vulnerability increases. Crop failure, for example, results in an increase of the cultivated area. In the examined region, gardening is strongly influenced by the social status of the household. Poorest families do not cultivate a homegarden due to a lack of access to resources. Hence, homegardens, which buffer against hunger, are only available for richer households. In his research DRESCHER (1998) detected notable differences between women's and men's agricultural activities.

NIÑEZ (1984b) studied Peruvian homegardens in three distinct ecological zones (arid coast, Andean highlands and jungle).

[1] *Milpa* is a traditional land use system found in Mesoamerica (section 2.9).

Homegardens in Nepal were examined by SUNWAR *et al.* (2006). Their aim was to characterize homegardens in two different ecological regions regarding species composition and varietal diversity. Furthermore, changes in the cultivation of species in the last 10-15 years were examined. The loss of 20 crop species during the last ten years was caused by the fact that people had no access to local crops and by deforestation.

CORZO MÁRQUEZ and SCHWARTZ (2008) studied traditional homegardens in Guatemala, whereby the majority of them was cultivated by indigenous Itzaj Maya and some by *Ladinos* of mixed Spanish and Maya descendant. The authors described the structure and management of homegardens as well as their economic value, considering their contribution to household income.

A study about gender roles and homegardens in a Riverine Caboclo Community in the Lower Amazon in Brazil was carried out by SERENI MURRIETA and WINKLERPRINS (2003).

Gendered relations in homegardens in three mountain regions of the Iberian Peninsula were analyzed by REYES-GARCIA *et al.* (2010).

FINERMAN and SACKETT (2008) studied the homegardens of the Saraguro people in the Ecuadorian Andes. As women use medicinal plants cultivated in the garden to treat illnesses, various species are cultivated for that purpose. Furthermore, by observing the cultivated medicinal plants in neighbouring homegardens women draw conclusions on the neighbour's health and economic conditions.

Women's homegardens in Bangladesh were examined by WILSON (2003). Their homegardens are located within the homestead boundaries and as they are "tucked" in corners, they may be overlooked. Plants are cultivated singularly or in clusters, along walls and fences. Women mainly cultivate indigenous vine or gourd species, which are well adapted to the climate conditions. Men, in contrast, cultivate homegardens outside the boundaries of the homegardens, but nevertheless within 10 metres around the house, thus these homegardens occupy more land, than women's homegardens do. What is more, men cultivate exotic species, even some temperate species requiring extra inputs, such as fertilizer, pesticides and irrigation. Women's homegardens show a higher diversity, than men's homegarden do.

VOGL and VOGL-LUKASSER (2003) carried out a comparison regarding management and plant species composition between homegardens on organic and non-organic small-scale farms in Alpine Eastern Tyrol, Austria. Both management and plant species composition and the use of garden produce were similar on both types of farms, however mixed cropping and the use of alternative remedies for control of pests and diseases were found more often in organic homegardens. Since the 1960s there has been a change regarding species composition in homegardens on organic as well as non-organic farms.

Homegardens from six Indian islands located in two different districts were analysed by PANDEY *et al.* (2006). They studied the influence of biophysical and socio-cultural factors on plant species composition and their distribution and diversity. Although climate conditions are similar, the floristic similarity of homegardens on islands was higher within a district than it was between different districts.

Nicaraguan homegardens were examined by MENDEZ *et al*. (2001). They compared homegardens in the same community regarding species diversity, arrangement and management and analysed the relationship between agro ecological and socio-economic characteristics.

FUNDORA-MAYOR *et al.* (2004) described the characteristics of seed production in homegardens and on farms in Cuba. They reported on and analysed the effects of the production of reproductive material on biodiversity. Some of the observed factors in Cuban homegardens that can affect the composition and genetic diversity, especially during the stage of producing their productive material, are: the coexistence of traditional cultivars with

the introduced advanced varieties; the genetic flow observed among homegardens and farms within an area, among the areas and between them and the environment; the selection patterns used by the farmers; the type of conservation of the reproductive material; State plans for development and the climatic factors that converge in the area where the homegarden is located. Most of the cultivars are reproduced in short intervals during the same year, thus they do not undergo any conservation process, but are selected constantly, which favours changes in genetic material. Sowing material often lost its viability and vigour, due to storage.

Javanese homegardens were described by SOEMARWOTO and CONWAY (1992). In their study remarkable productivity, stability, sustainability and equitability were described as a result of the high diversity of plants and animals as well as the work input of the gardeners.

Homegardens or *vuon nha* in Vietnam formed the field of research of TRINH *et al.* (2003). They selected four sites where they focused on the biodiversity in the homegardens. The homegarden was, under the system of collective farming, the only private plot, where farmers had full power to decide on production and the use of products. Vietnamese homegardens play an important role concerning protein supply and income bonds.

OMOHUNDRO (1985) examined the dynamics of homegarden cultivation in Newfoundland. He examined both historic and contemporary gardening in the coastal region of the North Atlantic. In this region, as in many others, homegardening was part of the pluralistic subsistence economy. Homegardening serves as insurance in times of low income. Although they have been a staple element in the economic strategy for a long time, nowadays homegardens are changing in the whole region. Historically, homegardens can be described by six features that are still important for contemporary gardening. Homegardening in this region declined after the Second World War. Several reasons for that are reported; such as the lack of time for gardening, the fact that people took up wage work, transfer payments, reduced value of homegardening, and the of family size, which tended to decrease.

JIMÉNEZ-OSORNIO *et al.* 2003 conducted studies on Mayan homegardens in order to analyze their contribution to *in situ* conservation. The studies showed that there is no common pattern of increase or decrease of species diversity in space and time and that Mayan homegardens are highly diverse regarding both plant species and animals.

Homegardens of the Bari Indians and those of settlers in Colombia were compared by PINTON (1985). The agricultural system of the Bari was a semi nomadic shifting cultivation. The settlers, landless peasants, who entered the Catatumbo region in 1960 practiced field agriculture. The Bari cultivated a garden plot for four to five years, after that followed a fallow period of three years. In this period residual perennial species were collected from the former garden. The garden was than abandoned and both a garden and a new house were built in a new region. Newly inhabited the settlers did not practice appropriate technologies, which caused deforestation, thus entailing the destruction of the ecosystem. This resulted in lower yields and furthermore, placed settler families in a situation of poverty. Female settlers did not hold on to their tradition cultivating a kitchen garden and could not contribute to a more balanced diet for the family. While the system of the Bari was a sustainable food production system, that of the settlers was neither self-supportive nor capable to meet the families' needs.

2.3. Homegardens in Mexico

„*The home garden is where the family spends most of the time...*" (JIMÉNEZ-OSORNIO 2003: 9). The homegarden in Mexico is called *solar* or *huerto*. The term emphasises the importance of the homegarden as a social space (Caballero 1992). Thus the *solar* is the location, where social processes take place, such as *"…grow and fission of families over time"* (CABALLERO 1992: 37).

Modern Mayan homegardens were generally described by CABALLERO (1992). Furthermore, the author looks back to the origins and also looks forward to future development of homegardens. Although some prehispanic tree culture system seems to be their origin, modern Mayan homegardens are strongly influenced by the introduction of technical innovations by the Spaniards. Some species found in homegardens of the Yucatan Peninsula nowadays are considered as having been economically important for a long period of time.

A study of homegardens in Chiapas was conducted by VOGL. She described fundamental elements of land use systems of the Chol and Tzeltal Mayas who live in the research area. She detected a loss of knowledge regarding the subsistence orientation of their economy. Aspects such as the way the homegardens were managed, the recorded species and their abundance, the way, the species were used, the function and existence of different areas, different levels in height and further cultural and socio-economic data were the basis for comparing the surveyed homegardens with those of other studies.

Homegardens of Yucatec Mayan immigrants, who moved from Yucatan to Quintana Roo in order to work in the developing tourist centres and settled close to Cancun, were examined by GREENBERG (2006). Instead of devoting themselves to the cultivation of the *milpa* they work outside to generate income, while women are responsible for the remaining piece of land, that is the homegarden. Women decided to conserve traditional Mayan species and varieties in their newly cultivated homegardens in order to keep their tradition and culture regarding food preparation alive and to demonstrate their Yucatec ethnicity and origin. Newly cultivated homegardens are much smaller, than those in Yucatan. The reduction of cultivated land entails a loss of crop diversity.

The cultural practices of the Mayan homegardens were analysed by BENJAMIN (2000). She documented traditional techniques used to support plant survival and to increase productivity. The author enlarges the traditional Mayan knowledge regarding plant management and explains the Maya soil classification. She showed that Mayan practices are important for the health and survival of some species. Without these practices a very different homegarden would come into being.

CABALLERO (1992) surveyed Mayan homegardens in ten villages from different regions of the Yucatan Peninsula. The aim of his research was to explore the intercultural variation regarding the use and management of plants and animals in homegardens in this area. Throughout the peninsula ecological conditions are quite homogenous, nevertheless, there are some important floristic differences, to be noticed. Based on the emphasis on the cultivation of a certain set of species particularly Mexican Palmetto (*Sabal Mexicana* Mart.)*,* breadnut or ramón *(Brosimum alicastrum* Sw.) and sugar apple or chirimoyo (*Anona squamosa* L.) the author defined three types of homegardens:

1. Homegardens with a high abundance of *Anona squamosa* and *Brosimum alicastrum*. These can be subdivided into homegardens dominated only by *Anona squamosa* and homegardens, where a high abundance of both speciescan be found.
2. Homegardens with a high abundance of *Sabal mexicana* and *Brosimum alicastrum.* These can be subdivided into homegardens dominated only by *Sabal Mexicana* and homegardens, where a high abundance of both species can be found.
3. Generalized homegardens dominated by *Citrus spp.,* different varieties of hog plum or ciruela (*Spondias purpurea* L.)*, Musa,* Spanish lime (*Melicoccus bijugatus* Jacq.) and cotoperis or guaya (*Talisia oliviformis* [Kunth.] Radlk.).

These different types can be the result of social and economic developments such as modernization and regional economic specialization. The high abundance of *Sabal mexicana* can be the result of its intensive use for thatching and handicraft manufacture. The dominance of *Brosimum alicastrum* can be considered as part of the „henequen“ Sisal (*Agave sisalana* Perrine) industry that was important until a few decades ago. It was used to

feed the animals that were involved in the cultivation of „henequen“. *Anona squamosa* is the dominating species in homegardens located in areas where the economic importance of fruit trees has increased. Furthermore its capacity to grow spontaneously from seeds dispersed by animals, accounts for its dominance in certain homegardens.

DE CLERCK and NEGREROS-CASTILLO (2000) surveyed 80 homegardens in Quintana Roo in order to describe and evaluate traditional crops found in Mayan homegarden, which are suitable for the development of agro forest systems. They found a variation in the number of strata, whereby the oldest and most developed homegardens contained five strata ranging from ground level up to more than 12m. They found out that homegardens serve as models for the structure and composition in the four stages of agro forests.

An ethnobotanical study in lowland Chiapas was conducted by VOGL, VOGL-LUKASSER and CABALLERO (2002). Two villages inhabited by migrants close to the town of Palenque were investigated to examine how migration from higher regions of Chiapas affects the management of the homegarden, regarding plant diversity, the use of plants and the knowledge of the local environment.

LOPE-ALZINA (2007) examined the influence of gender relations on the selection of maize and squash varieties both in the *milpa* and in the homegarden.

Homegardens of three ethnic groups (Yucatec Maya, Choles and Mestizos) in the municipalities of Calakmul and Hopelchen in the state of Campeche were examined by DE LOS ANGELES CHI QUEJ (2009). He characterized the homegardens and described their management. Homegarden production in the surveyed communities is primarily subsistence oriented and the cultivation of the homegardens is performed for the main part by women.

A comparison of 31 homegardens regarding their structure and components (livestock, fruit trees, ornamental plants etc.) was made in Yucatan by CUANALO DE LA CERDA and GUERRA MUKUL (2008). They found out, that the number of components is not related to the size of the homegarden area. Nevertheless, the size of homegardens limits the number of plant species and the number of animals. In households with many children, fewer components are found in the homegarden compared to other homegardens. The presence of the male household head increases the number of components.

Energy flows in households that cultivate a homegarden in the municipality of Calakmul, were examined by ALAYÓN-GAMBOA and GURRI (2007). A total of eight households were analysed. Out of these, four households practice agriculture as part of the survival strategy, for the other households, agriculture is a business. Particularly in the homegarden, inputs (household labour, household agro-system production, and purchased external energy either renewable or non-renewable) and outputs (sales, family and animal foods) were considered. The results showed, that the homegarden complements the household food by providing food products. In households, where homegardens are part of the subsistence strategy people depend on a greater energy interaction between the household agricultural subsystems, than in commercial agricultural households. A smaller investment on non-renewable and external renewable energy makes them more sustainable than the latter, hence they are less dependent on outside sources. In market-oriented households the homegarden is less cultivated, with an increase in animal husbandry, hence it contributes less to household food.

Local knowledge about soils was the topic of a study by DÜRNBERGER (2010) in a Mayan community in Calakmul. He examined which soil types farmers tell apart and how they determine the advantages and disadvantages of each type of soil. Nine soil types were described by the farmers. The farmer's knowledge about edaphic processes and its implementation were examined. The author analysed the meaning of soil within the Mayan cosmovision, proven by religious ceremonies or daily activities.

NEULINGER (2009) examined botanical composition of 20 homegardens in four communities in Calakmul and analysed how far farmers valued the different functions of the homegardens.

All owners of the homegardens were immigrants with different origins. A total of 310 plant species were found. Main use of plant is ornamental, food and medicinal use. Botanical composition was linked to the cultural background of the farmers and revealed a strong relation, whereas age, gender or culture do not influence valuation of different functions of the homegardens.

2.4. Women and agriculture

Women have been farmers or at least have been involved in agricultural production since mankind began cultivating the (LASTARRIA-CORNHIEL 2006). Until the Rio Earth Summit in 1992 women's role in farming and the use of natural resources was considered as of little importance concerning sustainable development. Despite the fact that their role as food providers and plant domesticators was already recognized (HENSHALL MOMSEN 2007). The global report (IAASTD 2009) shows that women are discriminated against in the agrarian sector. Women have several responsibilities in terms of subsistence production in many countries of the southern hemisphere. Nevertheless, they do not have equal access to resources like land, water or machines (FARNWORTH and HUTCHINGS 2009, HOWARD and NABANOGA 2005, BUTLER FLORA and SANTOS 1986). In many rural societies men and women do not have equal rights to land because of the societies' patriarchal nature. Thus, sons inherit the land of the family. In case of divorce women do not get anything from their husbands, furthermore, women's secondary status limits access to land on the land market (LASTARRIA-CORNHIEL 2006). Likewise, in many cases education, political participation and access to information are out of reach for women. On the one hand, spaces and environments are used differently by men and women, on the other hand gender roles determine access to different spaces and environments. This difference entails a variation of knowledge. Gendered access and use of spaces means a gendered knowledge about (HENSHALL MOMSEN 2007). Gendered knowledge goes hand in hand with a gendered use of plant products (HOWARD and NABANOGA 2005). The household as their main locus (FARNWORTH and HUTCHINGS 2009) women are often familiar with the space and environment surrounding the house, thus keeping the knowledge about species growing in this area, while men know more about the environment in more distant areas (HENSHALL MOMSEN 2007). Men have easier access to spaces, considered as those of women's, than women have to "men's" spaces (HOWARD and NABANOGA 2005). Women in contrast have access to marginal lands where soil fertility is low (HOWARD 2003a).

In many regions of the world women define themselves rather as farmwives than as farmers (FARNWORTH and HUTCHINGS 2009). Furthermore their access to bank accounts or loans is limited (FARNWORTH and HUTCHINGS 2009). As men are the managers of fields -controlling them- women are expected to work in the fields (LASTARRIA-CORNHIEL 2006).

Women rather collaborate on informal networks, while men participate in more formal ones (WESTERMAN *et al.* 2005). While women are occupied with household chores, men are present in public forums (TSEGAYE 1997). In Ethiopia women exchange knowledge at informal meetings, such as the coffee ceremony, or during their daily work (ibid.).

Indigenous women, such as Quechua women in Peru are seen as crucial for biodiversity management, due to their knowledge about seeds, selection and vegetative propagation. They conserve and reproduce different plant varieties (FARNWORTH and HUTCHINGS 2009). Due to the fact that managing plant varieties is considered as a 'minor' resource, women are seen as 'minor' actors secondary to men, who again manage major staple crops, considered as valuable (HOWARD 2003a). As women use plants and plant material in different ways they tend to have other and more selective criteria regarding plant varieties, than men have. They select seeds based on the question how to ensure food requirements and meet processing and storage needs (HENSHALL MOMSEN 2007).

The feminisation of agriculture refers to women as major labour force in small scale and subsistence agriculture, as men have migrated to urban areas in order to seek wage labour

(IAASTD 2009). This term also considers the increasing involvement of women in commercial agriculture thus as wage workers (LASTARRIA-CORNHIEL 2006). This must be seen in the context, that agriculture is undergoing a process of change. Across regions small-scale agriculture has been declining and in developing countries export orientated agriculture has changed from traditional export crops, such as coffee (*Coffea ssp*.) or sugar (*Saccharum officinarum* L.) to horticultural crops, such as vegetables, flowers and fruits, requiring intensive work effort (LASTARRIA-CORNHIEL 2006). As wageworkers in agro-business firms, women participate in the production and processing of non-traditional export crops. These jobs are often of a temporary nature and wages are mostly low. By pursuing temporary wage work, the cultivation of the own land comes off badly. Thus, neither the subsistence production, nor the income from wage labour is high enough to live on. In developing countries male farmers are often seen as innovative, attempting to produce for export, while female farmers are seen as subsistence farmers, producing for home consumption and local markets (FARNWORTH and HUTCHINGS 2009).

Although industrialised agriculture including chemical input and mechanisation as well as cash crop production and animal husbandry are still male domains (FARNWORTH and HUTCHINGS 2009), women broadened and deepened their participation both in small-scale, subsistence oriented as well as in commercial agriculture (LASTARRIA-CORNHIEL 2006).

Changes in life style, the introduction of new crops as well as wage labour are factors that affect gender relations concerning both carrying out agricultural activities and decision making regarding agricultural tasks (HENSHALL MOMSEN 2007, LASTARRIA-CORNHIEL 2006). High yield and hybrid seeds focused on men and excluded women's knowledge, skills and productive contribution (RAMPRASAD 2009). Worldwide women are kept away from technology in farming (FARNWORTH and HUTCHINGS 2009).

Male wage labour influences the process of crop and varietal decision making as well as seed selection in view of the fact, that women are more involved in these activities, if more men work outside the village to earn money (HENSHALL MOMSEN and OAKLEY 2007). Another effect of men's out migration is that women solely carry out the agricultural tasks, or hire others for hard work (LASTARRIA-CORNHIEL 2006).

In Central Mexico, women are pushed in decision-making positions due to men's out migration, and their power, traditionally carrying a major role in agriculture is influenced by the introduction of new and non-traditional crops (HENSHALL MOMSEN 2007).

LOPE-ALZINA (2007) reported that women influence the selection of varieties the same way as men do in both the *milpa* considered as men's space and the homegarden considered as female dominated space These influences reflect a gendered division of labour with a predominance of men and women in a specific space and in the production system that seems to be dynamic, in time and space.

HAMILTON et al (2001) examined structural and cultural bases of gendered resource control in small-scale commercial agriculture in Ecuador and Guatemala. In the central Ecuadorian highlands both men and women are involved in the process of economic decision-making. Their rights are equal regarding land use and cultivation practice. The construction of gender of traditional Andean concepts influences the control of land, labour, technology and financial resources. In the community, that was analyzed both household heads are expected to contribute to decision making processes regarding any productive domain in which they work. Both women and men are seen as important components for family wealth. The challenge of maintaining a livelihood based on small-scale market oriented agriculture, reinforced the traditional preference for a dualistic household headship.

Another survey was conducted in Maya communities in Guatemala. Production in this area is domestic or export market oriented and high-value non-traditional export crops are grown. Resource-control decision patterns were examined. Landholding and resource control is more male dominated. While women's sources of income traditionally were handicraft

production, small animal production, storekeeping and selling agricultural and non-agricultural production on local markets, men were responsible for both subsistence production and commercial agriculture oriented at domestic markets.

Budgets were separated one for household needs the other for agricultural investments and managed by women and men respectively. Women were involved in several activities regarding the production of non-traditional exports and commercial crops. Although land holding and selling of non-traditional exports is male dominated, decisions on land use are made jointly between men and women.

HENSHALL MOMSEN and OAKLEY (2007) studied the gender division of labour regarding agricultural tasks in Bangladesh. They focused in particular on the gendered division of seed selection of field crops and crops cultivated in homegardens and their processing activities.

Plots to which women have access to and can grow their traditional varieties are, often less productive than those of men. DRESCHER (1998) reported the disadvantage of women in Zambia concerning the location of their homegardens. Homegardens of men in rural Zambia are closer to water for irrigation, thus the distance to water makes the cultivation of homegardens more difficult for women.

When the income of a peasant family is constantly decreasing, due the decrease in prices for agrarian products, women have to intensify their performance and contribute to male tasks in order to compensate the deficit (KÜHHAS 1993). Income that is generated by women is considered as reproductive income and is mostly controlled by women in order to maintain the household in contrast to this, male income is controlled by men and used discretionarily (BUTLER FLORES and SANTOS 1986).

There is a difference between women and men concerning the orientation of the production. Women generally produce for consumption within the family, while men are market oriented. Even the selection of the cultivated crops reflects this difference (DRESCHER 1998). TRINH *et al.* (2003) claim that the same applies for Vietnam. Whereas men have the privilege to decide on rice, fruit trees, ornamentals and medical plants, women decide on vegetables, tubers and roots. Thus, the decision-making domain of men is referred to plants generating income. The restricted mobility of women exacerbates the selling of products at markets (FARNWORTH and HUTCHINGS 2009).

Further, women and men have access to different markets. While men produce for national or international markets, women's products are sold on local markets. This influences the varietal selection. National or international markets demand modern varieties, whereas in local markets there is a demand in local, traditional varieties.

In Uganda tree planting is generally male dominated but women plant trees for household consumption on plots determined by men. Men on the other hand cultivate economically important tree species (HOWARD and NABANOGA 2005).

2.4.1. Division of labour

The gender division of labour is based on religious and social belief systems including concepts of gender and rules about appropriate behaviour (HOWARD and NABANOGA 2005). These concepts and norms determine women's and men's roles and responsibilities as well as the physical spaces and environments in which men or women or both can carry out activities. The gender division of labour is related to a gendered knowledge about specific tasks (LOPE-ALZINA 2007) and results in the assigning of different economic spheres of both other genders. Because women and men carry out different activities, they hold different knowledge (HOWARD 2003a). Women's knowledge about plants has been overlooked for a long time, as their contribution to subsistence has been overlooked, too. The norms of gendered labour division are undergoing a process of change (GREENBERG 2006). Male out migration, education and markets influence alter traditional roles and responsibilities of each sex, nevertheless they still prevail. Therefore today women have begun to carry out tasks,

which were traditionally considered as men's tasks (HOWARD and NABANOGA 2005). In some regions women increasingly carry out income generating activities, which conflicts with the traditional role of men as the breadwinners of the family (HOWARD and NABANOGA 2005). Depending on the degree of linkage to markets, the gendered labour division and the use of female labour varies (BUTLER FLORES and SANTOS (1986).

Cultivating a homegarden is often *"a shared activity within a household"* (REYES-GARCIA *et al.* 2010:236). Mayan homegardens are perceived as female dominated, where men carry out particular tasks, such as land clearing, tree pruning, maintenance of houses and boundaries and weeding (BENJAMIN 2000). REYES-GARCIA *et al.* (2010) observed that in Spanish homegardens many gardening tasks, such as harvesting, were carried out jointly by women and men or with the help of other household members. In Colombia cutting, clearing and burning of an area in order to establish a new homegarden, is a collective work of the community, whereas women are in charge of cultivating and harvesting.

In Mexico men are generally responsible for the cultivation of the *milpa*. Women do not go to the *milpa* on their own, as they are not allowed to. Although there are explicit gendered spaces of production, the couple mostly come jointly to a decision on what to cultivate. These gendered spaces include gendered codes of behaviour (LOPE-ALZINA 2007).

In Uganda women cultivate the homegarden and collect firewood and get water. Women weed men's fields and help construct houses and also help with thatching (HOWARD and NABANOGA 2005). The harvesting of vegetables is traditionally considered a women's task. However, as male income generating activities shift, men get more involved in harvesting.

In subsistence oriented agricultural systems women are responsible for most post-harvest management processes, hence, the selection of varieties regarding processing criteria are determined within the domestic sphere (LOPE-ALZINA 2007). The division of labour influences the responsibility of certain production spaces and the cultural association between specific crops or varieties and their producers. As a result there are crops seen as women's crops and crops associated with men (LOPE-ALZINA 2007).

2.4.2. Women and homegardens

"*Home gardens are an example of a 'womens' enterprise that functions based on inter- intra-household knowledge, labour, exchange of plant materials and marketability of produce"* (LYNN-PATTERSON 2000: 30).

Although women carry out many tasks in homegardens, they are not necessarily the women's domain, where women make decision exclusively. In rural Bangladesh, women carry out most of the tasks - from sowing to harvesting - in homegardens (TALUKDER *et al.* 2000).

DRESCHER (1998) reported that in Zambia and Zimbabwe the gendered division of labour depends on the area, hence on the ethnic affiliation. While in urban and peri-urban areas it I the women who are more involved in gardening, in rural areas it is the men who are the main gardeners. Women are responsible for the design and the preparation of the soil as well as for sowing and irrigation whereas men construct fences. As far as harvesting is concerned men and women are involved equally. Children carry out tasks such as irrigating and harvesting.

In Mayan homegardens women are usually the decision makers (BENJAMIN 2002 and LOPE-ALZINA 2007). Women carry out most of the work in homegardens and can work there on their own. Nevertheless, the homegarden offers men the opportunity to test new improved maize varieties. What is more, it serves also as a gene bank where certain varieties can be preserved (LOPE-ALZINA 2007).

In the Saraguro community in Ecuador homegardens are clearly female dominated. Women established the surveyed gardens and manage them, make decision about what to plant and how to use garden products. Furthermore they use their garden as a pharmacy in case of

illness of family members (FINERMAN and SACKETT 2003). Their homegardens are a status symbol for Saraguro women and represent their care of the family and contribution to the household economy.

Bari women in Colombia are the ones responsible for the homegarden. Hence the garden size depends on the number of women within a household.

Women in India are seen as playing an important role in the management of homegardens (RAMPRASAD 2009). In Ethiopia and Uganda, too, women are responsible for garden plots (TSEGAYE 1997, HOWARD and NABANOGA 2005).

In three different regions in the Iberian Peninsula the prevalence of women's, men's and shared gardens varies. Homegardens that are mainly cultivated by men, women or men and women together, differ concerning their location, size and orientation. Women's and shared homegardens tend to be smaller and closer to the house, while men's homegardens usually are better orientated. Furthermore, differences were found in the way the homegarden was fertilised and watered as well as concerning the control of pests. Women's homegardens are mostly fertilised with organic inputs and are watered by means of mechanical watering systems, while in men's homegardens chemical products for pest control are used. Differences exist regarding the species composition; women's homegardens are more diverse and richer than men's and shared homegardens. While in men's homegardens only edible plants are cultivated in women's homegarden plants for other purposes are also found (REYES-GARCIA *et al.* 2010).

2.5. Biodiversity in homegardens

As a refuge for crops, homegardens are perceived as important locales for biodiversity conservation (HENSHALL MOMSEN 2006, LEVASSEUR and OLIVIER 2000, SOEMARWOTO and CONWAY 1992, TRINH *et al.* 2003). Many studies have been carried out regarding species diversity and composition, but there is a lack of research concerning getting information about the development, multiplication, processing and the storage of seeds from plant species (JIMÉNEZ-OSORNIO *et al*. 2003). However having "*the greatest plant knowledge"* (HOWARD 2003: 3) it is mainly women who manage plant resources cultivated in homegardens, on farms, forests and fields worldwide (HOWARD 2003). Women have considerable knowledge about selecting and domesticating plant species (TSEGAYE 1997). However, to meet the household needs, species are selected with specific selection criteria, thus they are also under this selection pressure in homegardens (TRINH *et al.* 2003). Due to the fact that people depend on plants for food and medical supply as well as material for shelter and clothing, the conservation of and farther access to a diversity of biological resources is crucial for women across the globe (HOWARD 2003). Women in Ethiopia gather wild plants in order to domesticate them in the homegarden plots (TSEGAYE 1997).

Generally, Mayan homegardens show a high diversity in plant species (CABALLERO 1992). In a single homegarden the number of plant species and individuals per species can vary remarkably. In the same way the total number of individuals found in homegardens varies. The size of the area, the age of the homegarden and the planting density seem to affect this variability. In Mayan homegardens, species are, on the one hand, plants that are native to the neotropics, and on the other hand, native to the old world (such as citrus varieties (*Citrus sp.*), coconut palm (*Cocos nucifera* L.) or banana and plantain (*Musa sp*). Out of these species some old varieties are cultivated in the homegardens, which again indicates that the incorporation of them into the traditional Mayan diet and cuisine. The biggest part captures plant species, which are native to the Yucatan peninsula, mainly tall trees. They are either left to live when a homegarden is established or they grow from seeds in existing ones. Homegardeners tolerate them or even promote these plants that dominate the canopy of the homegardens. Some of the wild forms were probably domesticated by the Maya in the Yucatan Peninsula. These manipulations of plants can also be found in the genetic variability of cultivated plants (CABALLERO 1992).

In Javanese homegardens the altitude significantly influences plant diversity. As altitude increases, homegardens become smaller showing less diversity but a greater plant density (SOEMARWOTO and CONWAY 1992).

Homegardens in urban areas in Zimbabwe and Zambia are also examples for the biodiversity of homegardens (DRESCHER 1998). Surprisingly, urban homegardens show a higher diversity -in order to satisfy the household needs - than gardens in the peri-urban area, which are rather market orientated. In contrast, in Vietnam commercialisation did not lead to a decline in species biodiversity although it affects species composition (TRINH *et al.* 2003).

2.6. Appearance of homegardens

Due to ecological site conditions, socio-cultural factors, different cultivation strategies and other factors homegardens vary greatly in different areas. BENJAMIN describes homegardens of the Yucatan Peninsula as *"… a collage of plant species competing for light, water and nutrients"* (BENJAMIN 2000: 110). The appearance not only shows the strategy of management (MENDEZ *et al.* 2001) but also the ecological conditions of the area where the homegarden is located. Size and location of homegardens depend on several factors. The location of the homegarden is of great importance to soil fertility, access to water and the proportion of light and shade. The selection of micro-sites to encourage plant growth plays a central role within the homegarden (BENJAMIN 2002).

Both, species composition and structures in the homegarden are associated with cultural, social, economic and ecological functions (VOGL 1998). Furthermore, species selection reflects a family's preferences as well as the availability of adequate sites (BENJAMIN 2002).

Homegardens are not static production systems (BENJAMIN 2002, VOGL 1998). Due to ongoing management, appearance of homegardens changes. In other words, plants, which are not used, are eliminated and trees are pruned or cut down.

2.6.1. Size of homegardens

The size of homegardens varies so that no standard size can be as it depends on the region. However, several studies of different geographical regions showed that the average size of homegardens worldwide is between 1000 and 5000m^2 (TRINH *et al* 2003). The size of homegardens may vary even within a community (MITCHEL and HANSTAD 2004) and it depends on the socio-economic level that the family has in the community (JIMÉNEZ-OSORNIO 2003). Furthermore, it is a question of population density, thus urban homegardens are generally smaller than rural or peri-urban ones. DRESCHER (1998) reported that the biggest homegardens are located in the peri-urban area, followed by rural homegardens, while the smallest ones are found in urban areas. The size of homegardens influences the production level and supply of fresh vegetables and fruits (MITCHEL and HANSTAD 2004).

DRESCHER (1998) stressed that the importance of access to water for irrigation and work force are two main factors that determine the size of the garden. Consequently, the area that is cultivated, can deviate from the total garden size.

2.6.2. Separated areas in homegardens

The structure of the homegardens reflects the family's needs (VOGL 1998) and the orientation of cultivation.

CABALLERO described four different areas in Maya homegardens, which are listed below:

- An area of the house and the kitchen, including an open area, for raising poultry. Within this area chilli pepper (*Capsicum sp.* L.) and other condiments are cultivated in pots or in raised wooden beds.
- An area devoted for growing perennial plants, which is the area that occupies most of the homegarden.

- An area where annual plants, mainly vegetables, beans and maize are cultivated.
- The smallest part is usually located in front of the house and it is the area where ornamental plants are cultivated.

Quite often a fifth area can be found which is characterised by natural vegetation and is seldom managed.

This division varies, however some gardens neither have a section of ornamental plants nor an area of secondary vegetation. The sections of the tree crops as well as the area of the house can be found in every garden and can therefore be considered as the defining elements of Mayan homegardens.

MENDEZ *et al.* (2001) also found four distinct areas in Nicaraguan homegardens, which the authors define as the residential zone, the fruit tree zone, the zone for ornamental plants and one for shaded coffee

VOGL (1998) found similar results in Chiapas and listed the following five areas:

- The living area
- An area of ornamental plants
- An area for the cultivation of crop and condimental plants
- An area for the cultivation of perennial plants
- An area of secondary vegetation

The area of ornamental plants was not found in each of the homegardens surveyed. The area of the secondary vegetation is not primarily productive, but it serves as a source of fodder and provides shady areas for small domestic animals. In this part of the homegarden medicinal plants grow as well as plants, whose timber is used for constructing buildings. Furthermore, gene material of local plant species is conserved in this area.

In homegardens in Vietnam, the area of ornamental plants is usually located in front of the house, while fruit trees are mostly planted behind the house. Some selected tall fruit trees are also planted in front of the house as they provide shade (TRINH *et al.* 2003).

2.6.3. Vertical structure in homegardens

Apart from the so-called horizontal structure, one can also identify a vertical structure in homegardens. These layers can be rather complex and can vary depending on the region (HUAI and HAMILTON 2009). Several authors described this structure such as CABALLERO (1992), DE CLERCK and NEGREROS-CASTILLO (2000) or ALBUQUERQUE *et al.* (2005). The different levels or strata are based on the height of the plants.

CABALLERO (1992) described three different strata:

- Low stratum: 0-2m (shrubs and small trees)
- Middle stratum between 2-5m
- Higher stratum between 5-15m which is where the tallest trees are found

Domesticated plants, which originate in the neotropics are the most common elements in the medium and lower strata. A clear-cut stratification does not exist on this level. In the medium strata fruit tree species from the old world are dominant.

DE CLERCK and NEGREROS-CASTILLO (2000) identified and defined five strata in Mayan homegardens:

- Herbaceous stratum: <0,5m formed by herbs and creepers, like basil (*Ocimum basilicum* L.) squash (*Cucurbita sp.* L.) and epazote (*Dysphania ambrosioides* [L.]

Mosyakin & Clemants). Some 14% of the species found in the garden grow in this stratum.

- Low shrub stratum: 0,5-1,5m characterized by annual and perennial herbaceous plants such as tomatoes (*Lycopersicon esculentum* Mill.), espelon, a varity of the cowpea (*Vigna unguiculata* [L.] Walp.), corn (*Zea mays* L.) and chilli pepper (*Capsicum* L.). Furthermore, shade tolerant species are found in this stratum such as pineapple (*Ananas comosus* L.), ginger (*Zingiber officinale* Roscoe), cassava (*Manihot esculenta* Crantz) and pioneer species. This stratum contains 12% of the species of the garden.
- Tall shrub stratum: 1,5-3m formed by plants in tolerant to shade, for example, bananas (various species of the genus *Musa*), papaya (*Carica papaya* L.), chaya (*Cnidoscolus aconitifolius* [Mill.] I. M. Johnston), achiote (*Bixa orellana* L.) and it contains 15% of the species of the garden.
- Low tree stratum: 3-6m (fruit trees) and it dominates if there is no fifth stratum. 41% of the species of the garden grow in this stratum. It is better developed in more mature homegardens, than in homegardens which were established recently.
- Tall tree stratum (palms, tall fruit trees, like mango [*Mangifera indica* L.] and avocado [*Persea americana* Mill] and timber trees). It is also better developed in more mature homegardens, than in homegardens, which were established recently.

The vertical structure of homegardens in Brazil was described by ALBUQUERQUE *et al.* (2005) who found three different layers in the surveyed gardens.

- Lower stratum: 1-3m (medicinal plants, fruits and forage plants)
- Mid stratum: 3-7 (multiple use)
- Upper stratum: 7-12 (composed by fruits and timbers)

BENJAMIN (2002) listed common plants, which are found in the different strata in Mayan homegardens and described their use:

Trees in the canopy: chicozapote (*Manilkara zapota* [L.] P.Royen), sapote (*Pouteria sapota* [Jacq.] H. E. Moore and Stearn), wild plums (*Spondias purpurea* L. and *Spondias mombin* L.), mango (*Magnifera indica* L.), breadnut (*Brosimum alicastrum* Sw.), Spanish cedar (*Cedrela mexicana* Roem.) and avocado (*Persea Americana* Mill.). People either eat their fruits parts are use parts of them as construction material.

Smaller trees are found in the second strata, such as papaya (*Carica papaya* L.), citrus varieties (*Citrus x limon* [L.] Burm.f., *Citrus sinensis* [L.] Osbeck, *Citrus aurantium* L. and *Citrus reticulata* Blanco). They are of major importance for household consumption.

Shade tolerant small trees and large shrubs and herbs: plantains *(Musa x paradisiaca),* chaya (*Cnidoscolus chayamansa* McVaugh) and achiote (*Bixa orellana* L.). They are used for household consumption and, moreover, are also used as medicine and for religious ceremonies.

Herbaceous layer: tomatoes (*Lycopersicon esculentum* Mill.) Chilli pepper (*Caspsicum sp.* L.), beans (*Phaseolus vulgaris* L.) onions (*Allium cepa* L.) and radishes (*Raphanus sativus* L.).

In homegardens in Zimbabwe and Zambia DRESCHER (1998) only rarely found bushes with a height of 1-3m or trees higher than 3m.

NIÑEZ (1984) defined two major ecological types of homegardens, which differ in their vertical profile (Figure 1 and Figure 2).

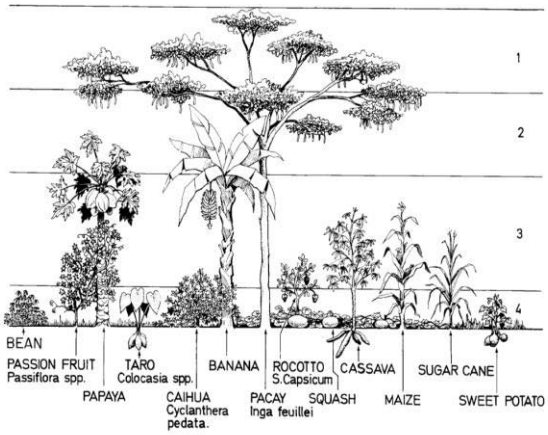

Figure 1: Ecological profile and production level of tropical homegardens (Source: NIÑEZ 1984: 18, modified)

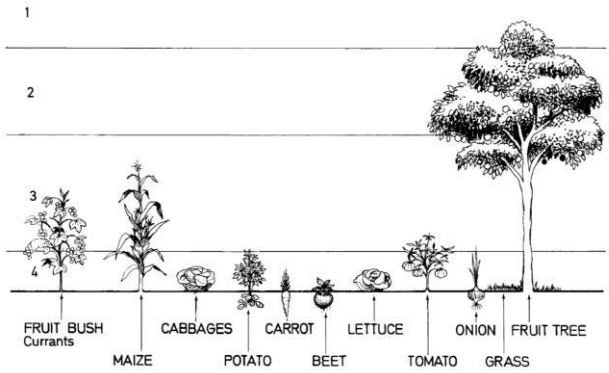

Figure 2: Ecological profile and production level of temperate homegardens (Source: NIÑEZ 1984: 19, modified)

2.6.4. Horizontal structures

The horizontal structures in homegardens refer to the spatial arrangement of plants. Plants can be cultivated as mixed stands, dense or sparsely or as monospecies stands. Plant to plant interaction, such as rooting patterns is taken into account in cultiavtion (PATTERSON 2000). Plants are cultivated in order to avoid a competition of light.

DRESCHER (1998) distinguished the following five cultivation categories in homegardens in Zambia and Zimbabwe:

- Cultivation of a single species in rows
- Mixed cultivation of different species on the same plot at the same time
- Cultivation in a special system of chambers and furrows on very small plots
- Cultivation in terraces that follows level differences
- Walls and hedges are places where special crops are cultivated, such as climbers or those that need special protection.

2.6.5. Species composition in homegardens

The majority of homegardens are composed of a variety of species, arboreal and herbaceous plants. They can either be indigenous to a specific region or exotic, which means they are introduced from other regions of the world such as Citrus varieties in the case of the Yucatan Peninsula. The native ones growing in homegardens can be wild or domesticated (BENJAMIN 2000). Wild tree species are dispersed by wind or animals. They are tolerated, if the gardeners can use them (FUNDORA-MAYOR *et al.* 2004) or were even managed. Examples of managed wild tree species are living fences, medical plants and some potential fruit trees.

Indian researchers claimed that tree growing in homegardens depends on the size of the garden (MITCHEL and HANSTAD 2004).

GREENBERG (2006) reported that in homegardens in the Yucatan Peninsula 33% of plant species are edible. In addition food plants are the most frequent species apart from hibiscus, and ornamental species.

In general the share of homegarden products to the household income influences the diversity of plant species (MÉNDEZ e*t al.* 2001). Species composition reflects the cultural idiosyncrasy and specific species play an important role in cultural tradition is it in food, religious or healing traditions. Homegardens are places where species, which are of cultural importance, are easily accessible (SOEMARWOTO and CONWAY 1992, TRINH *et al.* 2003). This cultural importance is one reason why the preservation of species is not of any importance to global cash crop. Thus, species composition in homegardens is influenced by both, biophysical and socio-cultural factors, next to specific needs of the household (VOGL *et al.* 2002; KUMAR and NAIR 2004).

2.7. Changes in homegardens

Worldwide the agricultural sector is changing. Since homegardens are part of an agricultural system, they, too undergo a process of change. They change their appearance of homegardens or their owners end to cultivate and abandon them. Due to the urban migration of young people, homegardens are at risk of disappearing (BENJAMIN 2000). Changes in the function of homegardens have lead to a different structure of them (VOGL 1998). While in some areas homegardening is on the decline, the size of homegardens increases in other regions (OMOHUNDRO 1985, VOGL and VOGL-LUKASSER 2003). For example homegardens in the Austrian Alps were smaller in former times than they are nowadays. This can be attributed to the fact since the cultivation of work intensive crops has been abandoned, more time is available to cultivate larger homegarden plots (VOGL and VOGL-LUKASSER 2003). An increase in unemployment as well as the existence of numerous well-stocked shops caused a decline in homegardening in Newfoundland, for example (OMOHUNDRO 1985). KÜHHAS reported that women in Agua Azul who had to leave their houses and move to another community, did not cultivate another homegarden in the newly inhabited area. On the one hand they did not start a new homegarden because they did not have enough time, and on the other hand, because products obtained from the garden are partly considered as inferior due to an increase of purchased food.

CABALLERO (1992) reported that Mayan homegardens changes, although they are still an important element of the subsistence strategy. Due to a process of adopting cultural traits from another society, a culture can lose its own traditions. As far as homegardens are concerned such an ‘acculturation’ have consequences on the species composition. As a result of an increased consumption of industrialized produced food, traditional food is less consumed and is considered to be of fewer nutritional value or lower social prestige among Indian groups in Mexico, for example (VOGL *et al.* 2002). The process of transformation in homegardens seems to accelerate throughout the Yucatan Peninsula. There is a notable trend towards an increase of ornamental plants and a cultivation of commercial varieties (CABALLERO 1992).

BENJAMIN (2000) reported a change in homegardens, which are situated close to urban areas or close to non-traditional agricultural production systems, such as cattle ranching in the Yucatan Peninsula. In large cities, such as Merida, homegardens give way to urbanization. In homegardens in communities close to Jakarta and other major towns in Indonesia, market orientated production of fruits has caused a remarkable reduction concerning the diversity of species (SOEMARWOTO and CONWAY 1992). Homegardens in more isolated areas in Bangladesh show more traditional patterns of homegardening (WILSON 2003).

As mentioned below, commercialisation affects species composition, nevertheless it does not necessarily involve a decline in biodiversity (TRINH *et al.* 2003). Studies of other regions however, proved that the opposite is true; that is, biodiversity decreases due to market-orientated production (DRESCHER 1998). Furthermore market orientation causes an increase in labour investments in homegardens (TRINH *et al* 2003). Market orientated production requires more inputs, thus homegardens, known as a system of low inputs, low yields and low risks become one of high yields, high inputs and high risks (SOEMARWOTO and CONWAY 1992).

In the Yucatan Peninsula citrus species alter the floristic composition in homegardens. Their abundance throughout the Peninsula is caused by a governmental program that promoted the cultivation of various citrus species (*Citrus spp.*) (JIMÉNEZ-OSORNIO *et al*. 2003). Some other species were introduced such as plantain (*Musa x paradisiaca*) and coconut (*Coco nucifera* L.).

Although gardening declined in terms of the number of people who cultivate a homegarden, they still exist in Newfoundland. Animal husbandry was abandoned in the 1960ies (OMOHUNDRO 1985). Some of the respondents, who do not cultivate a homegarden, associate gardening with being *'peasantish'* (OMOHUNDRO 1985: 64).

Homegardening has a lot to do with knowledge. Thus, one has to learn how to cultivate a homegarden. If parents abandon their homegarden and do not transmit their knowledge about cultivating plants to their offspring, their children do not know how to cultivate a homegarden (OMOHUNDRO 1985).

Due to the decrease in primary and secondary vegetation, farmers are forced to substitute the plants, which have formerly been found in this area by industrial goods (betony instead of wood for constructions, modern medicine instead of medical plants) (VOGL 1998).

2.8. Functions of homegardens

NIÑEZ (1984) sums up the functions of homegardens: *"Household gardens supply and supplement subsistence requirements and generate secondary direct or indirect income"* (NIÑEZ 1984: 15).

In general, the use of homegarden products is overlapping. Primary plants cultivated or tolerated in homegardens provide fruits and vegetables and therefore, representing an important source of vitamins and minerals, thus homegardens can contribute to a diet, which is rich in important nutrients.

Homegarden production can either be oriented towards food security, thus towards home consumption, or towards income generation, meaning market orientation (TRINH *et al.* 2003). In many regions production of food in homegardens is primarily for subsistence (DRESCHER 1998). The diversity of plants cultivated in homegardens increases the diversity of foods, which ultimately leads to a more balanced diet. In Vietnam TRINH *et al.* (2003) reported significant differences regarding the aim of production at the four different sites of their study. In one region 88% of the production is intended for markets, whereas in another region, where homegardens are the primary agricultural activity, 75% of the products are intended for home consumption (TRINH *et al.* 2003). LEVASSEUR and OLIVIER (2000) found that in homegardens in Belize, species grown for food prevail, which indicates the importance of homegardens for enriching the local diet of homegardens in this region. Several studies

showed, that homegardens supply the household with 50% of vegetables fruits and herbs (TRINH *et al.* 2003). The diversity of plants cultivated in homegardens increases the diversity of foods leading to a more balanced diet (TALUKDER *et al.* 2000). In Bangladesh, a national blindness survey conducted in the years 1982-1983 showed, that children living in households with a homegarden were less affected by night blindness (which can be caused by a vitamin A deficiency) than those living in households without a homegarden (TALUKDER *et al.* 2000). These findings lead to the initiation of programmes to implement gardening throughout Bangladesh.

By means of selling garden products, income can be generated with homegardens. Products for selling include fruits and vegetables, animal products as well as other valuable materials such as wood (MITCHEL and HANSTAD 2004). In Javanese homegardens the net income per unit is relatively high, and can actually be higher, than that generated by cultivating a rice field (SOEMARWOTO and CONWAY 1992).

Plants are used for medical and ceremonial purposes, for making tools and household tools as well as for thatching (CABALLERO 1992, TRINH *et al.* 2003). However, plants are not only grown for that purpose, they are also an important source of fuelwood. Beside dead wood, other dry plant material is also used as fuel (SOEMARWOTO and CONWAY 1992).

What is more, homegardens are places where social relationships are strengthened. Open areas serve as playground for children and as a place for talks among neighbours (VOGL 1998, SOEMARWOTO and CONWAY 1992, CORZO MÁRQUEZ and SCHWARTZ 2008, PINTON 1985).

In addition they are a status symbol and contribute to an increase of women's social status (SERENI MURRIETA and WINKLERPRINS 2003, MITCHEL and HANSTAD 2004). There is direct a relationship between women's plant management and their social status. Moreover homegardens represent cultural values, such as autonomy, piety and personal investment in the family (FINERMAN and SACKETT 2008).

2.9. Traditional land-use systems in Mexico

The management strategy of rural communities in México is formed by the homegarden and the *parcela*[2] (including the *milpa*) (JIMÉNEZ-OSORNIO 2003). These traditional production activities are still widespread all over the Maya area (CABALLERO 1992). The cultivation of the *milpa*[3] is the most important and labour intensive part of the rural production strategy (BENJAMIN 2000). The land use system of the *milpa* has existed in the Yucatán Peninsula for more than three millennia (PARSON *et al.* 2009). In this system of *roza tumba y quema* (clearing, cutting, burning) a forest area is cut first. These plots for planting are then burned and maize is cultivated mixed with squash and beans (ibid.). Slashing and burning clears the soil for planting. The ash of the burned vegetation contains nutrients for the growing crops. Furthermore, weed seeds are reduced by the fire. While in the traditional system the plots were left for regeneration for 15 to 40 years after a few harvests, nowadays fallow periods shorten this time to about 5 years (MONTAGNINI 2006). Thus, soil fertility declines. In combination with a decrease in market prices due to international trade policies the cultivation is again intensified. As a result, livelihood of peasants is endangered and the incentive to abandon the land for migration into urban areas is high (VOGL 1998). Another effect of the intensification in agriculture is an increased pressure to change forestland into fields for crops.

The *milpa* is cultivated by intercropping annual staple crops or maize, beans and squash in association. Other horticultural crops are also found within the *parcela*, but in different areas

[2] *Parcela:* this term refers to the work side assigned by the *ejido* assembly to an *ejidatario* or a *poblador*. It varies in size and is mostly located outside the *ejido*.

[3] The term *milpa* derives from the Nahuatl word *milli*, meaning planting (SCHÜREN 2002)

than maize. In some regions the *milpa* system possesses attributes of a productive homegarden, like dispersed fruit trees, vegetable crops and livestock (MONTAGNINI 2006).

Nowadays, the mechanization of the agriculture increases due to market oriented agricultural development policies. In contrast to the traditional system, land is prepared for sowing by means of machines and not by hand. While the traditional, labour intensive system is subsistence oriented, the mechanization and intensification goes hand in hand with an orientation towards a production for markets, either local or national. Yields as well as costs increase with mechanization (NICHTERL 2001). The specialization of agricultural production depends on external inputs. An increase in monocultural production is associated with a decline of mixed small-scale farming (JIMÉNEZ-OSORNIO *et al*. 2003).

Although *ejidatarios* have to announce the area that they want to cut and burn for cultivation of the *milpa* they, nevertheless, enjoy great autonomy concerning land use, only determined by environmental conditions. There is a tendency of individuals to ignore these conditions and use the land for short-term earnings (ERICKSON *et al*. 1999).

LOPE-ALZINA (2007) reported that a third production unit emerged recently in a community in Yucatán. Small parcels of community land within city limits are given to families to be used for future housing construction. These plots are neither exclusively women's nor exclusively men's. Hence, both women and men have equal decision-making power regarding these plots. Furthermore, women can go to the plots without being accompanied by a man.

2.10. Subsistence production

Bennholdt-Thomsen (1982) defines subsistence producer as people who live on food produced by themselves and, what is more, make everyday things on their own. A subsistence-based economy is often a combination of production systems. In rural areas far from towns, the main function of homegardens is subsistence production. This combination of complementary strategies serves as an insurance against the risk of failure of any of the strategies (OMHUNDRO 1985). Modern subsistence production is mainly performed by women, while men increasingly work for wage.

NICHTERL (2001) examined the food situation in Mayan villages in Yucatan and found, that traditional agriculture is shaped by subsistence production. However, during the week farmers migrate into the cities for wage work. VOGL point out that, in the context of subsistence within a Mayan community, production is primarily important for meeting family members' needs. Thus, there is an entity of production and consumption within the family (VOGL 1998). Changes in needs, increasing specification and a proliferating involvement in national markets lead to an increasing demand concerning clothes, sugar and oil, namely products, which can be purchased either for money or goods. This process shifts uniquely subsistence oriented production, to a production which is partly market oriented (VOGL 1998). Since homegardens provide food and income they play an important role for the families livelihood and clearly contribute to a better diet (MITCHEL and HANSTAD 2004, SOEMARWOTO and CONWAY 1992).

Destination of production influences the varietal selection. Even though the production is mainly for household consumption, the selection of varieties is strongly influenced by the women, who are in charge of most post-harvest management processes (LOPE-ALZINA 2007).

Homegardens play an important role in the household subsistence in all regions although there are remarkable economic differences throughout the Yucatan Peninsula (CABALLERO 1992). The different agricultural activities that form this subsistence system (the *milpa,* the homegarden, bee keeping), complement each another, thus, they provide different kinds of food to meet the family's needs. Furthermore, these activities represent a source of income (CABALLERO 1992).

The subsistence economy of a community in Chiapas is based on the cultivation of the homegarden and the field with different crops, the use of wild plants (primary and secondary vegetation) and livestock production (VOGL 1998).

2.11. The concept of gender

KÜHHAS (1993) provides an approach to the concept of gender in Mexico. The traditional concept of gender in Mexico is based on the idea that the ideal productive unit, which is formed by the male and female head of the house, is viable, if both complement each other. Men represent the household towards external persons and institutions. In Mayan societies the gendered division of labour is strictly organised. In other words men and women define themselves by means of the spheres for which they are responsible. These spheres are gender-specifically divided. By doing so, men and women reproduce a social normative arrangement. Nevertheless, there are deviations, for example when women assume tasks of male field of work. Only seldom do men carry out tasks, referred to the female sphere.

The concept of machismo is a Mexican ideology of masculinity, which has an impact on every single sphere of the social life. Obtaining and maintaining control over women and sexual aggression towards women are aspects of this concept. The relationship between men and women is characterised by competition. Women are under the ownership of men (BENNHOLDT-THOMSEN 1982).

BENNHOLDT-THOMSEN (1982) described the gendered division of labour in a Chol community in Chiapas. Women keep the house, prepare the meals and take care of the children. Furthermore, they are responsible for the fowl and the pigs, they sew clothes for money and work in the coffee plantations as wage workers. Men work outside the house where they carry out fieldwork for subsistence production as well as for commercial production and wage work. Sons help their fathers on the fields.

The property situation mirrors the different workspaces, thus women own, if any, some poultry or kitchenware, while men own the house and the land (BENNHOLDT-THOMSEN 1982).

3. Methods

3.1. Study site

The fieldwork was carried out at the communities Cristóbal Colón and Narciso Mendoza in the *municipio*[4]of Calakmul. These villages were recommended by Dr. José Armando Alayón Gamboa, the co-supervisor of this thesis, as he is familiar with the area has been working there himself.

3.1.1. Calakmul

3.1.1.1. Geography

Data collection took place in the southeast of the Republic of Mexico, in the State of Campeche, which is located in the peninsula of Yucatan (Figure 3). This region is characterized by ecological and cultural homogeneity (CABALLERO 1991). Historically the region was dominated by the Maya civilization (MONTAGNINI 2006). The villages, where the fieldwork was carried out form part of the *municipio* of Calakmul. With an extension of 14.681km^2 Calakmul occupies some 25.8% of the State of Campeche (AYUNTAMIENTO DE CALAKMUL 2007). Geographically it is situated between 19° 12' 17"N and 17° 48' 39"N latitude and 89° 09' 04" W longitude and 90° 29' 05" W longitude. It houses the Man and Biosphere Reserve Calakmul, which is part of the Corredor Biolólogico Mesoamericano (CBM) and designated as an area of high priority for conservation by the UN Environment Programme. In 1997 Calakmul was given the municipal status with Xpujil as its administrative capital in 1997, which formerly was part of the municipality of Hopelchen. It was done in order to facilitate the economic development of the region (ERICKSON *et al.* 1999). It is bordered on the north by Hopelchen municipality on the west by Escárcega and Candelaria municipalities, on the south by Guatemala and Belize, and on the east by the state of Quintana Roo.

Calakmul means *"La ciudad de los montículos adyacentes"* (“City of conjoined hills”) (AYUNTAMIENTO DE CALAKMUL 2007).

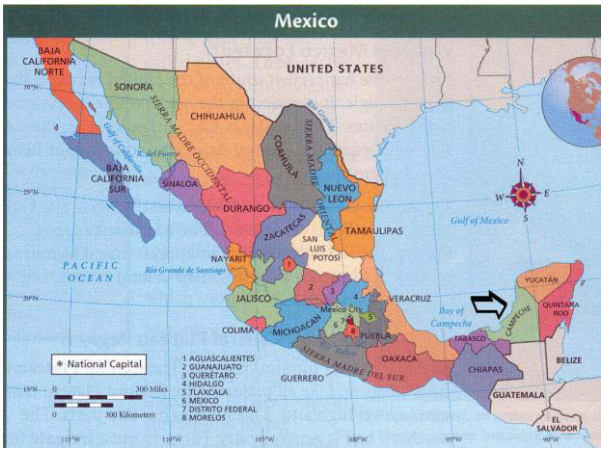

Figure 3: General map of Mexico, Campeche is marked by the black arrow (modified after www.blessedhopeacademy.com)

[4] The *municipio* represents the smallest official administrative and territorial unit

3.1.1.2. Geology and Geomorphology

The Yucatan Peninsula is part of the Yucatan Platform, formed of calcium and magnesium carbonates and soluble rocks, mainly limestone. The flat karst landscape resulted from the dissolution of limestone. Typical karst aspects such as sinkholes, or *cenotes*, underground caves and rivers can be found throughout the Peninsula. The relief is mostly flat with undulating uplands. Calakmul is located at the tableland of Zoh Laguna (Meseta baja de Zoh Laguna). The altitude ranges from 260m to 360m above sea level (BENJAMIN 2000; FLORES and ESPEJEL 1994).

3.1.1.3. Climate

According to Köppen, modified by GARCÍA (1973), the climate is warm sub-humid (Aw), with a mean annual temperature of 27° C and a low of 18°C. Annual precipitation ranges from 600-1200mm, with an average annual rainfall of 750mm.

The region has a marked seasonality with three seasons dividing the year. The dry season extends from February to May, followed by the rainy season from June to September with 80% of the annual precipitation. During the rainy season, trade winds, which are a weather effect of the Intertropical Convergence Zone (ITC), cross the Yucatan Peninsula, bringing in, warm moisture-laden air from the sea. The cold season lasts from October to January. “Nortes”, which are frequent fronts of cold winds that cross the Gulf of Mexico from a northeast to southwest direction, carry humidity, hence humidity is increasing in this direction. Due to long periods without or of little precipitation, the majority of the Peninsula is considered to be a tropical dry savannah (BENJAMIN 2000; WILLIAMS-LINERA and MEAVE 2002).

3.1.1.4. Hydrology

The hydraulic system in the Calakmul region is influenced by the prevailing geological conditions. Due to the existing bedrock, namely limestone, which is susceptible to erosion, rain drains, subterranean and surface water is limited. Rainwater quickly flows through a complex and extensive system of caves and cavern beneath the surface. Surface water and wetlands are found in basins, where clay sediments built a layer, which is less permeable to water, thus decelerates water drainage. These basins can be filled with water during the rainy season. During dry season almost all of the surface water found in water holes or in form of streams runs dry. Therefore, water scarcity is critical during the cold and dry season. Thus, water is the limiting factor in the region regarding human activities, primarily concerning agricultural activities. The quality of ground water is poor due to excess in calcium sulphates. Therefore, it is not potable for humans and the main source of drinking water, which is available, is rain water stored in water holes. These water holes are swamp like areas that originated from erosion and sedimentation processes. What is more they are found in an area where to precipitation and evaporation balance out.

Aguadas are small water holes made by humans to store the rain. Revetted with clay or stones they allow people to store the water during drought. However, they often run dry and the quality of the water is poor, and causes infectious disease.

Cenotes are natural springs in the Karst that originated from the structural collapse of the rock ceiling above a subsurface void, caused by the dissolution of limestone. *Cenotes* contain groundwater.

Superficial water bodies found which can be found in the region are the lakes Laguna de Noh, El Teniente and Laguna de Alvorado. The rivers of the region are El Escondido, El Desempeño, Las Pozas, Río Azul and Las Palmas, all of which carry little volume of water (GARCÍA-GIL 2003; MORALES 1999; RYAN 2009).

3.1.1.5. Soil conditions

Poor and stony soils are characteristic of many areas of the Yucatan Peninsula. Soils originate from limestone bedrock as parent material. In most sites the humus layer is poor and fertility is low. Due to the process of leaching, accelerated by torrential rains and high temperatures, minerals and organic solutes are lost (http://www.e-local.gob.mx).

Soils found in the region are Lithosol, Gley soils, Vertisol and Rendzina. Gley soils are found in lowlands where they are fed with water all year round. Furthermore they form the base of the *aguadas*. Lithosols and Rendzinas are other soil types found in the lowlands of Calakmul. The former are shallow, the latter have a high content of organic material and are the main soil type of the region. Vertisols are the dominating soils in higher located sites with a high content of clay, which forms deep cracks in dry seasons due to the process of shrinking. As limestone is the parent material and precipitation is low, soils in the Yucatan Peninsula can be moderately basic (BENJAMIN 2000; MORALES ROSAS 1999).

3.1.1.6. Vegetation

Calakmul is part of the second largest area of tropical forests in North America namely the Mayan Forest. Several plant communities can be found in the Peninsula of Yucatan. In the northwest of the Peninsula the deciduous forest prevails, whereas in the centre and the northeast the subdeciduous forest dominates, and in the south prevails the tropical evergreen forest (CABALLERO 1991).

According to MARTÍNEZ and GALINDO (2002), the ecosystems to be found in Calakmul include:

- Subtropical and subtropical dry broadleaf forests
- Tropical and subtropical grasslands, savannas, and shrublands
- Flooded grasslands and savannas
- Wetlands
- Riparian vegetation
- Secondary vegetation

The forest as a whole is composed of old forest and secondary forest. Secondary forest with different stages is the the type of vegetation that characteristically comes up on fallow plots (ALAYÓN-GAMBOA and GURRI-GARCÍA 2007).

3.1.1.7. Land use in Calakmul

Most of the Municipality of Calakmul is covered by forest (97.30%), and 2.46% are used for agricultural activities (crop cultivation and livestock production). Other vegetation (a plant association called Tular (Totora [*Schoenoplectus californicus ssp. Tatora*]) covers 0.12% and 0.03% of the total area is used for settlements (Table 1).

Table 1: The proportion of land use and vegetation of the total area of Calakmul (14.681km^2) (Own table data from INEGI)

Land use	Proportion of the total area in %
Forest	97.3%
Crop Cultivation	1.34%
Pasture Land	1.12%
Other Vegetation (Totora [*Schoenoplectus californicus ssp. tatora*])	0.12%
Human settlements	0.03%

Calakmul is characterized by a lack of real economic alternatives to slash and burn subsistence agriculture. Thus, most of the people living in the area practice subsistence and small-scale agriculture. Colonists imported their agricultural knowledge from their place of origin into the new environment. People coming from central and northern parts of the state tend to employ mechanized agriculture and cash crop cultivation, which includes the intensive use of agrochemicals. These practices lead to a reduction in forest cover and to a decrease of soil fertility. Jalapeño pepper *(Capsicum annum* L.*)* is the main cash crop in the region, whereas maize *(Zea mays* L.) and beans (*Phaseolus vulgaris* L.) are the most important crops for subsistence production. Colonists who are already familiar with farming in this region, such as the indigenous Maya in tropical conditions, practice the swidden system of agriculture. This system allows the forest to regenerate.

Another agricultural practice is livestock production. Cattle are perceived as a symbol of wealth by local communities. From a conservationist perspective, cattle ranching can be destructive due to the soil being compacted and the influence of forage grasses on the regrowth of forest vegetation. Within the communities a conversion of forest to pasture land may result in a profound and perhaps irreversible land use transformation. Both cattle ranching and the mechanisation of agriculture require great financial input which most of the colonists, however cannot afford. Some regional *campesino*[5] organisations own a tractor, which is used to plough one or to two hectares for several farmers (ERICKSON *et al.* 1999; ALAYÓN-GAMBOA and GURRI 2007).

Forest resources are also an important source of income, thus valuable timber has been heavily exploited (ALAYÓN-GAMBOA and GURRI 2007). Nowadays the Calakmul Biosphere Reserve permits a sustainable use of forest resources for the local population, but no extensive logging of the forest.

3.1.1.8. The Calakmul Biosphere Reserve

The villages in which the fieldwork was carried out are situated within the buffer zone of the Calakmul Biosphere Reserve, which was established in 1989 by a presidential decree and accepted into the UNESCO network of “Man and Biosphere” (MAB) reserves in 1993. With an extension of 7.231.85 km² it is the largest protected area of tropical forests in Mexico (PORTER BOLLAND *et al.* 2006). Due to its size, the biosphere has an important impact on the regulation of the microclimate and that of the ecosystem (ARREOLA *et al.* 2004). Within the reserve 80% of the plant species of the Yucatan Peninsula are found (DÍAZ-GALLEGOS *et al* 2001). The vegetation consists of a patchwork of mature disturbed forest, secondary growth vegetation of less than 25 years, and savannah-type flood plains. Moreover, the forests of the Calakmul Biosphere Reserve shelter numerous ruins of the Preclassic and Classic Mayan civilization, which gives them a cultural as well as an ecological value. The reserve is an important element of the ecological corridor that exists between the humid tropics of Guatemala and the Lacandon region in the south of Mexico, and the northern part of the Yucatan Peninsula and the Caribbean. A change in the use and management of natural resources effects species’ structure and composition in distinct vegetation types (DÍAZ-GALLEGOS *et al.* 2001).

As a biosphere reserve its area is divided into *core* and *buffer* zones. This division goes hand in hand with restriction of use of the area. The highway No 186 leading from Chetumal to Escárcega separates the northern core areas from the southern ones. While ecologically sustainable productive activities are allowed within the buffer zones, no human activity is permitted within the two core zones. In several *ejidos*, which had already existed when the biosphere reserve was established, conflicts arose from the fact that the border of the core zone cut across the territory of these *ejiods* (ERICSON *et al*. 1999). These boundaries, as well as the fact that the land was already used by locals, and the location of villages were not taken into account because the population was less dense than it is today. The population

[5] *Campesino* span.: farmer

has been growing from 3000 to more than 25.000 since 1989 (which is when the reserve was decreed). Due to the restriction of land use, stipulated by the reserve, the communities surrounding the reserve see the conservation agendas as a force that undermines the survival strategy (ERICSON *et al*. 1999).

There is no consistent political position concerning the future of the area, hence also concerning the biosphere reserve. While some ministries support the protection of the area for the biological and cultural wealth of the region, others promote the increasing tourism. There clearly are contradictions regarding policies to expand roads to facilitate access and to subsidize agricultural production.

Growing tourism significantly affects infrastructural measures. Due to the possibility to buy land within the *ejidos*, outsiders bought land in Xpujil, which is mainly used for constructing shops and hotels, in order to meet the growing demand for tourist services (ERICSON *et al*. 1999).

The Calakmul biosphere reserve is endangered by several factors:

- Forest Fires
- Population growth
- Conflicts between reserve and population
- Illegal hunting
- Agriculture (slash and burn) and cattle
- Highways
- Tourist infrastructure
- Faulty design of the polygon
- Lack of synergy and coordination between institutions (RAYN 2009).

3.1.1.9. Population (Sociodemographic characteristics)

Calakmul remains one of the most isolated and least populated regions of Mexico. The majority of the inhabitants are peasants. Much of this region was colonised due to a government policy that encouraged the settlement of areas considered to be under-utilised. As a result of the agrarian reform policies in the 1970ies, an extensive, spontaneous and planned in-migration by colonists from 23 different states of Mexico began. The majority of them came from Chiapas, Veracruz and Tabasco. These colonists have been pushed from their places of origin by lack of land, lack of employment, displacement by commercial agriculture and ecological catastrophes (volcanic eruption of El Chichónin 1982, situated in Chiapas). As a consequence the population growth increased remarkably. Migration effected the heterogeneous population in this region. Thus, nowadays Mestizos, Yucatec Mayas, Choles, Tzeltales, Nahuans, and Totonacs live in the municipality of Calakmul. Distinct customs with respect to the land vary amongst ethnic groups, which makes conflicts an ever-present reality. Most of the colonists have arrived within the last 30 years. In spite of rapid growth, the population density remains low. Therefore, there is plenty of land available for cultivation in the area, however, political pressure will probably increase to convert the forest resources of the biosphere reserve into pastures and farmed lands (AYUNTAMIENTO DE CALAKMUL 2009; GURRI *et al.* 2002; ERICKSON *et al.* 1999).

3.1.1.10. Land tenure

As a result of the Revolution, Mexico established a distinctive system of communal land known as *ejido* in 1917. An *ejido* consists of a settlement area in the centre, with areas of communal use (school or other public institutions) surrounded by fields. This type of land grant is administered by a group of individuals called *ejidatarios,* who form the *Asamblea General* (general assembly). It is the topmost institution, which decides on all works to be done, on the use of resources and on other aspects affecting daily life. *Comisario ejidal* is the agency of an *ejido* formed by the president, a clerk and a treasurer, responsible for the achievement of what was decided. A president and two clerks, who check legal aspects of

the decisions made by the *Asamblea General*, form the *Consejo de Vigilancia.* Each person holding a function within the *ejido* gets elected every second year. An *ejido* functions as a platform for political participation and serves as an organ to public authorities outside the *ejido. Ejidos* are authorised to enforce internal rule making, thus *ejidatarios* are responsible for the formulation of internal *ejido* laws. Land distribution within the *ejido* is determined by internal regulations, whereby parcel allotment to individual *ejidatarios* generally varies from 20 hectare to 100 hectares.
Pobladores are persons living within the communities, but do not have a right to land within the *ejidos*. In some *ejidos* conflicts arise between the two groups, regarding access to social services from government agencies, decision-making power and natural resources. In the examined communities the *pobladores* constitute a minority. Some are newcomers who will get their status as *ejidatario* after some time, of having lived in the *ejido*, others are sons of *ejidatarios*.

As a political institution the *ejido* is typically male dominated (KÜHHAS 1993). *Ejidatarios* are usually men, although women can also be *ejidatarias* (ERICSON *et al*. 1999). Official functions within the *ejido* are carried out by men. In principle women can carry out functions, however in the *ejidos* where data was collected no woman had any important function.

In 1993 the *ejido* legislature was changed by an amendment to Article 27 of the Mexican constitution, which now permits the privatization of *ejidos* land (PORTER BOLLAND *et al.* 2006). The governmental program was called PROCEDE *Programma de Certificación de Derechos Ejidales y Titulación de Solares Urbanes* (NICHTERL 2001). Land within the *ejidos* can now be bought and sold, which attracted outsiders to invest in tourist infrastructure in order to meet a growing demand for hotels and shops.

3.1.2. Surveyed communities

Both villages are situated off a main road running north south along the eastern side of the Calakmul Biosphere Reserve. This road facilitates market and services access in Xpujil. Furthermore, it will also encourage tourist access to the archaeological sites in the region (Figure 4).

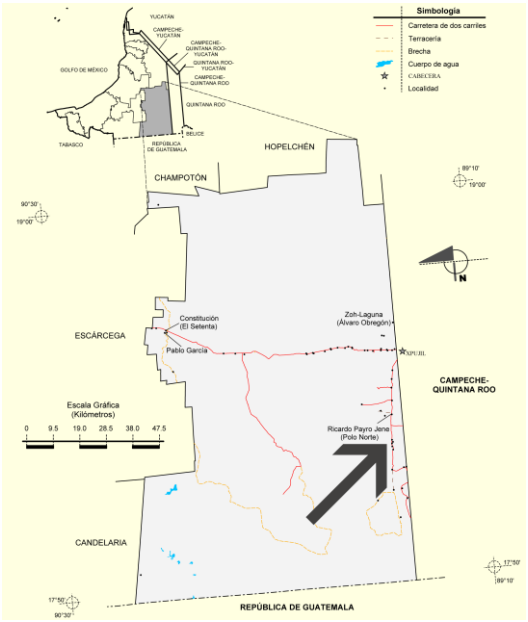

Figure 4: Localization of Narcizo Mendoza and Cristóbal Colón within the municipality of Calakmul, marked by the arrow (modified after INEGI)

3.1.3. Narciso Mendoza

Narciso Mendoza is located at the kilometre 33 of the Xpujil to Justo Sierra Méndez road. Its southwest border is adjacent to the reserve.

Its geographical data are: 89°27’13” W longitude, 18°13’50” N latitude, with an altitude of 240m above sea level.

Nine homegardens were examined in Narciso Mendoza and households were visited to conduct interviews with both heads of the household.

3.1.3.1. Population of Narciso Mendoza

The total population of Narciso Mendoza adds up to 368 people. Out of these 172 are male and 196 are female. Narciso Mendoza is home to 62 households.

3.1.4. Cristóbal Colón

Some two kilometres close to Narciso Mendoza one can find the village of Cristóbal Colón which is located on the same road as Narciso Mendoza. Its geographical data are: 89°27’13” W longitude, 18°13’18” N latitude, with an altitude of 250m above sea level.

In Cristóbal Colón eleven homegardens were examined and households were visited in order to interview both household heads of the household.

3.1.4.1. Population in Cristóbal Colón

The total population of Cristóbal Colón constitutes 371 people. Out of these, 193 are male and 178 are female. These 371 persons live in a total of 79 households

3.1.4.2. Infrastructure within the communities

Most of the households in both communities are energised. There is a *casa salud,* a public health house, in each village, which is open once a week whereby the medical personnel rotates. There is no public bus transportation, but *colectivos* or taxis offer rides to Xpujil, the administrative capital of Calakmul.

Both communities are beyond a mobile phone signal and no telephone system exists. Mail service was established during the second stage of the fieldwork.
Both communities have a kinder garden and a primary school and in Narciso Mendoza one can even find a secondary school.

3.1.4.3. Access to water within the communities

Water is the most limiting factor within the communities which are both equipped with a water supply network. A water tap is found in homegardens, however it often does not work. Generally, water is distributed every third day. During drought, shortages in the supply of water necessitate water distribution by tank wagons.

In Narciso Mendoza there is a well, where people draw water with the help of buckets (Figure 5).

Figure 5: Girls drawing water from the well in Narciso Mendoza (Pictures: DIETRICH 2010)

A river passes through Cristóbal Colón, which is dammed within the community. People use the water for washing and irrigating and, if they boil it, they even use it for drinking. During the drought the river almost runs dry.

3.2. Methods and Tools

3.2.1. Literature review

3.2.1.1. Literature research concerning books and scientific articles in Austria

In order to become familiar with the research area and to get the state of the art, search for books and articles (with the keywords: homegardens, traditional agricultural systems, subsistence farming, women and agriculture, Mexico etc.) was done at the library of the University of Applied Life Sciences and at the library of the University of Vienna. At the same time the search for articles in various scientific journals (using the same keywords) started. Access to the catalogues of international editors (consortia such as: Science direct, SpringerLink, Wiley Online Library etc.) was offered by the library of the University of Applied Life Sciences.

Article references of studies by authors such as Howard, P; Kumar B.M. /Nair P.K.R. or Vogl, C.R, Vogl-Lukasser, B. and Caballero, J. were used for a searching circle once again.

3.2.1.2. Literature research concerning books and scientific articles in Mexico

I spent the time between the stages in the communities in San Franciso de Campeche, where I used the library of the ECOSUR (El Colegio de la Frontera Sur) for further research. Many researchers at the ECOSUR have been working in the area, so I found a lot of helpful studies either in digital or in printed form for my own study.

Furthermore, I looked for literature at the library of the ECOSUR in San Cristóbal de las Casas in Chiapas.

3.2.1.3. Internet research

In order to get a first overview of the current results of research as well as to get to know the official position in the field of women in agriculture several websites were checked, such as the homepages of FAO (Food and Agricultural Organisation of the United Nation), UNRISD (United Nations Research Institute for Social Development), etc. Same keywords, as mentioned above were used to enter the search engine.

3.2.2. Data collection in the communities

3.2.2.1. Selection of the conducted communities

My co-supervisor Dr. José Armando Alayón Gamboa suggested the communities of Narciso Mendoza and Cristóbal Colón for my fieldworkas well as two other communities. The first two were selected because of the fact they have Spanish speaking population, thus, to facilitate communication. Mayas, who speak Chol, inhabit the other suggested communities. Thus, I would have needed an interpreter for my research, and primarily for the interviews with women.

3.2.2.2. Time schedule of the field work

The research was conducted from January to May 2010 in Campeche. To collect the data I divided fieldwork into three stages which all took place in the communities (Table 2).

Table 2: Time schedule of the fieldwork

Data collection	Time schedule	Methods and tools
1st stage of fieldwork	February 2010	Homegarden visits
		Free lists
		Informal interviews
		Pre-tests of the structured interviews
		Participant and non-participant observation
2nd stage of fieldwork	March 2010	Homegarden visits
		Structured interviews
		Participant and non-participant observation
3rd stage of fieldwork	April 2010	Structured interviews
		Rankings
		Participant and non-participant observation

~~3.2.2.4.~~3.2.2.3. Informal interviews

Formatiert: Nummerierung und Aufzählungszeichen

Data which was collected by talking to people (gardeners and others) without the use of questionnaires, thus without structure or control (BERNARD 2002), was carried out during each of the three stages in the communities. This information was then written down.

~~3.2.2.5.~~3.2.2.4. Structured interviews

Formatiert: Nummerierung und Aufzählungszeichen

Structured interviews, composed of questions, which were exactly the same for each respondent (BERNARD 2002) were conducted. Most of the questions included were open. Some were fixed choice questions where the answers were already pre-coded. The questionnaire was pre-tested during the first stage in the communities and suitably modified. Interviews were conducted in 20 households. The idea was to interview the female and the male household head. The interviews were carried out face-to-face and men and women were asked separately to avoid answers being influenced by the other interviewees. On average, each interview took between 45 minutes to one hour to complete and was carried out in the house of the respondent or outside in the homegarden.

The questionnaires included questions about:

- the socio-economic conditions of the gardener including age, sex, marital state, place of origin, number of years living in the village, level of education, years of homegarden cultivation, relation to people who had taught the gardeners how to cultivate a homegarden, information about the number of people living in the household
- the structure and management of the homegarden, labour division in the household
- the function of the homegarden and use of homegarden products
- the responsibilities within the household

Before the questionnaire was created people were asked to list the tasks carried out in the homegarden, either by themselves, by family members or other persons in order to elicit the homegarden management. The responses were noted down and used to create the questionnaires. Whenever a new task was mentioned by a respondent it was added to the list. As the number of responses increased, changes to the list become less that made the list more stable, thus more complete.

~~3.2.2.6.~~3.2.2.5. Rankings

Formatiert: Nummerierung und Aufzählungszeichen

Rankings were conducted in order to identify differences in the perception of the importance of the homegarden between women and men. For this purpose simple small cards with hand drawn sketches of the benefits of the homegarden were used. All of the respondents were asked to order these cards. Thus “interval-level data” (BERNARD 2002: 296) was created by asking people to rank the importance of the homegarden.

~~3.2.2.7.~~3.2.2.6. Participant observation and non-participant observation

Formatiert: Nummerierung und Aufzählungszeichen

Participant observation and non-participant observation was used to observe daily practices in the homegardens for getting a better understanding of gender roles in managing the homegarden. Field notes and pictures were taken of these activities.

~~3.2.2.8.~~3.2.2.7. Homegarden visits

Formatiert: Nummerierung und Aufzählungszeichen

Walks in all surveyed homegardens were carried out accompanied by either the female or the male household head or by both. Plant species and their use were taken down. Species were named by the gardeners. In this study voucher specimens were not taken due to the social focus of the study on the division of work and labour. Whenever plant names were mentioned, photos of these plant species were taken and the species determined with local experts on Botany from ECOSUR.

3.2.3. Storage of the data and technical equipment

Structured interviews were recorded with the help of a digital voice recorder, which was provided by the ECOSUR, Campeche. This data was stored on the computer. In addition back ups were made on an external hard disk drive. What is more, notes were taken during the interviews to facilitate the transcription afterwards. Pictures were taken with a digital camera and after labelling then they were also stored on the computer.

3.2.4. Data analysis

Recorded interviews were transcribed. This material was then coded and analysed, both quantitatively and qualitatively. A Predictive Analytics Software (PASW) for Mac version 18.0 was used to produce statistics of survey data. Pearson correlations were performed, using levels of significance listed in Table 3 in order to explore pair-wise relationships between selected variables. Analysed data was then displayed graphically with Excel.

Table 3: Interpretation of p-values of statistical tests (Source: BORTZ and DÖRING 2006, JESCH 2009)

p-value	Symbol	Interpretation
>0,05	n.s.	Not significant
≤0,05	<0,05	Significant
≤0,01	<0,01	Highly significant
≤0,001	<0,001	Very highly significant

3.3.

~~3.3.~~3.4. Description of respondents

Formatiert: Nummerierung und Aufzählungszeichen

The following section describes my interviewees. During the first stage in the communities my co-supervisor Dr. José Armando Alayón Gamboa, who had already worked with some of them, introduced me to them. During these visits, the residents were asked, if they were willing to answer questions pertaining to the division of labour in their homegarden.

~~3.3.1.~~3.4.1. Sex

Formatiert: Nummerierung und Aufzählungszeichen

Out of the 36 informants, half were men and half were women. I attempted to interview the female and the male head of the family of each household that I visited, however, one woman is widowed, and one man was in the United States of America at the time of the interview to work there. Another woman was in a poor health condition and one woman did not want to give an interview because she was concerned of having too little knowledge.

~~3.3.2.~~3.4.2. Age

Formatiert: Nummerierung und Aufzählungszeichen

The mean age of my respondents was 44,5 years, with the age ranging from 36 to 55 years of age (Figure 6). The youngest respondent was 26 and the oldest 74 years old. Half of the women were younger than 45 years.

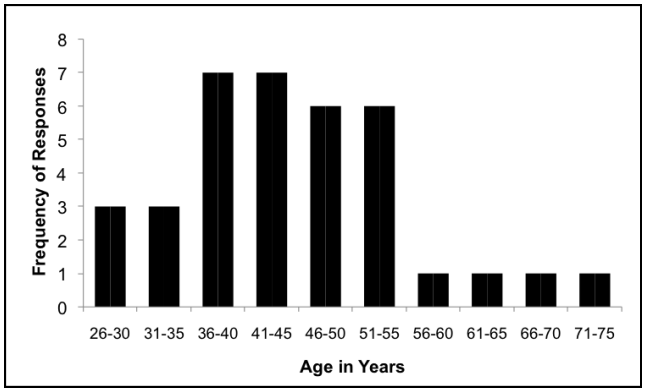

Figure 6: Frequency of the respondents' age (n=36; mean=44,5)

~~3.3.3.~~3.4.3. Origin of respondents

Formatiert: Nummerierung und Aufzählungszeichen

In the 1970ies migrants from all over Mexico populated the area. The respondents either came from the Mexican states of Veracruz, Tabasco, Chiapas, Oaxaca or were born in the state of Campeche (Figure 7). Each community tended to be formed by people who originally come from the same state. Thus, in Narciso Mendoza, for example, almost all people who live there originate from Tabasco live, while the inhabitants of Cristóbal Colón mainly stem from the Mexican state of Veracruz. One female and one male respondent, both living in Narciso Mendoza were born in Calakmul. Two respondents came from other municipalities of

the State of Campeche (Escarcega and Hopelchen). One woman migrated to Cristóbal Colón from Chiapas and another one migrated from Oaxaca.

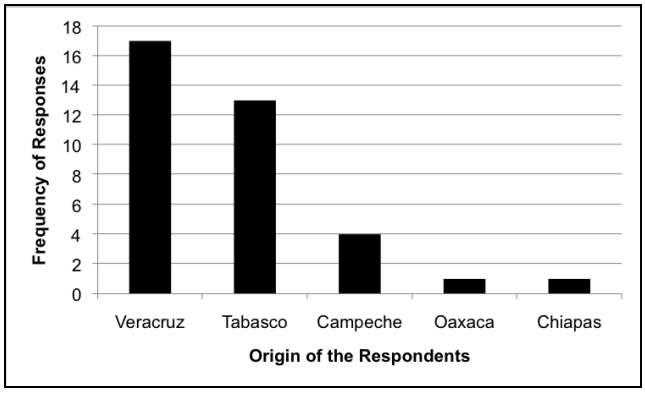

Figure 7: Origin of the respondents of Narcizo Mendoza and Cristóbal Colón (n=36)

~~3.3.4.~~3.4.4. Education

Formatiert: Nummerierung und Aufzählungszeichen

Six out of a total of 36 respondents had never attended school. Out of these six four were women. Three of them are between 36-45 years old. 19 people had started attending primary school (six years) (nine women). Most of them (84.2%) are between 36 and 55 years old. Nine people completed secondary school (four women). All of them are younger than 55 years of age. Two (one women and one man) completed high school (*Praeparatoria* 3 years). They are both younger than 35 years.

~~3.3.5.~~3.4.5. Ethnicity

Formatiert: Nummerierung und Aufzählungszeichen

The majority (80.5%) of the respondents are Mestizos, this term is used for people of Indigenous and European (Spanish) descent. Four stated to be Totonac, two are Nahuan and one is Mayan

~~3.3.6.~~3.4.6. Language

Formatiert: Nummerierung und Aufzählungszeichen

All of the respondents speak Spanish. According to their ethnic descent, the Totonacs speak Totonac, the Nahuan speak Nahuatl and one, who is Maya, speaks Chol. Although they can talk in their mother tongue, they talk to each other in Spanish most of the time.

~~3.3.7.~~3.4.7. Occupational profile

Formatiert: Nummerierung und Aufzählungszeichen

Most of the respondents do not have any other job outside the household. All women are housewives, and two of them also work in other households to improve their income cooperating on the domestic work. All of the male interviewees are farmers apart from one, who works as a teacher in Quintana Roo and is at home on weekends. Apart from their work as farmers seven men also work outside their farm and three of them do so at least once in a while. They help others within the *ejido* to cultivate their land or work on cattle farms. Only a few of them go to Cancun for some time to work there within the tourist sector.

~~3.3.8.~~3.4.8. Income

Formatiert: Nummerierung und Aufzählungszeichen

In most cases the household income consists of various sources. For 15 households it is the cultivation of Chilli pepper (*Capsicum* spp.), which is important for covering the costs. Chilli is grown in monoculture on the *milpa*. Post-harvest processing includes liberating the seeds and drying the fruits. Seeds and dried fruits are sold separately. Chilli pepper is also sold fresh, thus immediately after harvesting. Buyers (called *coyotes*) come to the communities and buy the products directly from there. This way they control the prices. As consequence peasants depend on the buyers and must sell their products at the prices that the *coyotes* set.

Male wage work (section 3.4.7) is another important source of income for 13 respondents. It plays an essential role, especially and primarily for women (10 of 13 respondents, who mentioned wage work as important source of income, were women).

For four people selling honey is relevant regarding income. Three stated that livestock produces a profit. One respondent sells a specific species of the Poaceae to people in Cancun where it is used for roofing.

Most of the respondents obtain governmental benefits. Ten peasants obtain aid from *PROCAMPO* (*Programa Nacional de Modernización del Campo*), which is the National Farm Modernization Program. It was established under president Salinas de Gortari, when NAFTA (the North American Free Trade Agreement) came into force at the beginning of 1994, to mitigate the impacts of the removal of trade barriers. This program directly provides farmers with cash subsidies for planting corn (*Zea mays* L.) on a per hectare basis. Farmers depend on subsidies like these to a large extend.
15 Women receive money from the *Opportunidades* program, which is paid every second month. The amount depends on the number of children and their age.

There are other governmental aids such as benefits for cattle breeding, one for bee keeping, and one for the elderly, which are each in total obtained by one respondent.

~~3.3.9.~~3.4.9. Household size

Formatiert: Nummerierung und Aufzählungszeichen

The average number of people living in a household amounted to five. The smallest household was a couple, living on their own without any children. The biggest households counted up to 11 people (Figure 8).

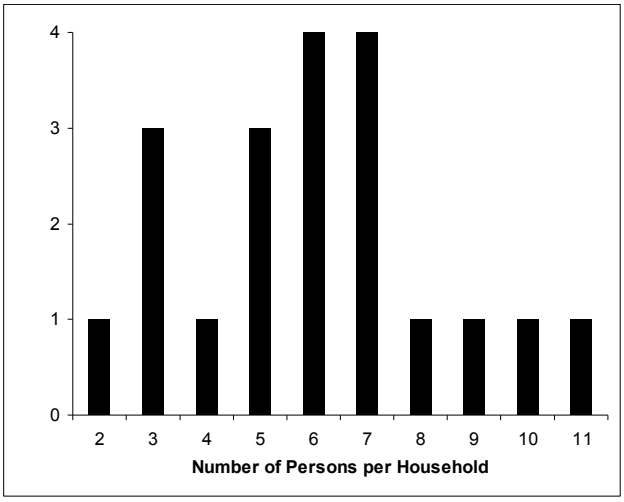

Figure 8: Household size of the surveyed households in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n=20)

~~3.3.10.~~3.4.10. Land tenure

Formatiert: Nummerierung und Aufzählungszeichen

Both women and men are owners of homegardens. Five male respondents said, that the owners of the homegarden were women. However, only two women perceived themselves to be the owner of the homegarden. According to14 women and 11 men, it is men who own the homegardens which makes men the main owners. Two women and two men said that others were the owners of the homegarden (Figure 9).

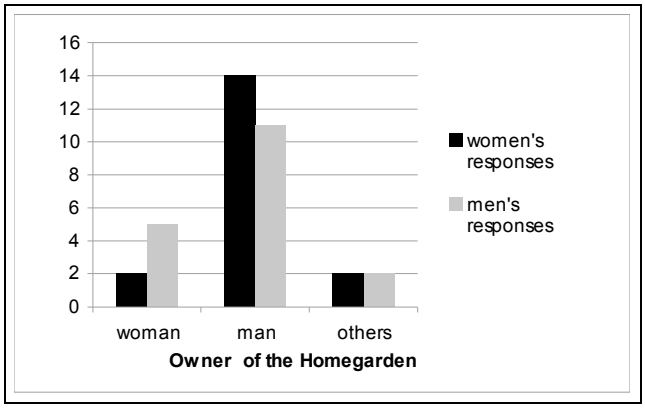

Figure 9: Ownership of the homegarden of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

The homegardens were either donated, bought, rented or inherited. Ten homegardens were donated by the *ejido*, seven were bought, two were inherited and one is rented (Figure 10).

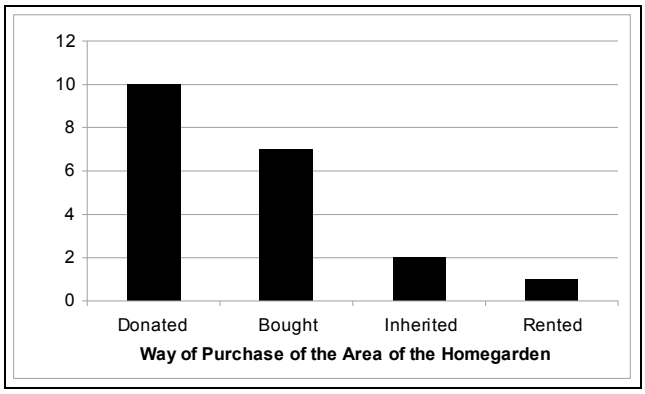

Figure 10: Way of purchase of the area of the homegardens of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n=20)

In most cases the male household head purchased the area (75%). In contrast only seven women did so. One male respondent said that he and his wife had bought it together and another male respondent claimed that another person had purchased the homegarden area.

4. Results

4.1. Appearance of the homegardens

Homegardens in Cristóbal Colón and Narciso Mendoza vary in several aspects. No examined homegarden equals another in appearance. Thus one appeared to be a forest due to the number of trees growing within, while another comprised a large area for goats and only five or six trees.

4.1.1. Location, size and shape of the homegardens

All the surveyed homegardens are located within the village and are adjacent to the gardeners homestead.

There is no uniform size of the homegardens. Most of the homegardens (66,6%) are 2.500 m^2 in size. The six smallest homegardens are 1.250 m^2, while the six biggest homegardens are 5.000 m^2 in size. Also the shapes of the homegardens vary, though they are more or less quadratic with some cases being rectangular and one triangular.

4.1.2. Homegarden Age

There is a wide difference in the age of the homegardens, with ages ranging from three to 38 years. The average homegarden age is 27 years. Most of the homegardens were established more than 16 years ago (75%). 25% of the homegardens are at least 29.5 years old. The youngest homegardens were recently established (e.g. four homegardens in the last 6 years). Three respondents did not know the age of their homegarden (one woman and two men).

4.1.3. Homegarden boundary

For defining the boundary of the homegardens several materials are used. Live fences, small branches, barbed - and netting wire fences were most frequently used materials for fencing (Figure 11). In 15 homegardens no visible boundary exists towards the public road. Towards the street two homegardens are defined with a fence made of small branches, one homegarden with a hibiscus hedge (*Hibiscus* L.), one with a stone wall, and one with a barbed wire fence (Table 4). Homegardens are separated from neighbouring properties by tall trees, Pita (*Bromelia pinguin* L.), netting wire fence or a fence made of small branches. Seven homegardens do not have any visible boundary towards the neighbouring property. Only one homegarden was totally bounded with several types of fences.

Table 4: Types of homegarden boundaries towards the road (n=20)

Boundary toward the road	Number of Homegardens
No boundary	15
Fence (made of small branches)	2
Hedge (*Hibiscus* L.)	1
Stone wall	1
Barbed wire fence	1

Figure 11: Homegarden boundaries (left: hibiscus hedge; right: fence made of small branches (Pictures: DIETRICH 2010)

4.1.4. Buildings

4.1.4.1. Houses

The houses in both villages are simple and rather small. Usually male household members build them on their own. Size depends on household size. Often one house is expanded by an extension, if more space is needed. Thus buildings in many cases consist of different extensions built at different points in time. Hence floor plans and number of rooms in the houses differ. Often the bedrooms and the kitchen are situated in two separated buildings. Therefore, at least two houses exist within all of the studied homegardens. Apart from serving as living quarters, houses are used for storage of maize.

House walls are made of hard wood, which is brought from the *parcela*. Planks are nailed onto a wooden construction and left raw without render. Windows are cut outs within the wooden wall, without windowpanes. Another kind of house is made of small branches fixed on a solid wooden frame. Walls can be rendered with plaster. Kitchen houses in some homegardens do not have any walls. Strong wooden poles carry the roof structure. To stop animals from entering the kitchen these poles are encircled by a netting wire fence.

The roof is made of corrugated iron or palm leaves. Nowadays roofs made of corrugated iron prevail, as houses can be roofed quickly with these sheets. The disadvantages of corrugated iron roofs – when compared with palm leaves - are their tendency to trap the heat and the noise of heavy rain. A governmental program finances corrugated iron roofs. Roofs made of palm leaves are set up within a week. Green palm leaves are used and fixed on the wooden structure. This kind of roof is absolutely water tight and lasts for up to 20 years. On hot days the heat is blocked out and the leaves absorb the noise of heavy rainfall.

Houses made of small branches are mostly roofed with palm leaves. Houses made of hard wood planks are roofed either with palm leaves or corrugated iron. No homegarden was surveyed with exclusively houses made of small branches and a palm leave roof. In the examined homegardens 34 houses are made of hard wood planks and roofed with corrugated iron, six houses of this type are roofed with palm leaves and seven are made of branches with palm leave roofs.

Most of the houses are furnished with concrete floors (41 houses) some have dirt floors (6 houses).

In Cristóbal Colón new showers and water toilets were built, financed by a governmental development program. Households that are not part of that program and those in Narcizo Mendoza have sheds, made of planks, for the shower and a latrine; these sheds are relocated over time.

All of the surveyed households have access to electricity.

4.1.5. Other structures and installations found in homegardens

4.1.5.1. Shelters and buildings for livestock

Four shelters were found in three homegardens. They are used as either carports for vehicle or as workshops for doing woodwork or making repairs. One respondent uses it to do carpentry for others as a source of extra income. These shelters are made of poles, with a roof made of corrugated iron. One such shelter is used for storage of a species of grass, which is sold to the tourist centres on the Caribbean coastline. It is roofed with palm leaves.

In twelve homegardens buildings for chickens, ducks and turkeys were found. These are simple sheds, made of planks and often roofed with palm leaves. Seven homegardens with barns for pigs were counted. These are of the same type like as for chicken. In one homegarden a barn for goats was found, surrounded by an area for grazing. In general a repository for water (e.g. old halved car tires) is located close to the shelters.

4.1.5.2. Washbasins

In all of the homegardens washbasins with a washboard were found. Although a washing machine exists in some households, dirty laundry is primarily washed by hand. For drying laundry is hung up on a clothesline in the homegarden.

4.1.5.3. Stoves for chilli drying

Stoves for Chilli peppers (mostly *Capsicum chinense* Jacq. and *Capsicum annuum* L.) drying are either temporary constructions or permanent installations in the homegarden. Temporary stoves for chilli drying are made of bricks and wooden poles. For permanent ones ground surface irregularities are utilized for a tunnel in which a fire is lit (Figure 12). A wooden frame with a net made of iron on which the chillis are placed is fixed above the fire. (The seeds of the chilli peppers are removed before drying and are sold separately).

Figure 12: Permanent stove for chili pepper drying in one homegarden in Cristóbal Colón, Campeche, Mexico (n= 36)(Pictures: DIETRICH 2010)

4.1.5.4. Growth supports

For plants like malabar spinach (*Basella alba* L.) or chayote *(Sechium edule* [Jacq.] Sw.) growth supports are built. Chayote is used for cooking; therefore these growth supports are mostly located close to the kitchen. Another kind of growth support is constructed for ornamental plants, and is located at the entrance area of houses (Figure 13).

Figure 13: Growth supports; left for ornamental plants in one homegarden in Narcizo Mendoza right for Malabar spinach (*Basella alba* L.) in one homegarden in Cristóbal Colón (Pictures: DIETRICH 2010)

4.1.6. Homegarden areas

Each homegarden has its specific zoning. Different uses determine the location of different areas. Although the location of the zones was deliberate, no uniform zoning was found in the 20 surveyed homegardens. Decisions on areas for zones are based on practical considerations, soil conditions and plant demands. For example herbs used for cooking are cultivated close to the kitchen, coffee (*Coffea spp.* L.) is cultivated in a shady area and crop cultivation is usually allocated to areas of high soil fertility.

Decisions about zoning are mainly made by men or by both household heads together. One woman said, that she decided the distribution of the homegarden in different areas. Nine women and eight men responded that men were responsible for zoning. Ten men and six women made the decision together with their spouses. Two women argued that other persons (i.e. not the female or the male heads of the household) determined the zoning of the homegarden (Figure 14).

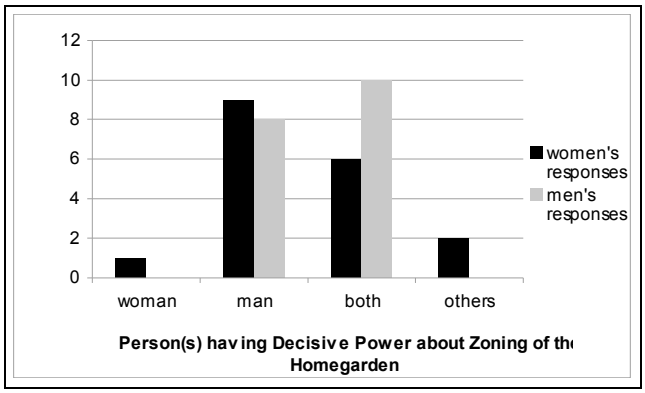

Figure 14: Person(s) having decisive power about zoning of the homegarden of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.1.6.1. Living area

In most cases an open area without dense vegetation is surround the house. This is used by children as a playground and as a meeting point for conversation among neighbours. Further housework, such as doing the laundry is mostly carried out in this part of the homegarden. Sometimes the stove for cooking is located in this area.

To facilitate feeding of animals, vessels to put the water and feed in are placed in the immediate surrounding of the kitchen house.

4.1.6.2. Ornamental plants

In all of the surveyed homegardens ornamental plants were found. They are spread all over the homegarden, cultivated either in pots or directly in the soil. Generally they are located in front of the house in order to decorate its entrance (Figure 11). Orchids, brought from the forest are fixed on trees or on poles.

4.1.6.3. Places for plant breeding

A place for plant breeding was found in six homegardens. This is a small fenced in area, where seedbeds of plants for transplanting either in the *milpa* or in the homegarden are prepared. Seeds are planted in old plastic bottles. Within the community one woman breeds plants for sale. In two homegardens hard wood trees such as mahagony (*Swietenia macrophylla* King) and Spanish Cedar (*Cedrela odorata* L.) are bred in order to transplant it in the *parcela*.

4.1.6.4. Area for crop cultivation

In nine homegardens areas for crop cultivation were found. These are fenced in either with a barbed wire fence or one made of small branches in order to hinder animals from causing damages. Gardeners cultivate their tomatoes (*Lycopersicon esculentum* Mill.) coriander (*Coriandrum sativum* L.), corn (*Zea mays* L.), chilli species (*Capsicum spp.*), radishes (*Raphanus sativus* L.) and squash (*Cucurbita sp.*). Plant species used as condiments were also found in this area such as mint (*Mentha sp.*) and oregano (*Origanum sp.*) In one homegarden young crops were shielded from strong sunlight with a thin cover.

4.1.6.5. Area of fruit species

In all of the surveyed homegardens fruit trees were found. In some of the homegardens they are grown more or less in one area, while in others they are spread all over the homegarden. Dominated by citrus varieties such as lime (*Citrus latifolia* Tan), orange (*Citrus sinensis* [L.] Osbeck), and sour orange (*Citrus aurantium* L.), most of the homegardens show a great variety of tropical fruit trees such as red mombin known as plum (*Spondias purpurea* L.), avocados (*Persea Americana* Mill.), mango (*Mangifera indica* L.), various species of Annonaceae, tamarind (*Tamarindus indica* L.), papaya (*Carica papaya* L.) and banana and plantain (*Musa ssp.*).

4.1.6.6. Area of the secondary vegetation

In all homegardens, except one trees of the secondary vegetation were found. In two homegardens species of the secondary vegetation occupy almost the whole homegarden area, with the exception of the living area. These trees are used for their wood or provide forage for livestock. In many homegardens species of the secondary vegetation are living fences between neighbouring properties.

4.1.7. Livestock in the homegarden

Livestock is a crucial element of the household economy. Meat and eggs play an essential role in the local diet. Livestock is mainly consumed within the family, but it is also sold, thus constituting an important source of income during hard times. Livestock was found in almost all homegardens. The livestock component of these households consists mainly of poultry. In one homegarden not even fowl were found, because the female household head is in a poor health is and therefore not able to take care of them. Most common animals are poultry, found in 16 homegardens. Turkeys and pigs are bred in ten households. Sheep and goats occur less frequently. Three families have sheep and one has goats. Horses are used for haulage and for land preparation and were found in three households. Ducks were only found in one household.

Small livestock may wander free or be confined. Chickens usually range free and eat what they can find. One woman mentioned her preference for fowl, because they do not cause damages, like pigs do. Pigs are usually fixed to a tree with the help of a leash in order to hinder breaking up the soil in the whole homegarden. This location is changed from time to time. Sheep and goats are also tied in this way or may be confined within a corral.

Livestock is fed maize and kitchen scraps. Sheep and goats are shepherded for grazing. Grazing takes place both within the community and outside of it.

Slaughtering takes place directly in the homegarden. Normally a pig, a sheep or a goat is slaughtered for special occasions (birthdays, Christmas) or in times of lack of money. Also meat preparation is done in the homegarden. Slaughtering is done with a sharp kitchen knife. Women slaughter fowl and men pigs, goats and sheep.

The peasant family, who has goats, sells them alive or slaughters them for home consumption. The family keeps goats primarily in order to sell them. One woman feeds pigs also for selling them alive to earn money. Eggs are mainly used for breeding. Most of the respondents buy eggs for consumption in the stores and do not use eggs from their own hens.

Bees were found in three homegardens. In these, beehives are fixed on trees. Furthermore in several homegardens birds are kept in cages for pleasure.

Doves and parrots were found in some households. Families have them, because they please the family members.

Dogs are found in most of the households. They guard the homegarden. Usually they are not tied but can stray round in the community.

4.2. Responsibilities in the homegardens

4.2.1. Cultivation of the homegarden

All of the homegardens were once cleared and cultivated by men, by both household heads or other persons, who owned the area in former times. No woman cultivated the homegarden on her own. Nine female respondents stated that their husbands cultivated the homegarden, three did it jointly with their husbands and four women said, that it was done by others. Most of the men said that the homegarden was made by others (eight male respondents). Six men cultivated it on their own and two jointly with their wives. Four respondents (two female and two male) did not know, who made the homegarden.

All of the homegardens are cultivated by hand without use of a plough or any other machine.

4.2.2. Responsibility for the homegarden

Men and women gave very different answers in terms of responsibilities in the homegarden. In fact, women were more often observed working in the homegarden.

As men are, in most households, the owners of the area, they are mainly solely responsible for the homegarden (stated by ten female and nine male respondents). Six men and five women stated that both household heads are responsible. Three women and one man said, that this task falls to the woman. Two men but no woman saw the whole family as being responsible (Figure 15).

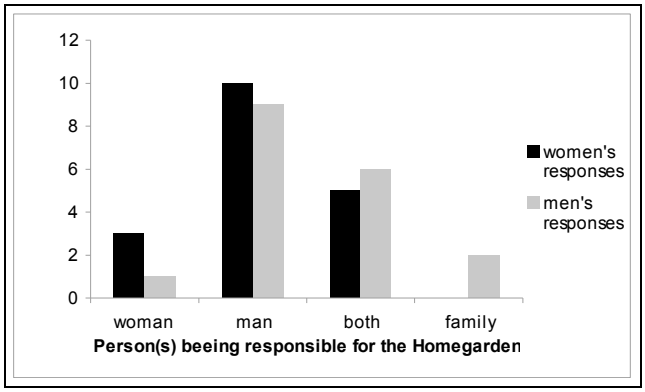

Figure 15: Person(s) being responsible for the homegarden of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n=36)

Statistical analysis (Pearson correlation tests) revealed that the sex of the responders does not have any significant influence on who is responsible for the homegarden.

4.3. Tasks to be realized in homegardens

4.3.1. Sowing and transplanting

Sites with the most fertile soils are chosen for sowing of crops. Black soil is considered to be more fertile than white soil. One woman stated that plants die in white soil. Thus black soil areas are preferred for planting. In ten homegardens sowing and transplanting takes place in the same area of the homegarden every year (in nine homegardens this area is fenced in; section 4.1.6.4). In the remaining ten homegardens the area used for cultivation is changed from time to time, as soil fertility decreases. Changing of the area for cultivation takes place in order to obtain a rich harvest. Out of the 36 gardeners 25 gardeners prepare seedbeds. Seeds are primarily sown in plastic bottles or plastic bags (oddment of bought fruit trees and other bought plantlets) to be transplanted later, when plantlets have reached a particular height. Four gardeners do so sometimes and seven sow always directly into the soil. Seedbeds are prepared for tomatoes (*Lycopersicon esculentum* Mill.), chilli pepper (*Capsicum spp.*). and radishes (*Raphanus sativus* L.).The seeds of squash (*Cucurbita* spp.), melons (*Cucurbita* spp.), jicama (*Pachyrhizus erosus* [L.] Urb.), beans *(Phaseolus vulgaris* L.), onions *(Allium cepa* L.) maize (*Zea mays* L.), camote (*Ipomea batatas* L.) and cassava or yuca (*Manihot esculenta* Crantz) are sown directly without preparing a seedbed beforehand.

Soil is loosened with the help of a simple hoe. Seedbeds are prepared with a scoop and a rake. A hole is opened in the earth with a hoe and it is loosed with a rake. Either seeds or plantlets are put into the hole and covered with earth and watered well. Some gardeners add fowl and goat manure or leaves to stimulate growth. One man mentioned, that he and his family take into consideration phases of the moon, when they plant a crop.

Men, women, the couple together or all family members (in one case) decide which plants are sown in the homegarden. Women mainly stated that they together with their husbands decide, what to plant. Four women decide on their own, while five leave the decision to their husbands. Seven men stated that they have decision-making power about what to plant, while two men said that women decide this and in nine cases men considered both sexes equally involved in decision making (Figure 16).

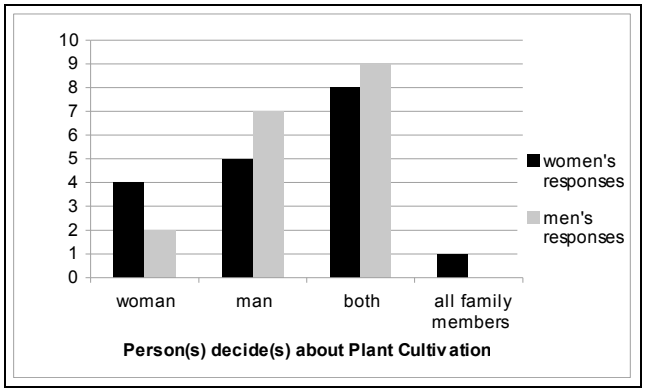

Figure 16: Person(s) making decisions about plants to be planted in the homegarden of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n=36)

In the homegarden 19 gardeners plant the same plants every year, while 17 gardeners vary and try different species and varieties once in a while.

Gardeners propagate their seeds for cultivation mainly by themselves. For that purpose best fruits are chosen. Selection criteria are flavour, size of fruits and quantity of fruits. The seeds are taken and stored in order to sow it the next time. 33 gardeners produce so their own seeds. Gardeners argued, that home propagation of plants is cheaper than buying seeds. Furthermore it ensures the well-known taste, size of the fruits and the adaptability to the soil conditions of a specific site. Gardeners gather and store seeds of jicama (*Pachyrhizus erosus* [L.] Urb.), chilli pepper (*Capsicum spp*), tomatoes *(Lycopersicon esculentum* Mill.*),* beans *(Phaseolus vulgaris* L.) and onions *(Allium cepa* L.). Seeds of coriander (*Coriandrum sativum*) are propagated mainly by the gardeners themselves. Seeds for cultivation are also collected from bought fruits, such as watermelon (*Citrullus lanatus* (Thunb.).

Chaya (*Cnidoscolus chayamansa* Mill.) is propagated by cuttings. To propagate chayote (*Sechium edule* [Jacq.] Swartz) the fruit is just left for germinating. It is planted, when the plantlet has reached a particular height. Nopal (*Opuntia ficus-indica* [L.] Mill) is propagated by planting a segment. Fruit tree species are mainly propagated by scions.

Gardeners prefer to propagate their own seeds, but when no seeds are available, 30 gardeners buy them in Xpujil or buy seeds or plantlets from mobile traders coming into the communities. Seeds of jicama (*Pachyrhizus erosus* [L.] Urb.), radish (*Raphanus sativus* L.) and chilli pepper (*Capsicum spp*) or (*Lycopersicon esculentum* Mill.) are bought occasionally, when there are no seeds left for sowing. Furthermore there is a governmental program, which subsidizes plantlets that are brought into the community. The gardeners have to pay half of the price of the plantlets. One woman considered it better to buy seeds of specific crops, like those of tomato (*Lycopersicon esculentum* Mill.) to avoid crop failure. Six respondents exchange seeds with neighbours and relatives within the communities. Mainly men buy seeds or plantlets (stated by 12 men and eight women). Five women said, that they select and buy plant material; another five female respondents do so jointly with their husbands, as two men stated. In one case one of the family acquires needed seeds or plantlets (stated by one men).

Both women and men and both together are responsible for managing the seeds. Men consider themselves as being mainly responsible for selecting and storing the seeds. They purport to have more knowledge about seed selection and have more experience in that field. Three men said that their wives are responsible for that task. More female respondents said that both are responsible (eight out of 18). If both cultivate the homegarden, both must be responsible for the seeds, one woman meant. Five women stated that women are

responsible. Also five women said, that mails are mainly responsible (Figure 17). For some respondents the responsibility for seeds depends on the species, with women managing rather seeds of ornamental plants, while men are responsible for the seeds of crops. One woman expressed that explicitly: *"Si, es una planta chica yo soy responsable, pero para las plantas grandes el es responsable". ("If it is small plant I am responsible, but for big plants, he is responsible of the seeds".*)

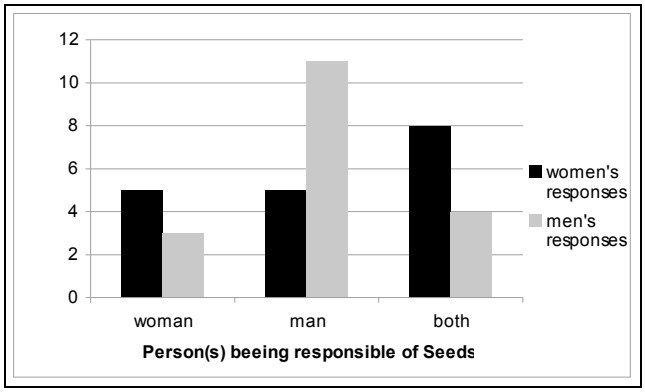

Figure 17: Responsibility for seeds for cultivating in the homegarden of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.3.2. Irrigation

In the dry season watering of cultivated crops, young trees and ornamental plants is the primary activity of gardeners. But irrigation is question of water availability. Meaning that sometimes due to tremendous water scarcity irrigating is not possible. Methods for irrigation were varied. Gardeners use primarily watering cans (Figure 18), simple plastic bottles or other containers made of plastic. In some of the more prosperous households water hoses for irrigation were found.

Figure 18: Father and son irrigating sown seeds in Narcizo Mendoza (Picture: DIETRICH 2010)

4.3.3. Weeding

Weeding is a method to keep the homegarden looking tidy. According to the respondents during the wet season weeding is an important task to be realized in the homegarden in order to avoid excessive growth of weeds and undesired plants. Plants are removed or displanted simply by hand or with the help of hoe or a machete. By weeding plant competition is reduced and gardeners favour cultivated plants. But not all homegardens are cleared of weeds. Out of 36 respondents 24 weed their homegarden. In some homegardens herbicides are used to avoid of time-consuming weeding by hand. In these homegardens weeding is done less frequently, than in others, where no herbicides are used.

4.3.4. Fertilisation

Gardeners use both organic fertilisers (organic matter of animal or plant origin, such as compost, manure, etc.) and inorganic fertilisers (synthetic-chemical and/or mineral origin) to provide nutrients to the soil and – in the case of most organic fertilisers – to improve soil fabric and structure. Methods and forms of using fertilisers are:

- Fowl or goat manure, if available, is mixed with soil and applied before plant cultivation.
- Vegetable residues are used as mulching material (composting *in situ)* with a direct application (without prior composting).
- Ash of burned vegetable residues is incorporated into the soil and as such used as fertilizer.
- Synthetic-chemical fertilisers are applied by gardeners mainly after sowing or planting out seedlings to supply nutrients to stimulate plant growth during the periods of high nutrient demand.

One male gardener practices crop rotation to enhance soil fertility within the homegarden. Legume plants are utilized in order to fix nitrogen in the soil.

4.3.5. Control of pests and diseases

The use of synthetic-chemical products in order to cope with pests and diseases on plants is predominantly: 25 gardeners utilize synthetic-chemical pesticides in the homegarden. Other gardeners would also use them, if they could afford them. Synthetic-chemical pesticides are mostly applied by a pump. Some gardeners are illiterates and may not understand the introduction manual properly, but most stated to know about the toxicity of these products. In general therefore male gardeners do not want their wives to apply them.

Herbicides sometimes are used instead of mowing by hand.

Some gardeners whitewash their fruit trees with a mixture of chalk and water in order to discourage ants on the tree and to protect the bark from damages, thereby hindering bacteria and fungi from entering. The whitewash is applied with a brush up to the first forked branch. In six homegardens this is done traditionally on Ash Wednesday. Other five families have the tradition to paint the trees at the end of the year. Most of the respondents prefer to apply the whitewash in the dry season because of a longer durability.

Another method to control pests and diseases is the use of plastic bottles for protection of the plants. There are two ways to use the plastic bottle:

- The plastic bottle is inverted over the small plants and acts as a “mini-green-house”, protects against pest organism and hinders slug damage.
- Snail traps are made of old plastic bottles, where the bottoms of these bottles are removed.

Diseased parts of plants are removed, in order to preserve the whole plant.

4.3.6. Harvesting

Harvesting of mature homegarden products in all homegardens is done by hand. Usually harvesting is not done in one go, but rather stepwise. Depending upon what is used for cooking such an amount is harvested (Figure 19). The situation is the same, when homegarden products are sold. Gardeners pick them, if there is a demand. Fruits on trees within reach are picked without any tool. Those, which grow higher up, are picked with the help of a fruit picker. Baskets are used for collecting, if more was harvested than was needed for immediate consumption.

Nopales, the young segments of *Opuntia ficus-indica* (Mill), are traditionally used in the local diet. They are cut with a kitchen knife (Figure 19). The one, who cuts the segments, must be careful, as the prickles are tiny and difficult to pull out of the skin. Only the amount, that is currently required for the meal is cut. Before cooking the prickles are removed laboriously.

Some plants are left in the homegarden in order to harvest their seeds, i.e. in the case of cilantro (*Coriandrum sativum* L.), and lettuce (*Lactuca sativa* L.).

Figure 19: Man harvesting coconuts in Narcizo Mendoza Woman cutting *nopales Opuntia ficus-indica* (Mill) in Cristóbal Colón (Pictures: DIETRICH 2010)

4.3.7. Animal husbandry

Animal husbandry includes tasks to be done daily. Animal husbandry includes feeding and water supply, administering medicine, preparation of nests, collection of eggs assistance at a birth and shepherding for grazing.

Primary gardeners are occupied with feeding and the supply of water. In most cases livestock is fed twice or three times per day (according to 31 respondents). Each time feeding and watering takes between 15 minutes and half an hour. For poultry maize grains are either simply thrown on the ground, where they are picked or they are put into a container. Water is put into a bowl or into an old car tire, which is halved. It is refilled, if needed. Respondents feed slops to the pig. Moreover maize is also used as fodder for pigs.

Sheep and goats are shepherded for grazing at least twice per day. For that purpose the animals are herded outside the village, where they can graze on communal land. Respondents owning a few sheep let them graze on communal land within the community or on neighbouring properties, when the neighbour agrees (Figure 20).

Figure 20: Sheep shepherding in Cristóbal Colón, Campeche, Mexico (Pictures: DIETRICH 2010)

Horses are fixed with a leash. They have free scope and can graze, without being shepherded.

Veterinary medications are administered by 25 respondents. They buy it in Xpujil. It is either done preventively or in case of illness (seven respondents). The respondents stated fowl come down with influenza in the cold period. Medicine is added to the water for fowl for several weeks. In this manner respondents vaccinate fowl against the flu.

Collection of eggs is done once per day in those households keeping fowl. Most of the respondents said, that this is done quickly within 15 minutes (24 respondents). In households with more animals this task is more time-consuming. With the eggs nests are prepared and offered to the hens for hatching.

Nests for fowl are prepared in order for them to breed. For that purpose baskets or a carton is covered with dried leaves or any soft material and offered to the hens. In nine households at least one nest is prepared per month in seven other households with poultry nests are prepared less frequent. Most of the respondents preparing nests, said that it takes on average half an hour.

Five respondents stated to assist at a birth of a sheep, a goat or a pig when needed. Gelding of pigs, goats and sheep is done in two households.

Poultry are often slaughtered to be prepared for the meal for the family. 19 Respondents stated they slaughter poultry more than once per month. Eight respondents do so at least once a month. The others slaughter less frequent or do not have poultry. In most cases women have decisive power about slaughtering fowl (stated by 28 respondents) and slaughter it on their own.

Figure 21: People cutting the slaughtered pig in Cristóbal Colón, Campeche, Mexico (Picture: DIETRICH 2010)

Turkeys are consumed less frequent than poultry. Four respondents slaughter turkey more than once per month, three do so monthly and 13 slaughter less frequent. In ten households there are no turkeys. Also in the case of slaughtering turkeys women have mainly decisive power.

Sheep and goats are consumed only rarely. In four households a sheep or a goat is slaughter twice per year. In two households men have decisive power about slaughtering, in one the female household head has it and in one both do.

Pigs are reared in ten households. They are slaughtered rarely, in most cases twice per year for special events. In three households men decide slaughtering, in two cases women do so, and in other five households the couple jointly have decisive power (Figure 21).

4.3.8. Tree pruning, tree cutting and collecting of firewood

Pruning of trees is done with a saw. In some households pruning shears are used for the cutting of small branches. Fruit trees are pruned in order to improve the health and increase the quality and yield of fruit. Pruning of trees is also done to avoid shading of sun-loving species. Unproductive and deadwood is removed in this way. Trees, which had not been planted, but rather left on the area, when it was cultivated, are not specifically pruned. They are tolerated, but not managed beyond of cutting to reduce risk from falling dead branches. Trees are rarely cut down in the homegarden. The wood is used as firewood. However, generally firewood is brought from the *parcela* (Figure 22). Half of the households bring firewood at least once per month. Others collect it less frequent, but a larger quantity. For that purpose a car is borrowed from friends, if the household does not own one. The firewood is brought in the form of large pieces from the *parcela* to the homegarden where it is and chopped into pieces to be used for cooking in the stove.

Figure 22: People bringing home firewood in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (Pictures: DIETRICH 2010)

4.3.9. Cutting the grass

The grass is cut primarily in the rainy season, when plants grow rapidly. Gardeners cut the grass with the help of a machete. This time-consuming activity is rarely (at an outside estimate twice per year) done in eight households. In six households cutting of grass is carried out up to once per month. Respondents of six households cut the grass more frequently.

4.3.10. Raking and Sweeping

To keep the homegarden tidy gardeners rake and sweep it often. With the help of a rake leaves and garbage is scraped together. Raking is done often. Most of the gardeners clean their homegarden at least once per week (30 gardeners). Raking is primarily important during the drought, when trees cast their leaves. Leaves are scraped together and burned afterwards.

4.3.11. Litter burning

In most of the homegardens, vegetative waste (leaves and other debris) as well as packaging material (plastic bottles) is burned. Burning areas differ between homegardens. In some homegardens specific garbage areas for burning exist, often hidden at the back of the homegarden. In other homegardens litter burning takes place in a pit. Another practice is to simply burn the waste, where it is accumulated. Ashes are normally left there.

Some farmers use the ash for fertilizing the soil in which tomatoes, squash, radishes, cilantro and chilli peppers are cultivated.

4.3.12. Construction and maintenance of buildings and fences

Male family members together with friends and neighbours build the houses. Most of the constructional timber is cut on the *parcela*. Other material used for construction of houses and fences are bought in Xpujil. Special tools, which the household does not own are lent from neighbours for money. Houses and buildings are not constructed very solidly. Thus, maintenance repairs must be done. There is no specific season in the year, when repairs are done. Repairs are done, if it is necessary and when other activities can be placed on hold. In most of the households (in 15 out of 20) repairs are done at least once per year.

In homegardens with boundaries gardeners maintained their fences more or less every year.

4.4. Seasonality of tasks

While some of the tasks in the homegarden are carried out year-round, others are associated to specific seasons in the year.

4.4.1. Tasks carried out year-round

Harvesting is generally done year-round, depending on the harvesting date of the species.

Eight gardeners, who weed their homegarden (24 out of 36), stated to carry out this task year-round, six remove weed during the rainy season and four during drought. Other gardeners did not mention a specific time of the year for weeding the homegarden.

All of the respondents except one said, that sweeping and raking is carried out year-round. One said, that it is carried out during drought. As raking and sweeping is done year-round associated litter burning is also carried out year- round.

Cutting of trees is done in few homegardens. Those respondents, who cut their trees, do it year-round, if it is necessary and they have enough time to carry it out.

Because women cook on fires wood collecting and chopping of wood is, in most cases, done year-round. Three respondents do it, when it is necessary and there is time and two collect wood in the cold and dry season.

Maintenance of houses and boundaries is generally not done on specific dates, but rather when it is necessary and there is enough time to do it (22 respondents). Seven respondents said, that they maintain houses and boundaries during the rainy season, because there is less work on the *milpa.* Four do it in the dry season and three in the cold season.

Feeding and watering of the animals is done daily. Medicine is administered not at a specific date, but – according to 21 respondents - mostly in times of illness. Four gardeners said, that medicine is administered during the cold season. As well as feeding is done daily, shepherding of goats and sheep is done every day. The preparation of nests is carried out year round. Gelding and birth assistance is done when necessary.

4.4.2. Seasonal tasks

Sowing is mostly done in the rainy season. Lack of water exacerbates difficulties of sowing and planting during the cold and the dry period, although principally it would be possible. Only three female gardeners also sow in the drought period. Sowing and transplanting is done in the rainy season. As cultivation of crops takes place during the rainy season, fertilizing is also done in this period of the year.

Plant growth is enhanced during the rainy season, and accordingly herbicides are mostly applied between June and September as is mowing. Most of the respondents mow the homegarden during the rainy season. In order to avoid excessive growth of the arising vegetation some gardeners mow year-round.

All the 32 respondents, who water their cultivated plants, agreed that plants are irrigated only during drought periods.

According to 14 respondents whitewashing of trees takes place in the dry season. Nine do it during the cold period of the year. Three gardeners whitewash their trees in the rainy season. Two gardeners do it once in the cold and twice in the dry season, another once in the rainy and twice in the cold season and one once in the drought and twice in the rainy season.

Tree pruning is another task carried out at specific dates, although these vary. Thus 12 gardeners prune the trees in the rainy season, eight do it during the drought and three in the cold season of the year. Two said, pruning is done in the rainy and in the cold season. Nine said, that they carry out pruning year round.

4.5. Frequency and time of tasks in the homegarden

4.5.1. Frequency of tasks carried out year-round

Depending on the species crops and fruit trees are harvested generally once or twice per year. Chicozapote *(Manilkara zapota),* sapote *(Pouteria sapota),* wild plums *(Spondias purpurea* and *Spondias mombin),* avocado (*Persea americana*), tamarind tress (*Tamarindus indica*), Annona (*Annona squamosa*) or mango (*Mangifera indica* L.) bear fruits once per year, while citrus varieties such as oranges (*Citrus sinensis*) or lemons (*Citrus limon*) are harvested twice per year. Tomatoes *(Lycopersicon esculentum),* Chilli pepper *(Caspsicum sp.* L.*),* beans *(Phaseolus vulgaris* L.) onions *(Allium cepa* L.) and radishes *(Raphanus sativus* L.) cultivated in the homegarden are generally harvested twice per year. Some species are harvested more frequently than twice per year, such as bananas (various species of the genus *Musa*), papaya (*Carica papaya* L.). Also the leaves of malabar spinach (*Basella alba* L.), chaya *(Cnidoscolus chayamansa*) and *Nopales,* the young segments of *Opuntia ficus-indica* (Mill) are harvested year round several times. The amount of harvested fruit varies depending on their use. For immediate consumption, either raw or prepared as a meal, small quantities are harvested, while for selling at the market more fruits are picked.

There was a wide range of responses regarding frequency of weeding. Some gardeners weed once per day (five respondents), four do it once per week and two once per month. Ten respondents weed at least three times per year. Less frequent weeding is carried out by three respondents. Depending on the frequency weeding is carried out quickly (within half an hour) or for those gardeners who weed less frequently, over more than two days (six responses). Those who do it more frequently do it within half an hour to two hours (13 respondents). Five respondents need more time (half a day until two days).

Cutting of trees is done once per year. Most gardeners (eight) need three to six hours for that task while three need one day.

Gardeners frequently collect and chop wood. Nine do it twice per week, nine once per week and seven once per month. Those who do it six times per year or even more rarely, bring a remarkable amount of wood from the *parcel* each, time which is chopped in the homegarden. Those, who frequently (once per week) collect firewood, do it within one hour. If wood collection is carried out less frequently more time is needed, therefore 13 gardeners need two to five hours. 13 gardeners need more than five hours.

Raking and sweeping in most homegardens is done once or twice per week, according to 19 respondents. Six respondents said, that raking and sweeping is done every day. Eight respondents, said, that it is done three to four times per week. Three gardeners stated this activity is carried out less frequently, than once per week. According to 33 respondents raking and sweeping mostly is done within one to three hours. Three said it takes more than three hours.

20 respondents mentioned that litter burning in most homegardens is done once or twice per week. According to five respondents litter burning is done every day. Six respondents, said, that it is done three to four times per week. Five gardeners stated this activity is carried out less frequently, than once per week.

Responses about time needed for litter burning vary. Ten respondents carry out this job within ten minutes. 14 respondents said it takes half an hour. 12 respondents stated to need more than in half an hour for litter burning.

Maintenance of houses is done mostly once per year (19 respondents), though ten respondents carry out maintenance work twice per year and seven respondents less frequently than once per year. 21 respondents completed the maintenance of houses in one day, while 13 gardeners said that more than one day is required. Two men stated maintenance is done in half a day. The responses regarding maintenance of boundaries

were similar. Out of those gardeners who have fences, the majority (15) maintain them once per year. Eight do it twice per year and two every second year.

In most households livestock is fed and supplied with water twice a day (21 responses). 14 respondents said, that these tasks are carried out three times per day. That feeding and water supply takes half an hour, was mentioned by 19 respondents. Ten said, that it is done within 15 minutes and five said, that more time than half an hour is spent on feeding of livestock and water supply. Two respondents said that shepherding of goats and sheep is carried out once per day. It is done twice per day, was mentioned by five respondents. Shepherding is done within one hour, stated by two respondents. According to four respondents taking three hours this activity is more time-consuming.

Ten respondents said, that nests are prepared once per month. According to 11 gardeners preparation of nests is done more frequently than once per month. Also 11 gardeners stated, it is done six times per year or less frequently. The preparation of one nest takes half an hour, said by 16 respondents. Five mentioned it is done within 15 minutes and 11 said more than half an hour is needed for preparing a nest. In all household, where gelding is done it is carried out once per year. Gelding takes half a day or more. Assistance of birth is done more or less twice to five times per year. Time spent on birth assistance varies.

4.5.2. Frequency of seasonal tasks

Most of the gardeners sow once or twice per year. Only five do it three times. Half of the respondents prepare seedbeds and sow in half a day. Five carry out sowing in one day. 13 gardeners need more than one day for planting.

In most homegardens transplanting of plantlets is carried out once per year (19 respondents). Eight transplant twice per year and five more than twice. Most of the respondents need at least half a day for transplanting. Only one man is occupied with transplanting more than one day. Ten respondents carry out transplanting in one to two hours.

14 of 24 respondents, who fertilize their plants, do it once per year. Ten respondents do it more frequently, with five of them fertilizing their plants more than six times per year.

Application of herbicides in the rainy season is done once or twice by most of the gardeners, who use synthetic herbicides. Five out of 25 respondents do it more than twice. Gardeners apply herbicides in one day, in between one and four hours. Seven respondents are engaged in this activity for more than four hours.

Half of the respondents irrigate their plants once a week during drought. More frequent irrigation takes place in eight homegardens. Two women irrigate their plants as much as once per day.

Most of the respondents prune the trees once per year (22 gardeners). Eight respondents do it two to four times and four more frequently than four times.

Whitewashing of trees is an activity most of the respondents (22 out of 30) carry out once per year. Eight do it twice. Depending on the number trees growing in one homegarden, the time spent on whitewashing varies. Thus, nine respondents need one to two hours, seven respondents up to five hours and six respondents need half a day. Eight gardeners are occupied with whitewashing trees for as much as one day.

4.6. Labour division in the homegarden

4.6.1. Organisation of work

Decision about how the work should be organized are generally made by both household heads (19 gardeners, eight women and 11 men). More of the women saw their partners as organizers of labour division than men did themselves. Eight women stated, that their partners decide about work organization and only four men said that they do so. In one household the woman is responsible for the organization of work, which was confirmed by both household heads. Three respondents said, that the family all together decides about labour division.

4.6.2. Tasks mainly carried out by women in the homegarden

In the following chapter tasks are listed, which are mainly carried out by women regarding the respondents (Table 5).

4.6.2.1. Raking, sweeping and litter burning

An explicit women's task in the homegarden is raking and sweeping. Female as well as male respondents stated, that this activity is carried out almost exclusively by women. Two women and one man said that both of them sweep and rake the homegarden. One woman said that her children are in charge of this task, because she has knee problems and cannot do that. Another woman said that the whole family does that work. The majority of the respondents (14 female and 15 male) stated, that themselves respectively their wives rake and sweep. No man said, that he rakes or sweeps the homegarden.

Similar were the responses to the question for the person(s) who burn(s) the litter, although four men and one woman said, their partners and them both carry out litter burning. Clearly the majority (15 female and 13 male respondents) stated, that they themselves respectively their wives are in charge of litter burning. One woman said, that the whole family burns the litter.

4.6.2.2. Animal husbandry

Some of the activities concerning animal husbandry are predominantly carried out by women, while others are mostly done by men. Women mainly feed livestock, give water, administer medicine, collect eggs and prepare nests.

Ten women said, that feeding is their job, which was also stated by 12 men. Four men and two women said they or their partners feed the livestock. Two women responded that the whole family is in charge of feeding. No man said that he solely carries out feeding, but two women said, their husbands do so. Alike answers were given regarding water supply. Both 11 women and 11 men stated, that they themselves respectively their wives supply livestock with water. While no man said that he solely is responsible for that task, two women said so. Five men, but no woman said that they or their partners do that work. Two women and one man said that the whole family does it.

Collection of eggs is mostly done by women. Nine women said that they do it solely. For 13 men this is the job of their wives. Neither a woman nor a man said that her husband respectively he himself collects eggs solely, but also one woman and one man stated that they share this task with their partners. Four women and one man said, that they whole family collects eggs.

Preparing of nests is also mostly done by women. Two women stated, that their husbands exclusively do this job. However in the majority of households women are responsible for that task, thus 12 women said they prepare the nests, which was corroborated by 13 men. One woman said either she prepares nests or her partner does, while three men sometimes carry out nest preparing with their wives.

Veterinary medication for livestock is used by 25 gardeners. More women than man administer medicine, stated nine women and nine men. Four men are solely responsible for this task. One woman said that her husband carries out this task and also one woman and one man mentioned that this is carried out by both household heads.

4.6.3. Watering

In the dry season watering is done mainly by women. Nine women said that they water their plants, three women do it together with their partners, and two women stated the whole family undertakes the task of watering. One woman said that her husband carries out that task.

Also male respondents see their wives as mainly responsible for watering (eight respondents). Two men are solely responsible for watering and five share the task with their wives.

Table 5: Tasks mainly carried out by women in the homegarden (n=36; sum of the line sometimes do not match with n, because in some cases this task is not carried out in all homegardens, or sons or daughters carry out a single task solely)

Tasks in the homegarden	Female responses regarding person(s) carrying out the task				Male responses regarding person(s) carrying out the task			
	Woman	Man	Both	Family	Woman	Man	Both	Family
Raking and sweeping	14		2	1	15		1	1
Litter burning	15		1	1	13		4	
Feeding	10	2	2	2	12		4	1
Supplying water	11	2		2	11		5	1
Collection of eggs	9		1	4	13			1
Preparing nests	12	2	1		13		3	
Administering medicine	9	1	1		9	4	1	
Watering	9	1	3	2	8	2	5	

4.6.4. Tasks exclusively carried out by women in the homegarden

Female as well as male respondents listed sweeping and racking and litter burning as those activities women are responsible for. Almost all men (17) saw these tasks, as “female tasks“. That was also the response of 14 women. Less explicit is the result for litter burning: 13 female and 12 men said that women are responsible for this task (Figure 23).

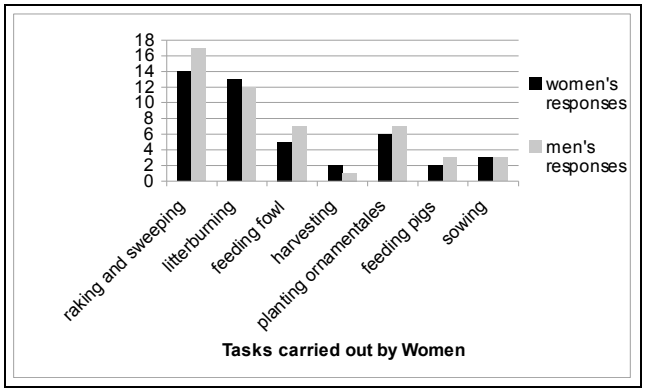

Figure 23: Tasks exclusively carried out by women in homegardens of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.6.5. Tasks mainly carried out by men in the homegarden

In the following chapter tasks are listed, which are mainly carried out by women regarding the respondents (Table 6).

4.6.5.1. Constructing and maintaining of boundaries, shelters and houses

Men are predominantly in charge of constructing and maintaining boundaries, shelters and houses. Out of 20 homegardens 13 have some type of boundary or fence (see 4.1.3). Nine women and nine men stated that these boundaries are maintained by men respectively by they themselves. Women rarely carry out maintaining of boundaries (only three female and one male response that this occurs). Two men and woman are responsible together with their partners for maintaining of the fences.

Exclusively men solely construct and repair houses according to 15 men and 15 women. Two women help their partners. Three male respondents mentioned that they get help of their wives.

Houses and shelters for animals are constructed and maintained by men (equally 12 male and female respondents). Only one woman, a widow does it jointly with her grandson. Three men said that their wives help them, which was not mentioned by any woman.

4.6.5.2. Mowing and application of synthetic herbicides

Time-consuming mowing is another activity in the homegarden carried out mainly by men (15 male and 11 female responses), although two women do it by themselves. Together with their partners two female and three male respondents mow the homegarden. One woman said that she does not mow the homegarden.

Handling synthetic herbicides in order to control pests and diseases is another task, undertaken almost exclusively by men. Out of 25 gardeners, who use such products 14 men said that they spray herbicides. Ten women mentioned that their husbands carry out application of herbicides. Only one woman does it on her own, as her husband works in the United States and only comes home intermittently.

4.6.5.3. Wood work

Tree pruning and cutting and collecting firewood are tasks, mainly undertaken by men.

13 women expressed that tree pruning is carried out by their partners. Equally 13 men said that they prune the trees. Only in one household does the woman prune the trees, as mentioned by both heads of the household independently. One man said that he and his wife share the task of pruning. One woman and one man reported that the whole family prune the trees in the homegarden.

In the homegardens where trees are cut, men carry out that task. The widowed woman cuts the trees in her homegarden with the help of her grandson. Eight women stated that their husbands cut trees, but only two men stated that they do so.

Collecting of wood from the *parcela,* as well as chopping wood in the homegarden is a task mainly carried out by men. 12 men are in their opinion responsible for bringing firewood. This was also expressed by nine women. Four men and four women collect and chop wood together with their partners. Three women and two men said that collecting firewood is a task shared by the whole family.

4.6.5.4. Animal husbandry

Five respondents (three men and two women) assist at the birth of livestock. Of these two men reported to be the sole assistant at a birth, while one woman and one man do it together with their partners. Another woman mentioned that her husband is responsible for birth assistance.

In the two households, where gelding is done, the man is responsible for that task, as mentioned by they themselves and by their wives.

Table 6: Tasks mainly carried out by men in the homegarden (n=36; sum of the line sometimes do not match with n, because in some cases this task is not carried out in all homegardens, or sons or daughters carry out a single task solely)

Tasks in the homegarden	Female responses regarding person(s) carrying out the task				Male responses regarding person(s) carrying out the task			
	Woman	Man	Both	Family	Woman	Man	Both	Family
Maintaining boundaries	3	9	1		1	9	2	
Maintaining houses		15	2			15	3	
Maintaining shelters	1				12	12	3	
Mowing	2	11	2			15	3	
Applying herbicides	1	10				14		
Tree pruning	1	13		1	1	13	1	1
Tree cutting	1	8				2		
Wood chopping	1	9	4	3		12	4	2
Birth assistance		1	1			2	1	
Gelding		2				2		

4.6.6. Tasks exclusively carried out by men in the homegarden

Being asked what are the tasks exclusively carried out by men in the homegarden, female as well as male respondents listed mowing and the application of herbicides as those activities that men are responsible for. For 14 men and 13 women mowing is clearly an activity for men. Application of herbicides as a task, exclusively carried out by men, was mentioned by ten women and 11 men (Figure 24).

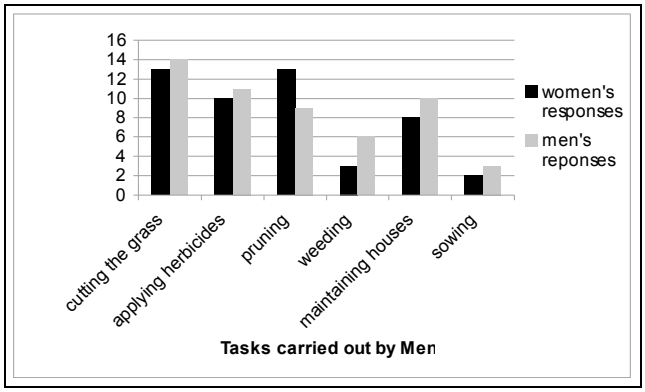

Figure 24: Tasks exclusively realized by men in homegardens of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.6.7. Tasks carried out by women and men

Several tasks in the homegarden are carried out both by women and men equally (Table 7). Most of the tasks concerning plant cultivation, except for watering are done by both household heads.

Sowing is either done together (seven female and seven male responses), by women solely (four female and three male responses) or by men solely (five male and four female responses). Three women and two men said that the whole family helps to sow. If women and men sow together, men prepare the seed beds while women plant the seeds and water afterwards.

Transplanting is similarly carried out either together or solely by women and men. Five men and four women transplant plantlets jointly (it is the same process as sowing). Five men and four women said that they transplant solely. Three women and six men said that their partners solely transplant. Two women saw the whole family as involved in that task.

Fertilising is carried out by men (seven male and five female responses) as well as by women (four female and three male responses). Moreover two men and one woman stated that they as well as their partners fertilize the cultivated plants.

Harvesting of crops and fruits is an activity, which mostly the whole family is involved in (stated by nine female and nine male respondents). Four women said that they harvest solely, which was acknowledged by three male respondents. Three men harvest solely. Also three women stated that their husband do so. This task is shared by two women and two men.

Whitewashing of trees is done by 30 gardeners. Six women and men said that the whole family undertakes that task. Three male and two female respondents do it together with their partners. Two women stated that they, solely, whitewash trees. Two men said that their wives do it solely. Three male and one female respondents mentioned that themselves respectively their partners carry out whitewashing. In one homegarden sons whitewash the tree on Ash Wednesday together with their grandfather.

Weeding is done by 24 respondents. Out of them, nine men and four women stated to carry out weeding solely. Five women and two men said that their partners do so. Four respondents (two female and two male) weed together with their partners.

Table 7: Tasks carried out by women and men in the homegarden (n=36; sum of the line sometimes do not match with n, because in some cases this task is not carried out in all homegardens, or sons or daughters carry out a single task solely)

Tasks in the homegarden	Female responses regarding person(s) carrying out the task				Male responses regarding person(s) carrying out the task			
	Woman	Man	Both	Family	Woman	Man	Both	Family
Sowing	4	4	7	3	3	5	7	2
Transplanting	3	4	4	2	6	5	5	
Fertilizing	4	5	1	1	7	3	2	
Harvesting	4	3	2	9	3	3	2	9
Whitewashing of trees	2	1	2	6	2	3	3	5
Weeding	4	5	2		2	9	2	

4.6.7.1. Tasks realized by children

Children are an important labour force in the homegarden. In most of the households they have to work in the homegardens. 28 respondents stated that their children are responsible for several tasks in the homegarden such as feeding the animals or sweeping. Six respondents do not ask their children to carry out tasks in the homegarden. Two did not answer to this question.

Most of the children help their parents with carrying out tasks in the homegarden. In some families sons and daughters are solely responsible for an activity. According to the responses of the gardeners daughters tend to realize the same tasks their mothers do, such as raking and sweeping. Sons carry out tasks, their fathers are in charge of, such as tree pruning or mowing. Sons are more often asked to help their mothers carrying out a task, such as collecting eggs, than daughters are asked, to help their fathers with work.

Men stated more often than women (24 male responses compared with five female responses considering several tasks) that their sons help them. While more female respondents saw their daughters more involved in homegarden activities, than men did, men mentioned the participation of sons more often than women did. Thus, according to 37 female responses daughters are involved (either they carry out something solely or jointly with other family members), but only 25 male responses mentioned collaboration with their daughters. Participation of sons was overall mentioned by 30 women and 41 men (Annex: Table 9).

4.7. Motivation for cultivating a homegarden

Most of the respondents highlighted the fact that they obtain produce they do not have to buy as motivation to cultivate a homegarden. Homegarden produce contributes to the household's nourishment and the families can save money. One male respondent said, that if he must buy all the products he obtains from the homegarden, he and his family would not have enough money for livelihood, and thus the homegarden helps them to survive. To have ingredients for cooking in the vicinity of the house, which can be picked just in time for meal preparation, gardeners observes this as facilitation. This contrasts with the *milpa*, which is, in most cases, some kilometres away from the community and products to be harvest for cooking must be considered before one goes to harvest.

The possibility of animal husbandry was considered as important advantage of the homegarden. Through animal husbandry meat, eggs and milk are primarily available for consumption within the families, and surplus is sold. Therefore respondents perceive animal husbandry as important source of income.

Another male respondent mentioned that, by having a homegarden the gardener can build his or her own house, where he or she does not have to pay rent and can do whatever he or she wants to do. Having a house and a homegarden also increases access to credits and insurance.

Most of the respondents mentioned that families can live together on a parcel of land and that there is enough space for every family member. The proximity to the house also allows parents to keep an eye on the children playing in the homegarden, a benefit primarily mentioned by women. Some of the gardeners stressed the benefit of having a homegarden to pass on to their children.

Most of the respondents also mentioned cultivating a homegarden and carrying out all the tasks to be done make them feel satisfied. Primarily women added in this regard their enjoyment in taking care of ornamental plants. If they did not managed their homegarden, in a short time all of the parcel would be covered with forest. One male respondent considered the homegarden as his job.

4.8. Knowledge transmission

To cultivate a homegarden successfully specific knowledge about plant species and composition, homegarden practice and animals is necessary. Mostly the parents transmit knowledge about homegarden practices to their children. 15 respondents (eight women and seven men) were taught by their mothers and fathers. Six women were introduced by their mothers. Eight male and three female gardeners were taught by their fathers. Three respondents acquired knowledge about gardening by practice and one from his spouse.

All of the respondents transmit their knowledge to their children. Regarding the future of the homegardens, 18 respondents think, that their children will go on cultivating a homegarden. 15 respondents do not know, whether their children will cultivate one. This heavily depends on, where the children are going to live. According to the respondents, if they stay in the village, they will probably keep the tradition of gardening alive. Two did not answer this question and one clearly said, that his daughter do not have any interest in gardening and will not cultivate a homegarden on her own. The responses regarding future of the *milpa* were similar. Half of the respondents do not know whether their children will keep the tradition of cultivating the area, while the others think their children will do so.

One male respondent said, that the soil's fertility is decreasing and he wants his sons (his daughter already lives in Merida) to learn, so that they do not have to be peasants (though they can if they want). Another man stated – with regard to the future of his children - that studying is the most important thing, but also the knowledge of cultivating a field is an advantage as it makes them more independent.

4.8.1. Influence of sex of the respondents on valuation of the benefits of the homegarden

All of the respondents were asked to rank eight benefits of the homegarden. These benefits were:

- Obtaining food
- Income generation
- Having space for animal husbandry
- Cultivation of spices and herbs

- Cultivation of medicinal plants
- Cultivation of ornamental plants
- Obtaining construction wood
- Obtaining fuel wood and materials for handicraft

Statistical analysis (Pearson correlation tests) showed, that sex of the respondents was correlated significantly to the ranking of several benefits of the homegarden (Table 8).

Table 8: Results of Pearson correlation tests, concerning the correlation between sex of the respondents and their ranking of eight benefits of the homegarden (n.s.=not significant)

Sex of the respondents	
Variable	p (two-sided)
Obtaining food	0.001
Income generation	0.023
Obtaining fuel wood	0.017
Having space for animal husbandry	n.s.
Cultivation of herbs and spices	n.s.
Obtaining wood	n.s.
Cultivation of ornamental plants	n.s.
Cultivation of medicinal plants	n.s.

The correlation between sex of the respondents and the ranking of obtaining food was very highly significant. All women except one ranked this variable as most the most important benefit, while at least five men placed it at the third position, which no woman did (Figure 25).

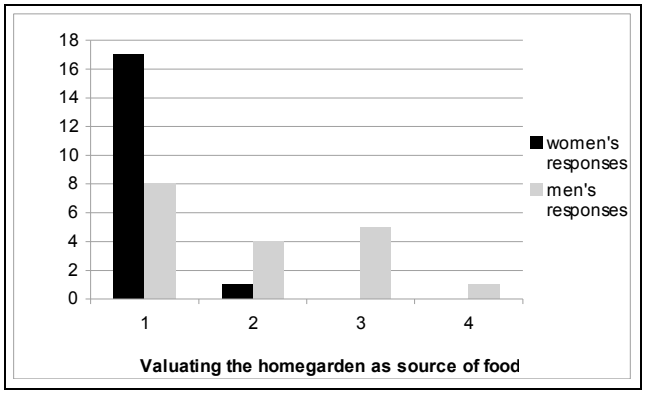

Figure 25: Respondents' valuation of the benefit obtaining food of their homegarden in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

The correlation between the sex of the respondents and the benefit of obtaining fuel wood of the homegarden was significant. For women the homegarden is more important as source of fuel wood, than it is for men. Thus no man placed fuel wood as a benefit in the second position, which two women did. However ten men ranked it in the last two places while only one woman did the same (Figure 26).

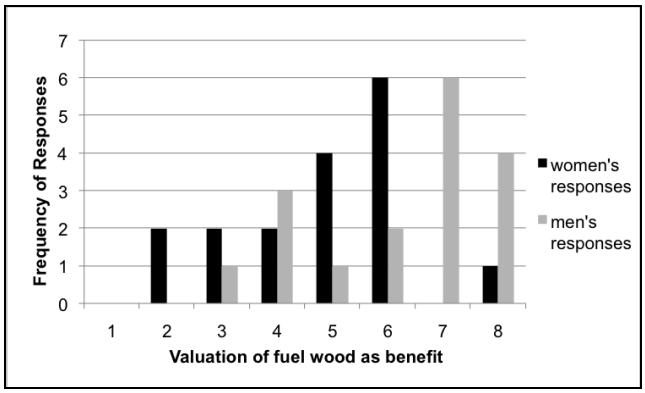

Figure 26: Respondents' valuation of the benefit obtaining fuel wood of their homegarden in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

Also significant was the correlation between the sex of the respondents and the homegarden as source of income. Men ranked this benefit rather in second and third position. At least half of the female respondents placed it in the last two positions (Figure 27).

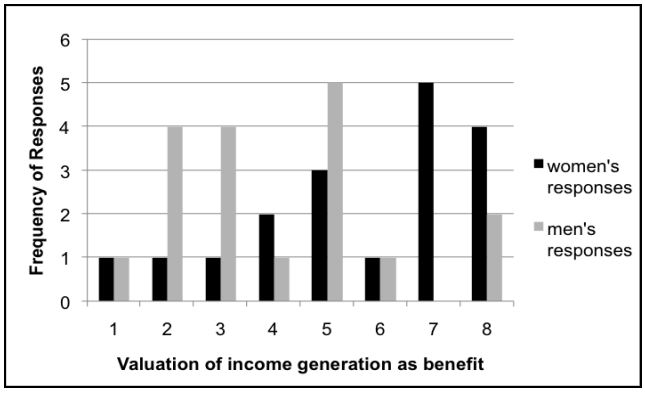

Figure 27: Respondents' valuation of the benefit income generation due to their homegarden in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.9. Use of homegarden products

4.9.1. Use within the household

The household itself is the most important destination of all homegarden produce. All of the gardeners stated, that homegarden products are primarily consumed and used within the household. The main use of homegarden products is for consumption. Many of the plants cultivated in the homegarden are used for more than one purpose e.g. mamey sapota (*Pouteria sapota* [Jacq.] H. E. Moore & Stearn), the fruit of which is eaten and the wood used for construction and as fuel wood.

Ripe fruits are either eaten raw, such as bananas (*Musa x paradisiaca* L.), mango (*Mangifera indica* L.) or Guanábana (*Annona muricata* L.) or prepared as sweets with a lot of sugar. Moreover drinks are made from fruits, eg. *agua de mango* (Water with mangos). Citrus fruits, such as oranges (*Citrus sinensis* L.) or bitter orange (*Citrus aurantium* L.) are often used for

this purpose. Citrus fruits also have an important role as condiment for salsa (hot, spicy sauces) and for the preparation of meat.

Vegetables, such as chayote (*Sechium edule* [Jacq.] Swartz), tomatoes (*Lycopersicon esculentum* Mill.) or radishes are used for cooking. Meals are also prepared with segments of Nopales (*Opuntia sp.*), the leaves of Chaya (*Cnidoscolus chayamansa* McVaugh) and the blossoms of Flor de Izote, a palm species (*Yuca elephantipes* Regel). Leaves of various species of *Musa sp.* L.), Acuyo (*Piper auritum* Kunth), also known as hierba santa and makal (*Xanthosoma yucatanensis*) are used to wrap a mixture of beans and meat or beans and vegetables. *Tamales* is the name of this local dish, which is prepared with various ingredients. The starchy tuber of makal is also edible and eaten like potatoes.

Beans (*Phaseolus vulgaris* L.), maize (*Zea mays* L.), chilli pepper (*Capsicum sp.*), camote (*Ipomea batatas* L.) and cassava or yuca (*Manihot esculenta* Crantz) are also grown in the homegarden and used for the nourishing the family.

Various plants grown in the homegarden are also used as household remedies against several diseases. The leaves of *Citrus* L. varieties are, for instance, prepared as infusions against influenza, Chipilín (*Crotalaria longirostrata* Hook & Arn.) prepared as infusion for calming (it is also used to make sauces) leaves of Colorín (*Erythrina coralloides* D.C.), prepared as infusion against diarrhoea, superficial applied for wound healing (Figure 28). This is just a selection of the uses of plants as remedies that the gardeners listed.

Figure 28: Plants growing in the homegarden used as remedies (a= Colorín, b=Lemon) (Pictures: DIETRICH 2010)

As one of the most important condiments in the Mexican cuisine, coriander or cilantro (*Coriandrum sativum* L.) is grown in all of the surveyed homegardens. Other plants used as codiments are e.g. basil (*Ocimum basilicum* L.), chives (*Allium schoenoprasum* L.) and oregano (*Origanum vulgare* L.).

Fodder, fuel wood and construction wood is also obtained in the homegarden. Plants, of which parts are used as fodder, are not specially cultivated for that purpose, but they are mostly tall trees of the secondary vegetation grown without management, such as the breadnut or ramón (*Brosimum alicastrum*). Pigs are fed with its nuts. Dead wood of all trees is used as fuel wood. Some trees, which are not used as construction wood, are also used as fuel wood. In some homegardens hard wood trees, such as Mexican cedar, known as cedro (*Cedrela odorata* L.), Chakte Viga *(Caesalpinia platyloba* S.Watson) and Big Leaf Mahagony or caoba (*Swietenia macrophylla* King) used for construction grow.

One woman said, that some plants are used to make household articles such as lek (*Lagenaria siceraria* Molina) which is a Species of Cucurbitacea. Its shell hardened when it gets dry. So it is used as bowl for storing of seeds or other things.

4.9.2. Sale of homegarden products

Out of 36 gardeners 15 women and 14 men mentioned, that products grown in the homegarden or meat and eggs of livestock raised in the homegarden are occasionally sold. Products that are commercially important include different varieties of oranges, limes and lemons (*Citrus* spp.), coconuts (*Cocos nucifera* L.) as well as animals. Furthermore, fodder grown in homegardens is sold e.g. leaves of trees of the secondary vegetation. Products were either sold directly in the homegardens, at the market in Xpujil, or to intermediaries. Problems are the lack of transportation infrastructure. People in the villages do not join together to trade their products, but depend on traders, who come into the villages and buy their products for national or international markets. The prices are set by the traders.

If one family in the community slaughters a pig, a goat or a sheep and sells parts of it, this will be called on the public address system. Small livestock is sold either alive or dead.

Decisions about the sale of products are made by the female household head, by both or by the whole family. Just one woman mentioned, that her husband is responsible for sale of homegarden products. Being almost always in or close to the homegarden women are responsible primarily for sales directly in the homegarden. In most cases women or women and men together, have control over the money earned (Figure 29). Eight women and six men stated, that they themselves respectively their wives can spend the earned money. Four women and seven men said, that both jointly decide, how to use the money. One woman and one man said that her husband respectively he himself takes the money. Two women mentioned, that the whole family uses the money.

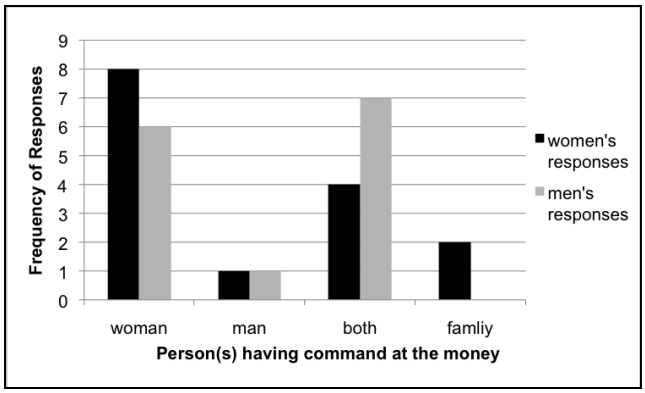

Figure 29: Person(s) having command at the earned money of a sale of products of homegardens of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 29; women=15, men=14)

4.9.3. Exchange of homegarden products

Exchange of homegarden products occasionally takes place. 22 gardeners (nine women and 13 men) mentioned that they change homegarden products with neighbours and friends. Also with relatives living farther away within the community fruits, crops, plants and eggs are exchanged. Meat or living animals are not exchanged, but rather sold. If anyone needs anything, she or he just asks for that product from those who have it. For example, a woman who liked to prepare Nopales (*Opuntia ficus-indica* [L.] Mill.) for dinner, but did not grow such a plant in her own homegarden, was observed, asking in the neighbouring homegarden for some segments of the plant. She obtained permission to cut as many segments she wanted.

4.9.4. Homegarden products as gifts

Many of the homegarden products, such as fruits or vegetables are used as gifts for relatives, friends and neighbours. Plantlets and seeds primary of ornamental plants women give as a present to other women, in order that they can cultivate in their homegarden. Further women often use ornamental plants from their homegardens to decorate the church on holidays.

4.10. Cultivation of the *milpa*

4.10.1. Activities on the *milpa*

The *milpa* is planted once a year in the beginning of the rainy season (May or June). It is followed by the harvest, beginning in September and continues until the land is cleared in order to burn for cultivating it once again.

At the end of the rainy season the peasants choose a forest area on the *parcela*, which will be cut down to cultivate the *milpa*. This area must be authorised by the *ejido*. Tractors are rare, thus most of the peasants cultivate their *milpa* by hand. Until March the trees are cut with the help of an axe, a machete and sometimes with a motor saw and left for drying. At the edges of the prepared area the vegetation is also cut and removed to avoid spreading of the fire to the surrounding forest. The area is burned between the 15th of April and the 15th of May, before the rainy season starts. As soon as the rain starts the sowing begins. Peasants try to sow a few days after burning in order to make use of nutrients of the ash. Often maize is cultivated mixed with beans and squash.

Different varieties of these crops are cultivated in order to meet the various needs of the family. The seeds for sowing are selected a year prior to sowing and stored. Getting benefits of the PROCAMPO (section: 3.4.8) peasants are bound to cultivate improved maize on this area. Some of the farmers mentioned, that the improved maize is more delicate susceptible to diseases.

Due to the rain weed (*acahual*) grows quickly; therefore the *milpa* is weeded with the machete frequently. During the growing season the pesticides are used in order to reduce weed growth and save pains of the time-consuming weeding by hand.

At the end of August until the beginning of September the young maize is harvested. But the major part of the maize is left on the *milpa* for drying. The corn stalks are folded. This is done to protect them from humidity and avoid loosing caused by bird damages. Between October and December dried maize is harvested and brought into the villages and stored in the houses.

Beans are cultivated twice per year. The first sowing is in January and harvested in March. The second crop of beans takes place between September and November.

Men carry out most of the labour. 16 male and 12 female respondents said that mainly men cultivate the *milpa*. One woman cultivates her *milpa* on her own since her husband died a few years ago. Four women and one man stated that they together with their partners carry out all activities. One couple pay others for cultivating their *milpa* (Figure 30).

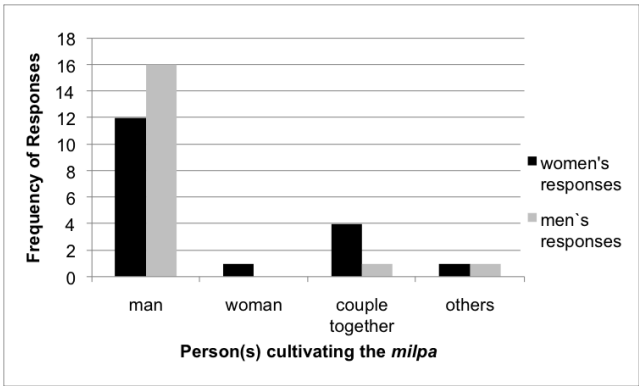

Figure 30: Persons cultivating the *milpa* of Mestizo farmers in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

In most families women help on the *milpa*. Five women said that they generally do not help their husbands, while two husbands said, that they do not have female help. Three male respondents answered, that their wives accompany them to the *milpa*. Two women said that the work there on their own. Also two male respondents said, that their wives work on the *milpa* on their own.

Children usually help on the *milpa* if they are old enough. Children of 28 respondents help on the *milpa*. The help of older sons on the *milpa* is demanded.

Men are in most cases owners of the area. In four households both household heads are the owner of the area and one woman said that she owns it. The *milpa* is mostly male dominated, thus men have decisive power. 15 male and 15 female respondents said, that men decide what to plant on the *milpa*. Two women and two men decide together with their partners, about sowing on the *milpa* and again one woman and one man stated that women have decisive power.

4.10.2. Products obtained from the *milpa*

The most important crops are corn (*Zea mays*L.) beans (*Phaseolus* spp.) and squash (*Cucurbita* spp.), which are planted together on the same plot. The *milpa* production is both a subsistence activity and considering the cultivation of chilli pepper (*Capsicum* spp.) a market oriented activity. Yields are not high enough to get through the year, thus families have to buy corn and beans in the month between the end of the harvest and when it starts again. According to the provided information production depends on site quality, the age of the plot, precipitation, disease and damage by animals.

Most *milpa* products are grown for household consumption. An exception is Jalapeño pepper (*Capsicum annum*). Its production is frequently found. Jalapeño peppers (*Capsicum annum*) are sold, right after the harvest, or they are dried in outdoor ovens to be sold as "*chipotle*" later in the season.

Often other plots are chosen to cultivate other crops or to plant fruit tree s,such as camote (*Ipomea batatas* L.), cassava or yuca (*Manihot esculenta* Crantz), tomatoes (*Lycopersicon esculentum* Mill.), banana (*Musa x paradisiaca*), papaya (*Carica papaya* L.), mango *(Magnifera indica* L.) and others for the household consumption.

The seeds for *milpa* cultivation are either propagated by the respondents themselves or bought. The exchange of seeds with neighbours is rare. Mostly men select, harvest and store them. Three women stated to be responsible for the seeds for the *milpa*. One man said his wife is storing the seeds. In four cases (two female responses and two male responses) both are responsible.

4.11. Honey production

Although honey harvesting is a temporary activity, beekeeping is an important source of income for three families out of 20. There is governmental aid available to support beekeeper making hives and frames for their bees cheaper. Bee colonies are kept in apiaries mostly situated in the owner's *milpa* but also in some homegardens. Honey production varies, depending on the location of the apiaries. Virtually all of the honey is sold and rarely consumed by the families themselves.

Men mostly carry out activities related to beekeeping. Exclusively men carry out tasks direct at the apiaries. Women help to extract the honey or to clean and prepare the frames to reuse them again. Honey collection depends on the region and on the weather conditions. Usually it takes place between March and June. Extracting is done with the help of a hand-powered extractor. The honey is sold in Xpujil, where it is brought to market by a honey cooperative.

4.12. Gendered spheres within the household

Women's and men's expectations are similarly regarding women's and men's behaviour and responsibilities within the family.

4.12.1. Female areas of responsibility

Regarding to the respondents women in both villages are responsible for a wide array of activities related to farming as well as household production and management. They prepare and cook all meals and wash the dishes, clean the house, wash and dry the clothes and look after the children. Women are expected to keep house and according to the respondents they are in reality under control of the household. Women are responsible for the feeding of the family and are clearly the head of the kitchen. If men are hungry, women go to cook for them. Men do not feed themselves with food.

Once in the evening a group of women were sitting together chatting in the homegarden. When the man came home and said, that he was hungry, his wife jumped to her feet to cook for him and the women's circle became disrupted. The family seldom eats together. *Tortillas,* a round flat cake, staple food in Mexico, made of maize (original version) or wheat flour are made fresh every meal. At least one woman bakes the *tortillas,* while other family members eat. Generally men (or men and children together) eat first served by women. Afterwards the children eat (if they have not done so already) and last, when all other family members are sated, women eat.

Women are seen as responsible for keeping the family together and the house in order and to coordinate the family. Women are responsible for the family's health according to one male respondent. One man said women have the household under control and they do have to think in an economic way. Another man said that women should participate more in public initiatives, but he thinks that they are too shy to raise their voices. One man mentioned that women are responsible for saving money, so that their children can leave for studying. Thus women contribute in a development of the community.

Male and female respondents said that women are responsible for animal husbandry of fowl. One woman and one man stated, that women are responsible for the homegarden.

According to two women and a man, a woman's role depends on the status of her family and upon the place in which a woman lives. If she is married and if she has children she is responsible for her husband and for her children, if not for herself.

4.12.2. Male areas of responsibility

According to the respondents men are responsible for the income and the general maintenance of the family. Both women and men expect men to watch out for the family welfare. Women and men both mentioned that men, like women, bring up the children. One man said that his task is to offer his children a spiritual discipline and have to teach them

morality. Another man said men have to enable his children to leave for studying. Both men and women said that men are competent to carry out all the tasks to be carried out on the fields, as well as all the hard jobs within the household, such as maintaining the house or collecting fire-wood. Men are responsible for keeping the pigs, sheep, goats and cattle, according to women and men. One woman expects her man to help her in the kitchen if she is occupied with the children and her hands are full. Also one man said that men have to assist their wives.

One man and one woman stated that men represent the family in public. However, one woman said that she also talks to the teachers in the school about the performance of her children. Men take the family to the doctor and hold talks with the doctor according to two women and two men.

Men are expected to shape policy at community level, one man said.

4.12.3. Differences regarding working time

Women are generally perceived to work more than men. No man said that he works more than his spouse. Seven women and 13 men said that women work more. Seven women and five men do not perceive any difference regarding working hours between women or men. One woman said that although women do not work more than men, they have to keep more things in mind, than men do. Many of the respondents who said that women work more than men also mentioned, that women do not have any leisure time for relaxing during the day, and work from dawn until late in the evening. They get up first and go to sleep last. Many male respondents said that when they come home from the fields in the afternoon the meal is already prepared and afterwards there is time for them to relax in the hammock. Both men and women said that while men can decide to work on the field or not, women do have to work every day. Women carry out all tasks in the house as well as the work in the homegarden and help at the *milpa*. One woman said that women work in the shadow, while men carry out heavy tasks in the sun.

4.12.4. Differences regarding decisive power

In most families both household heads have decisive power regarding the most important decisions within the family. That was mentioned by ten women and 12 men. No woman in any family has sole decision-making power over the most important things. Men, however, do, according to eight women and six men.

Women, men or women and men together are responsible for the money and have decisive power over how to spend it (Figure 31). Three women and three men said that they are respectively their partner is responsible for the money. Seven women and three men said that either their partner or they themselves respectively are responsible for the money. That they decide together how to spend or to save money was mentioned by eight women and 12 men. One woman said that her husband gives her all the money he earns by selling chilli pepper, because she knows what to buy.

Men are solely the head of the family or women and men together have this position together. More women than men stated that men are the household head (11 women and seven men). In contrast more men (11 responses) saw women and men together as household heads than women did (seven). One male respondent said that he is the household head because in general he is responsible for the family. Another man argued to be the family head, because he deals with the money of the family and arranges how the family moves on. Some male respondents said that men decide the most important things to be decided. Men are the household heads, because they say, what things are to be done. Machismo is a reality in many families in Mexico according to one male respondent, who is jointly the family head with his spouse. They try in cooperation to get ahead and lend each other a hand. Furthermore, he said that the most important thing is, to come to an agreement and to have shared objectives. Regarding decisions one woman stated that she cannot make decisions regarding her children on her own, but she must to come to an agreement with her

husband. One man said that his wife is the household head, because she stays at home most of the time.

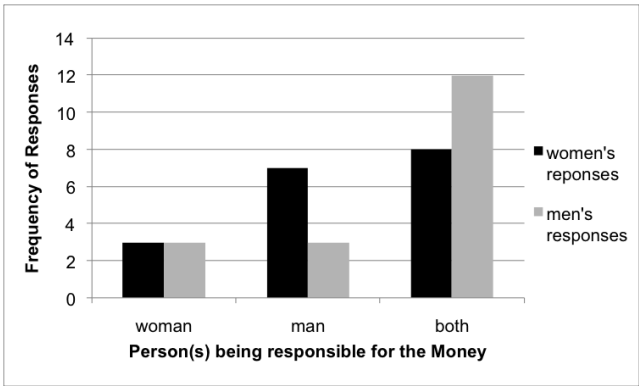

Figure 31: Person(s) responsible for the money in households of Mestizo in Narcizo Mendoza and Cristóbal Colón, Campeche, Mexico (n= 36)

4.12.5. Responsibility for the education of the children

Most of the respondents (12 women and nine men) stated that they together with their partners are responsible for the education of the children. Four women and seven men said that they themselves are respectively their partner is responsible for bringing up the children. Only one woman and one man said that the farther is in charge of education. Twelve respondents said, that the upbringing of daughters differs from that of sons. Sons are more independent and are allowed to stroll around on the street. Girls have to ask for permission to leave the house. Mothers are more responsible for daughters and men are rather responsible for sons. Daughters and sons are taught to carry out different tasks. Daughters learn from their mothers to keep house, while fathers teach their sons to cultivate the fields.

4.12.6. Perception of differences between women and men

Both female and male respondents did not mention any general difference between women and men. All of the male and 16 female respondents said that both women and men have the same value. While two women felt, that women do not have the same position and the same value as men. According to most of the respondents the situation was different in former times. That women had less value than men, was mentioned by 16 female and 16 male respondents. Two men and two women said that the in former times women and men had the same value.

One man said that although there are physical differences between men and women, both can do every task. Furthermore, he said that women and men think in different ways. This was also stated by another man, who illustrated that women are mentally occupied with the nourishment of the family, the upbringing of the children and the animal husbandry, while men reflect about their work on the field. Another man meant that women are more intelligent and have better ideas; but in general there are no differences and both women and men have equal rights.

One woman said that her husband realizes tasks that are generally considered to be women's tasks, dishwashing or cooking. She said, that men are clearly the head of the family and direct the family.

Another man stated that women and men do not have equal possibilities. According to this respondent women participate little in the public life, and women do not assume leading positions. Men are *ejidodatirios*, participate in voting and are in known, what is going on in

the *ejido*. Two women said that women cannot do all the things men do. Women cannot stroll around at the street alone, without defamation, but men can do so. Furthermore, going to Xbujil is much easier for men, than for women.

Although some respondents (women and men) mentioned that gender roles and gendered areas of responsibility were stricter in former times than today; (men commanded and had solely decisive power) four women mentioned, that men still command and stay on top of things. Also one man said that generally in Mexico men command, but in his family the situation is different.

One man said that women are of value to men. Without a woman daily life is much harder to cope with. One woman said that life for a single woman is hard in the village, because there is nothing to live on.

5. Discussion

5.1. Appearance of the homegardens

5.1.1. Objective 1: Brief description of investigated homegardens (location, size, appearance)

All of the surveyed homegardens are adjacent to the gardeners homestead. This can be explained by the plots given by the *ejido*, when the community was established. They are large enough for an area for crop cultivation, animal husbandry and areas for fruit trees. This finding contrasts to that of JESCH (2009), who documented a great distance of homegardens from the homestead in northern Spain. The location of the surveyed homegardens support the findings of MITCHEL and HANSTAD (2004), who define the homegardens as being located close to the house. The study by REYES-GARCIA *et al.* (2010) shows that location and size of the homegardens depend on the sex of the cultivating person(s). Women's homegardens and those homegardens cultivated by women and men together were closer to the house and smaller than those homegardens cultivated solely by men. Also in Bangladesh, women's homegardens are located in the direct surrounding of the house, within the boundaries of the homestead, while men's homegardens are located outside of the boundaries of the homestead, though still within 10 metres of the house WILSON (2003). Although most of the surveyed homegardens in both villages have the same size and more or less the same shape, each has its specific appearance. No homegarden is equal to another homegarden. They differ little in terms of size, because the standard size allocated by the *ejido* was 2500m². The existing differences can be explained by the tradition that parents pass on one part to their daughter or their son, so that they can build their own house. The smaller homegardens had already been divided and a son or a daughter had built a house and cultivate his or her own homegarden. To be able to provide children with a homegarden (when they start a family) may also be the reason that some homegardens are larger than others. In this case both parents have asked for a homegarden, therefore for the meantime it is twice the size of a single plot until it is given to the offspring.

Not all homegardens have boundaries. Boundaries towards the road are rare and are made of various materials. Only one homegarden was completely enclosed. This may indicate free entry to neighbours.) Open homegardens as invitation to enter has also been observed in Javanese homegardens by SOEMARWOTO and CONWAY (1992). In Colombia in the homegardens of the Bari Indians no clear boundaries towards neighbouring homegardens were found (PINTON 1985).

Because of the great variations regarding appearance and cultivation it can be said argued that no typical homegarden of Cristóbal Colón or Narciso Mendoza exists. Due to the variations in age and function of the surveyed homegardens DE CLERCK and NEGREROS-CASTILLO (2000) came to the same conclusion in Quintana Roo. These variations can be explained by the different cultivation strategies and various uses of the homegardens. Thus the appearance of homegardens reflects the gardener's economical considerations as well as the household needs, as was also observed by VOGL (1998). For BENJAMIN (2002) the use and appearance of the homegarden are results of individual lifestyle preferences. Moreover the appearance is influenced by the ecological conditions (MENDEZ *et al.* 2001).

All homegardens have different zones, though not all homegardens have all zones. Zoning is based on practical considerations. Mainly men or women and men together decide about zoning of the homegarden.

Different zones are:

- Living zone (found in all homegardens)
- Zone of ornamental plants (found in all homegardens)

- Places for plant breeding (found in six homegardens)
- Zone for crop cultivation (found in nine homegardens)
- Zone of fruit trees (found in all homegardens)
- Zone of the secondary vegetation (found in 19 homegardens)

Similar zones were described by CABALLERO (1992) and VOGL (1998) in Maya homegardens and MENDEZ *et al.* (2001) in homegardens in Nicaragua. The area of the ornamental plants is usually located at the entrance of the homegarden. The area of ornamental plants was found in front of the house in homegardens in other regions of the world (CABALLERO 1992, PEYRE *et al.* 2006, SERENI MURRIETA and WINKLERPRINS (2003) and TRINH *et al.* (2003). As the homegarden is considered as status symbol by the respondents and as ornamental plants are attributed to women it can be assumed, that a nice looking entrance of the homegarden contributes to an increase of women's social status within the community. The area for the fruit trees is dominated by Citrus varieties, which can be explained as the consequence of a governmental program that promoted the cultivation of various citrus species (*Citrus spp.*) (JIMÉNEZ-OSORNIO *et al*. 2003).

Other structures found in the homegardens are buildings for livestock, stoves for drying of chilli pepper, shelters used as carports or as workshop to do carpentry. Chilli peppers are dried after the seeds have been removed in the homegarden in order to sell the dried fruit and the seeds separately. Doing carpentry for others is also a source of income. These activities are examples of the homegarden as a place for post harvest management and for other income generating activities, which supports with the definition of homegardens made by MITCHEL and HANSTAD (2004).

In all but one surveyed homegarden livestock is found. Most common is poultry found in 16 households. Pigs and turkeys are found in ten households. Livestock is mainly consumed within the household, but is also sold. It plays an essential role in the local diet and further it is an important source of income when money is scarce. Pigs, sheep and goats are mainly used for special events. The role of the animal component as a type of food insurance and its importance for festivities was also described by CUANALO DE LA CERDA and GUERRA MUKUL (2008). MONTANIGNI (2006) emphasises the importance of poultry regarding its ability to generate income from selling eggs and meat.

5.2. Management of the homegarden

5.2.1. Objective 2: Description of the tasks to be realized in homegardens and the gendered division of labour.

Homegardens in Narciso Mendoza and in Cristóbal Colón generally are neither women's nor men's domain in terms of realization of tasks. The data show that both men and women carry out several tasks in the homegarden. No homegarden is managed solely by a single person. During the time at which the communities were built, predominantly men cleared the land and set up the homegardens. Similar situations were found by BENJAMIN (2002) in Mayan homegardens in Yucatán. Nowadays, the homegardens are cultivated through the cooperation of the whole family, as also found by REYES-GARCIA *et al.* (2010) in rural regions of the Iberian Peninsula, where three fourths of the homegardens are managed by more than one person and gardening is "a shared activity within a household" (REYES-GARCIA *et al.* 2010: 236). Also in Java the whole family is responsible for tasks to in the homegardens (SOEMARWOTO and CONWAY 1992). In Zimbabwe and Zambia management of homegardens depends on ethnicity. In the southern regions among the Tongas women manage the homegarden, whereas in the north eastern regions men prevailingly cultivate a homegarden (DRESCHER 1998).

Although it is not exclusively the men's domain, data analysis revealed that men are more often solely responsible for the homegarden than women, or than women and men together

(section 4.2.2). It can be assumed, that responsibility is related to ownership, because both women and men saw for the main part men as homegarden owners (section 3.4.10.). In contrast to that finding are the results of DEERE and LEON (2003), who report a relatively high proportion of female landowners in Mexico, although there is a significant gender inequality in land ownership in other countries in Latin America. According to the authors female land ownership in Mexico is caused by special inheritance rules in the *ejido* sector, containing favourable provisions for widows. In other regions homegardens are instead managed by women and women are predominantly responsible for the cultivation of the homegarden. These findings are supported by those of HOWARD and NABANOGA (2005) for homegardens in Uganda, FINERMAN and SACKETT (2003) in Ecuador, VOGL and VOGL-LUKASSER (2003) in Austria, TSEGAYE (1997) in Ethiopia, BENJAMIN (2002) and LOPE-ALZINA (2007) in Mexico, SERENI MURRIETA and WINKLERPRINS (2003) in Brazil and HENSHALL MOMSEN, PATTERSON (2000) in Belize and OAKLEY (2007) in Bangladesh. As Bari women in Colombia are mainly responsible for the homegarden, the size of the homegardens depends on the number of women in a household (PINTON 1985).

Homegarden management includes several tasks. The orientation of the cultivation (home consumption or sale) and use of the homegarden influence the management and the activities in the homegarden. In homegardens, used primary for animal husbandry other tasks are important relative to those carried out in homegardens cultivated for the main part for household subsistence consumption. Not all tasks are carried out in all of the surveyed homegardens. All work is done by hand as is also described by VOGL and VOGL-LUKASSER (2003).

The homegarden tasks can be subdivided in six areas:

- Tasks regarding cultivation of plants (sowing, transplanting, watering, fertilizing, harvesting)
- Tasks regarding animal husbandry (feeding, supplying water, administer medicine, collection of eggs, preparation of nests, shepherding for grazing)
- Tasks regarding keeping the homegarden clean (raking and sweeping, litter burning, weeding, cutting the grass)
- Tasks regarding tree care (pruning, removing deadwood, cutting, whitewashing)
- Tasks regarding control of pests and diseases (application of pesticides, snail traps)
- Maintenance and construction of houses, shelters and boundaries

Women and men mainly decide jointly how the work in the homegarden is organised. In some households men decide solely about homegarden activities. In one household the woman is in charge of this task.

Tasks predominantly carried out by women are raking and sweeping, litter burning, irrigating plants, feeding livestock and water supply, collection of eggs and preparation of nests for breeding. These tasks equal the list of female tasks documented by DE LOS ANGELES CHI QUEJ (2009). DRESCHER (1998) listed as tasks carried out by women in Zimbabwe and Zambia: seedbed preparation, sowing, weeding and irrigating. In Colombia women cultivate the homegarden and harvest ripe crops and fruits, whereas the whole community cuts, clears and burns the area in order to establish a new homegarden (PINTON 1985). Also in Uganda harvesting is traditionally considered as women's task (HOWARD and NABANOGA 2005), further women collect firewood and water in this region.

Data analysis revealed that male activities are wood work (tree pruning, tree cutting and wood chopping), maintenance of boundaries, shelters and houses, mowing, applying pesticides, birth assistance and gelding. These results agree with those of DE LOS ANGELES CHI QUEJ (2009), BENJAMIN (2000), PATTERSON (2000) and MARSH and HERNÁNDEZ (1996). As forest clearing is seen as a noble deed in Java it can only done by men, who have

spiritual power (SOEMARWOTO and CONWAY 1992). Knowing about the toxicity of synthetic-chemical pesticides, men do not want their wives to apply it. Also FARNWORTH and HUTCHINGS (2009) reported that women rarely apply inorganic chemicals or fertiliser. In Zimbabwe and Zambia men are responsible for fencing in the homegarden plots (DRESCHER 1998).

Sowing, transplanting, fertilising, harvesting, whitewashing of trees and weeding are carried out by women, men, both together and the whole family. But neither women nor men prevailingly are in charge of these tasks. These results agree with studies of REYES-GARCIA *et al.* 2010). Harvesting is carried out by both sexes also in Zimbabwe and Zambia (DRESCHER 1998).

Several authors observed a similar gendered division of labour in homegardens. In Guatemala women are in charge of handle fowl, young and fragile plants, mulch, sweep and weed lightly the homegarden, while men and older boys carry out tree care, maintain fences and weed (CORZO MÁRQUEZ and SCHWARTZ 2008). Also in Uganda men are in charge of tree pruning, house constructing and maintenance of fences (HOWARD and NABANOGA 2005). In Mayan homegardens women are principally the decision makers and take care of trees but men prune trees, sow plants and remove unwanted plants (BENJAMIN 2000). In Nicaraguan homegardens the division of labour seems to depend on the number of women and men living in a household, rather than on the roles assigned to each sex (MENDEZ *et al.* 2001). For HOWARD (2006) there is a strong relation between the gendered division of labour and men and women's differential access to homegarden resources, such as land, trees and other plants.

Some tasks are carried out year round such as sweeping and raking, collecting and chopping of wood feeding of animals and weeding. Others are seasonal tasks, such as sowing, irrigating and applying herbicides. The frequency and timing of tasks in the homegarden varies greatly. Irrigation of crops is the main activity during the dry season. Peasants in Zimbabwe and Zambia consider irrigation, which is the main task from May until July, as labour intensive (DRESCHER 1998). Sweeping and raking is done often (in most homegarden at least once per week). It can be assumed that frequent sweeping and raking should keep the homegarden clean, so that vipers and tarantulas have no foliage to use as hideouts. Furthermore governmental health programs promote activities to keep the homegarden clean so that the reproduction of mosquitoes, which can cause mosquito born dengue fever or other diseases, is prevented.

Seeds for cultivation in the homegarden are propagated mainly by the gardeners themselves. If no seeds are available from their own homegardens, gardeners buy them in Xpujil. In Zimbabwe and Zambia seeds are either bought or propagated by the gardeners. In rural regions buying of seeds is less common than in urban areas (DRESCHER 1998). Women, men and both together are responsible for seed management, although men saw themselves more competent regarding the selection of seeds. The responses regarding decision making about cultivated plants were similar. Mainly women and men together decide what to plant. This was also found by LOPE ALZINA (2006) in Yucatan. For the main part women take care for ornamental plants. Other authors also described the strong association between women and ornamental plants (MENDEZ *et al.* 2001, HOWARD 2006, CORZO MÁRQUEZ and SCHWARTZ 2008, SERENI MURRIETA and WINKLERPRINS 2003). As women are responsible for the homegarden in Ethiopia, they decide what to plant, carry out planting, select the seeds and store them, experiment with new varieties and exchange information (TSEGAYE 1997). Among Yucatec Mayan immigrants leaving Yucatan for Quintana Roo women decided, which seeds to take along in order to cultivate in the newly inhabited area (GREENBERG 1996). Women in Bangladesh select and store seeds of indigenous vine or gourd species they cultivate in their homegarden, while men cultivate exotic species and store their seeds on their own.

Children are an important labour force in the homegarden. Most of the respondents assign tasks in the homegarden to their children. Daughters' tasks reflect those of their mothers and sons do the activities their fathers do. Sons are more often asked to help their mother in the homegarden than daughters are asked to help their fathers. In Zimbabwe and Zambia children are mainly responsible for irrigation, weeding and harvesting (DRESCHER 1998). Irrigating in the homegarden is also the task of children in a Caboclo community in Brazil (SERENI MURRIETA and WINKLERPRINS 2003). HOWARD (2006) also pointed out the importance of children's labour in homegardens.

As part of the farming system the cultivation of the *milpa* was also touched upon in this study.Produce from the *milpa* is primary used for consumption within the families with except of chilli pepper (*Capsicum ssp.*). In a broader sense it is also a product cultivated on the *milpa* or on the *parcela* (section 2.9 and 3.4.8), which is primarily sold. Men carry out most of the activities on the *milpa*. Women generally help on the *milpa*, but do not go to the *milpa* on their own. One woman cultivates the *milpa* on her own with the help of her grandson, because her husband died a few years ago. Other authors observed that although men dominate work in the field, women involvement is common (HENSHALL MOMSEN and OAKLEY 2007, VOGL 1998 DE LOS ANGELES CHI QUEJ 2009, LOPE ALZINA 2006). Men mostly decide what to plant on the *milpa.* This result is in contrast to those of HENSHALL MOMSEN and OAKLEY 2007 documenting women's decisive power regarding crop cultivation. In rural areas of Bangladesh women do not participate in agricultural field crop production (WILSON 2003).

5.3. Motivation for cultivating a homegarden

5.3.1. Objective 3: Documentation of the importance of homegardens for the subsistence production of their managers.

Surveyed homegardens are primary cultivated in order to meet household needs. Homegarden products are mainly produced for consumption within the household. Neither in Narciso Mendoza nor in Cristóbal Colón homegarden is the production market orientated. So the household is the main destination for homegarden products. As stressed by SOEMARWOTO and CONWAY (1992), NIÑEZ (1984), DRESCHER (1998), CABALLERO (1992) amongst others, homegardens play an important role for the household subsistence economy. By cultivating the homegarden families can cover certain needs without spending money. So homegarden produces allow gardeners to save money, as they do not have to purchase them. This benefit was also described by SOEMARWOTO and CONWAY (1992). Women use produce of homegardens in the Austrian Alps within the family (VOGL and VOGL LUKASSER 2003).

Homegarden products are mainly used for nourishing the families. Plants cultivated in the homegardens are also used as remedies, condiments and fodder. Furthermore the use of wood for fuel wood and construction was mentioned. CABALLERO (1992) listed similar purposes products of Maya homegardens are used for: food, medicines, wood and ritual purposes. Women in Austria mentioned obtaining homegrown food as the main motivation for cultivating a homegarden (VOGL and VOGL LUKASSER 2003).

Although gardeners earn some money from sales of homegarden products, homegardens are not the main income for any households in Cristóbal Colón or Narciso Mendoza (section 3.4.8). In both surveyed villages more men than women perceive the homegarden as a source of income. For the Bari Indian in Colombia the homegarden is the basis of the household economy (PINTON 1985). Also in Nicaraguan subsistence farming systems the homegarden is the most important source of income and represent the highest average of income (MENDEZ *et al.* 2001). Similar were detailed CUANALO DE LA CERDA and GUERRA MUKUL (2008) examining a Mayan community. As an important cash source, homegardens in this community are mainly cultivated because their economic importance.

Surplus is sold either directly in the homegarden or on the market in Xpujil. As important products for sale the respondents mentioned oranges, limes, lemons and coconuts. Lack of

transportation infrastructure exacerbates sale in Xpujil. Because they spend most of their time in, or in direct vicinity of the homegarden, women mainly sell products directly there. Mainly men market products in Xpujil. Both women and men control the earned money from sales. WILSON (2003) reported for Bangladesh that men market the surplus from women's homegardens, because women do not go to the market in the surveyed villages. Most of the men consider that the earned money belonged to them, because they sell the products. But women provide a shopping list by turning their produce over for sale, in this way they benefit from the sale of their products, though they do not get the money (WILSON 2003). By selling the surplus women in the Ecuadorian Andes contribute to household income and improve their own status (FINERMAN and SACKETT 2003).

Gardeners in Narciso Mendoza and in Cristóbal Colón see their homegarden as place where they can build a house and live without paying rent. Having a place to build a house was described by MITCHEL and HANSTAD (2004) as a dominant benefit, that people mentioned regarding their homegarden. Furthermore they can raise animals in their homegarden.

Respondents stated that with a homegarden as insurance, peasants can get credits of a bank. Homegardens offer access to credits MITCHEL and HANSTAD (2004) also pointed out as benefit for gardeners.

Beyond economic consideration gardeners cultivate their homegarden, because it makes them feel satisfied. Also women in Austrian homegardens mentioned the pleasure they receive from gardening as a reason for its cultivation (VOGL and VOGL LUKASSER 2003).

Most of the respondents transmit the knowledge of homegarden cultivation to their children. Likewise they were taught by their parents to cultivate a homegarden. While women were taught by their parents, their mother or their father, men were taught gardening by their parents or their father. HOWARD (2006) point out the importance of knowledge transmission from mothers to their children by working together in the homegarden. Regarding the future of homegardens half of the respondents believe, that their children will continue cultivating a homegarden. The others say that it depends on, where the young ones are going to live. BENJAMIN (2000) mentioned the out migration of young people as the main risk the erosion homegarden knowledge.

Respondents use homegarden products as gifts for relatives, friends and neighbours. Homegarden products are also exchanged within the community. Women pass on seeds or plantlets of ornamental plants to other women, so that they can cultivate these plants in their homegarden. Ornamental plants are used to decorate the church especially for feast days. In Bangladesh homegarden products are given as a gift to equally wealthy neighbours or relatives securing reciprocal returns (WILSON 2003). Men are not involved in this network of gift giving in Bangladesh. A female reciprocity network exists also in a Caboclo community in Brazil (SERENI MURRIETA and WINKLERPRINS 2003). HOWARD (2006) believes that the importance of these exchanges and gift giving, beyond the physical aspect of these exchanges, is the creation of social networks. This aspect, as well as the additional opportunity to accumulate the knowledge provided by these networks was also raised by PATTERSON (2000) and GREENBERG (1996).

Women and men in Cristóbal Colón and Narciso Mendoza were asked to list several benefits regarding their importance for the household. Women's and men's valuations of three benefits differ significantly. There were very significant differences between the women's and men's valuation of obtaining food as benefit of the homegarden. While all women except one placed it as most important benefit, less than half of the male respondents did so, Five even placed it in the third (out of eight) position. More men than women perceive the homegarden as a source of income. In contrast more women perceive the homegarden as a source of fuel wood. DRESCHER (1998) reported for Zambia and Zimbabwe that men and women do have different preferences regarding homegarden products and value them differently.

5.4. Gendered spheres within the household

5.4.1. Objective 4: Documentation of gendered spheres within the household

Women are responsible for the nourishment of the family, and for keeping the family together. Women are in the control of the household and in charge of animal husbandry of fowl. BENNHOLDT-THOMSEN (1982) found similar female areas of responsibilities in a Chol community. FARNWORTH and HUTCHINGS (2009) speak about the household as the main locus of women.

Men are responsible for the maintenance of the family in general. According to the respondents they are responsible for generating income. Their area of responsibility is the *milpa*. These findings agree with those of BENNHOLDT-THOMSEN (1982) in a Chol community. HENSHALL MOMSEN (2007) tells, that gender roles determine access to different spaces and environments. And men have easer access to spaces considered as those of women, than women have to "men's" spaces (HOWARD and NABANOGA 2005).

Men are in charge of the tasks perceived as physically hard jobs such as maintaining the house, or collecting fire wood. Men take care of pigs, sheep, goats and cattle. Men take the family to the doctor and represent the family in the public life. This agrees with KÜHHAS (1993) reporting, that men in a Mexican community represent the household to external persons and institutions. In Mayan societies men and women define themselves by the spheres they are responsible for and these are specifically gender divided. By doing so, men and women reproduce a normative social arrangement KÜHHAS (1993).

Women do not participate profoundly in public life, while men are *ejidotarios,* hold offices and participate in voting. Although there is no restriction for women, they do not hold an office within the *ejido*. Furthermore they do not have any role of importance within religious life. Similar findings were reported for another region in Mexico by KÜHHAS (1993). LASTARRIA-CORNHIEL (2006) links women's limited access to land to an elusiveness of education and political participation. Women collaborate in informal networks, while men participate in more formal ones (WESTERMAN *et al.* 2005) (also section: 5.3.1).

In general women work more than men. While men can decide daily to work on the *milpa* or not, women have keep the house day after day. Men can have a rest whenever they want, but women do not have any leisure time for relaxing during the day. Both women and men said, that they think women work more than men. That can be explained by the fact that women in most households participate in tasks that are considered "men's" tasks and help on the *milpa,* while men virtually never carry out "female" tasks, such as cooking or doing the laundry.

In most households both household heads made decisions about the most important things. Male household heads may solely decide about important things concerning the family but no woman does so. In most cases women and men together manage the household budget. In some families women or men solely are responsible for the money. In the central Ecuadorian highlands both men and women are involved in the process of economic decision-making (HAMILTON *et al.* 2001).

Women and men have the same value and the same rights for most of the respondents. Two women argued, that women do not have the same position as men. Gender roles and gendered areas of responsibilities were stricter in former times, when men commanded and women do not have equal rights.

It is not an appropriate behaviour for women to stroll around within the *ejido*. In addition it is more difficult for women to go to Xpujil alone than it is for men. Also FARNWORTH and HUTCHINGS (2009) reported a restricted mobility for women, hindering the sale of products at markets. Women in Bangladesh do not go to the market to market their products (also section 5.3.1) because both women and men see the world outside the homestead as "not a safe place for women" (WILSON 2003: 220). SERENI MURRIETA and WINKLERPRINS (2003)

reported for one household in a Caboclo community in Brazil, that the physical movement of female family members is restricted to the house, to common areas of the community and houses of relatives. In Belize, women cultivate *milpa* gardens (established after *milpa* fields are left fallow). As women go only accompanied by their husband on the *milpa*, the size of those gardens and of homegardens adjacent to the house depends on the absence or presence of the husband, thus on the possibility for women to go to the *milpa* or not. Women, whose husbands do not leave the community, cultivate large *milpa* gardens, whereas women, whose husbands are away for considerable periods have more diverse homegardens, with a large number of edible crops (PATTERSON 2000).

Women and men or women alone bring up their children. Some respondents said, that the upbringing of girls differs from that of boys. Women are responsible for teaching daughters to keep house, while men show their sons the fieldwork on the *milpa.* Sons are allowed to stroll around, while girls should stay in the house.

Women and men or men alone are the head of the family. One man said, he is in this position because he is responsible for managing the money. In the Ecuadorian Andes there is traditionally a preference for a dualistic household leadership (HAMILTON *et al.* 2001). For Mexico KÜHHAS (1993) reported that in the traditional conception of gender, the ideal productive unit formed by the male and female head of the house is viable if both complement each other.

6. Conclusion and Future Perspectives

There is no typical homegarden of Narciso Mendoza and Cristóbal Colón. They vary in several aspects: size, shape, homegarden age, homegarden boundaries or density of the vegetation. However, they also feature also similarities: the division of the homegarden in different zones (though not all homegardens have all of the zones) or shelters for livestock. Livestock is an important element in the homegarden and is found in all but one homegarden.

Surveyed homegardens are neither the women's nor the men's domain. Although women spend more time within the homegarden than men and probably spend more time in the homegarden, men are considered responsible for the homegarden. Men and women share the management of the homegarden. There are several tasks mainly carried out by women: keeping the homegarden clean by sweeping and raking, litter burning, irrigating, feeding of livestock, collection of eggs and preparation of nests. Furthermore, there is a strong relation between women and ornamental plants, which are exchanged between women and used for decorating the church. Men are responsible for tree care, maintenance of buildings and fences, applying synthetic pesticides, assisting at the birth of pigs, sheep or goats and castrating. Children help in the homegarden carrying out most of the tasks, although daughters realize tasks their mothers do and sons help their fathers.

There are both seasonal tasks to be carried out in the homegarden such as irrigating during drought or sowing during the rainy season and tasks carried out year round, such as sweeping and raking or feeding livestock.

Women and men value several benefits of the homegarden (obtaining food, income generation, having space for animal husbandry, cultivation of spices and herbs, cultivation of medicinal plants, cultivation of ornamental plants, obtaining construction wood, obtaining fuel wood and materials for handicraft) differently. While for women it is more important to meet daily needs of the family (obtaining food and fuel wood), for men economic considerations are primary (obtaining income).

Homegarden products are mainly used to meet the household needs. They are also given as gifts and exchanged with neighbours. Both women and men are involved in the exchange network, with the exception of the exchange of ornamental plants. Any surplus is sold. Most of the plants cultivated in the homegardens are used for the feeding the family or for decorating (ornamental plants). Parts of some plants growing in the homegarden are further also used as household remedies.

Gendered spheres within the household seem to be clearly divided. Both men and women see women as responsible for keeping the house and for the feeding the family, and men as responsible for providing the income, and for the maintenance of the family in general. Men alone, or women and men together, are the household heads. In most families women and men together have decisive power regarding the most important decisions. Men represent the family in public life, hold offices and participate in voting within the *ejido*, while women do not have any role of importance although there is no restriction.

The future of the homegardens in the surveyed communities is unclear. Considering the poverty and the remote location of the communities, gardeners nowadays are more or less required to cultivate the *milpa* and the homegarden in order to meet household needs. Living on subsistence production is not, what young people want to do and they tend to migrate into urban areas. Most of the respondents want their children to study so that they have the freedom to choose to take employment in urban areas or to stay and live from subsistence production as they themselves do. Changes in the cultivation strategy or changes in the income situation may change the appearance of the homegardens.

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Annex

Table 9: Tasks carried out with the help of children. (D= Daughters, S=Sons, C= Children, M=Mother, F=Father; red numbers show, where daughters, sons or children carry out that task without their mother or their father; n=36)

Tasks in the homegarden	Female responses									Male responses								
	D	S	C	MD	FD	MS	FS	MC	FC	D	S	C	MD	FD	MS	FS	MC	FC
Raking and sweeping			1	4						1			2		1		1	
Litter burning			1	2						1					1			
Feeding			1										1				1	
Supplying water			2										1				2	
Collection of eggs	1		1	1				2				2	1				2	
Preparation of nests	1			2									1					
Mowing		2					2		1							6		1
Tree pruning		3								1						2		
Tree cutting						1										1		
Wood chopping		1					1									2		
Sowing				1	1						1					1		
Watering				1	1			2		1	1						1	
Transplanting	2									1						1		
Application of herbicides																2		
Fertilizing	1															1	1	
Whitewashing		1	1						1		2	3				1		1
Weeding				1			1									4		1
Harvesting								1	1			1				2		
Maintaining boundaries				1				1			1							
Maintaining houses		1					1											

10. Abstract

In many Mexican regions homegardens are an important part of the subsistence economy of the peasants. A gendered division of labour, a gendered access to resources, such as land or plants and decisive power indicate gender relations and gender role ascription. Problems addressed in this work are: the appearance of homegardens, the gendered division of labour within them and the importance of homegardens for the gardeners. The study sites were two communities in Calakmul, a municipality of the Mexican state Campeche. Using qualitative and quantitative methods the data collection took place over a period from January until May 2010. Altogether 20 homegardens were investigated and 36 interviews (18 female and 18 male respondents) were conducted.

Generally homegardens appear to be very differently, but feature several similarities such as their division into several zones or shelters for livestock.

Women and men decide jointly about the division of labour in the homegardens. Tasks mainly carried out by women are: keeping the garden clean by sweeping and raking, litter burning, irrigating, feeding of livestock, collection of eggs and preparation of nests. Men carry out: tree care, maintenance of buildings and fences, applying of synthetic pesticides, assisting at a birth of pigs, sheep or goats and castrating. Tasks carried out by both women and men are sowing, transplanting, harvesting, whitewashing the trees and weeding. Children help in the garden carrying out most of the tasks, although daughters realize tasks their mothers do and sons help their fathers.

Products of the garden are mainly produced to meet household needs. Any surplus is sold, either directly in the garden or at the market. Sales from within the garden are usually undertaken by women, while men sell the products at the market. Products from the garden are also given as gifts or exchanged with neighbours, relatives or friends. Ornamental plants, cultivated by women, are also used to decorate the church.

The value placed on the benefits of the garden varies significantly between men and women for three of the eight benefits considered. Most of the women ranked obtaining food from the garden first, while less than half of the men did so. Men consider the homegarden as source of income very important, while women do not value this greatly. The homegarden as source of fuel wood is more important for women than for men.

11. Kurzzusammenfassung

Hausgärten sind in vielen Regionen Mexikos ein wichtiger Teil bäuerlichen Subsistenzwirtschaftens. Geschlechtliche Arbeitsteilung, der unterschiedliche Zugang von Männern und Frauen zu Ressourcen und Möglichkeiten Entscheidungen zu fällen, geben Hinweis auf die Geschlechterbeziehung und geschlechtliche Rollenzuschreibungen. Problemstellungen dieser Arbeit sind: Erscheinungsform von Hausgärten, die geschlechtliche Arbeitsteilung in diesen und die Wichtigkeit der Hausgärten für die BewirtschafterInnen. Forschungsorte waren zwei Dörfern in Calakmul, im mexikanischen Bundesstaat Campeche. Die Datenerhebung erfolgte zwischen Jänner und Mai 2010. Methoden der Erhebung waren semi-strukturierte Interviews, teilnehmende Beobachtung, Gartenbegehungen, Rankings und Freelists. Insgesamt wurden in 20 Haushalten 36 Interviews (mit 18 weibliche und 18 männliche InterviewpartnerInnen) geführt.

Die Hausgärten haben sehr unterschiedliche Erscheinungsformen, aber weisen Ähnlichkeiten auf, zum Beispiel Unterteilung in verschiedene Bereiche oder Unterstände für das Vieh.

Frauen und Männer entscheiden gemeinsam über die Arbeitsteilung im Garten. Tätigkeiten, die hauptsächlich bzw. ausschließlich Frauen ausführen sind: Sauberhalten des Gartens durch kehren bzw. rechen, Müll verbrennen, Gießen der Pflanzen, Füttern der Tiere, Eier einsammeln und Vorbereitungen von Brutnester. Arbeiten die hauptsächlich bzw. ausschließlich von Männern durchgeführt werden sind: Baumpflege, Holzhacken, Errichten und Erhalten von Zäunen, Unterständen und Häusern, Pestizidausbringung, Geburtshilfe bei Schweinen und Schafen und Kastrieren der Tiere. Säen, Auspflanzen, Ernten, Kalken von Bäumen und Jäten wird sowohl von Männern, als auch von Frauen durchgeführt. Kinder helfen im Garten bei den meisten Tätigkeiten, obwohl Töchter eher die Arbeiten verrichten, die auch ihre Mütter ausführen und Söhne tendenziell bei den Arbeiten der Väter helfen.

Die Produkte des Gartens werden hauptsächlich für den Eigenbedarf produziert. Überschüsse werden verkauft, entweder direkt im Garten oder am Markt. Die Verkäufe im Garten übernehmen meistens Frauen, während Produkte am Markt überwiegend von Männern verkauft werden. Produkte aus dem Hausgarten werden an NachbarInnen, Bekannte und Verwandte verschenkt oder ausgetauscht. Außerdem werden Zierpflanzen, die von den Frauen im Garten kultiviert werden, als Schmuck in den Kirchen verwendet.

Die Bewertung verschiedener Funktionen des Hausgartens durch Frauen wich in drei von acht Funktionen signifikant von jener, der Männer ab. Die meisten Frauen platzierten die Möglichkeit, im Garten Nahrungsmittel zu produzieren, an erster Stelle von acht, während weniger als die Hälfte der männlichen Befragten diese Funktion so bewertete. Die Hälfte der Männer fanden den Hausgarten als Einkommensquelle sehr wichtig, während Frauen dem kaum Bedeutung zumaßen. Der Hausgarten als Quelle von Feuerholz wurde von Frauen als wichtiger bewertet, als von Männern.