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A sweet future?

– An agroecosystem analysis of strawberry farms in northern Nicaragua

¿Un dulce futuro?

– Un análisis del agroecosistema de cultivo de fresas en el norte de Nicaragua

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From Uppsala to Nicaragua and back again,
with so much love and so many experiences.

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Abstract

Title: A sweet future?

- An agroecosystem analysis of strawberry farms in northern Nicaragua.

Nicaragua is severely challenged by poverty and the country was hit hard by the coffee crisis in the beginning of theyear2000. The situation forced farmers to find other ways to earn their livelihood and strawberries were identified as a possible cash crop. One geographical area with promise for strawberry cultivation was Las Sabanas in northern Nicaragua. There, the farmers have now founded a cooperative, DeliFresa, and the berries are introduced on the market. Simultaneously, more farmers begin to cultivate strawberries with new demands and needs for development arising. The main objective of our study is to describe and analyse the farming system for the farms constitutingthe cooperative DeliFresa, in order to identify challenges for development of their strawberry production. Specific objectives are to describe the role of strawberries within the farming system and evaluate its potential for development, with focus on social and economical perspectives, and to investigate processes and actors included in the value chain for strawberries produced by DeliFresa. We analyse the farming system by performing anagroecosystem analysis and a value chain analysis. Our data consist of 18 qualitative interviews, three participatory observations and four group meetings, taken with theoretical sampling. Our results show that the strawberries now arean important cash cropand they are sold in a short value chain consisting of four key actors; the farmer, the cooperative DeliFresa, supporting organisations and final customers. The most important process is logistical difficulties of getting the strawberries to the customers. We identify five main challenges for development: (1) The lack of goals (2) Division of labour (3) The functioning of the cooperative (4) Productivity losses (5) The unstable market.

Key words:agroecosystem analysis, value chain analysis, strawberries, Nicaragua

Resumen

Título:¿Un dulcefuturo?

- Un análisis del agroecosistema de cultivo de fresas en el norte de Nicaragua.

Nicaragua es un país severamente impactado por la pobreza, especialmente a comienzos del año 2000, cuando la baja en los precios del café afectó al país. La mala situación de los agricultores les forzó a encontrar otras maneras de ganarse su sustento y el cultivo de fresas fue identificado como un posible cultivo comercial. Una de las áreas aptas para el cultivo de fresa era Las Sabanas en el norte de Nicaragua. En este caso, los agricultores han fundado una cooperativa, DeliFresa, y las fresas se han introducido en el mercado. Al mismo tiempo, más agricultores empiezan a cultivar fresas y nuevas demandas y necesidades de desarrollo están surgiendo. Encontrar estos puntos es, por tanto, una cuestión clave para el desarrollo de la vida de los agricultores. El objetivo principal de nuestro estudio es describir y analizar el sistema de producción de las fincas miembros de la cooperativa DeliFresa para identificarlos desafíos para el desarrollo de la producción de fresas. Los objetivosespecíficos son describir la función del cultivo de fresas en el sistema de producción y evaluar su potencial de desarrollo, con énfasis en perspectivas sociales y económicas y para investigar los procesos y agentes incluidos en la cadena de valor de las fresas producidas por DeliFresa. Las teorías elegidas son el Análisis del Agroecosistema y el Análisis de Cadena de Valor. Un muestreo teórico se ha aplicado y los empíricos recogidos por 18 entrevistas cualitativas, tres observaciones participativas y dos reuniones de grupo. Los resultados muestran que las fresas ahora son un cultivo comercial importante para el agroecosistema.Nuestros resultados muestran que las fresas son ahora un importante cultivo comercial y se venden en una cadena de valor corta, formada por cuatro actores claves, el agricultor, la cooperativa DeliFresa, organizaciones de apoyo y los clientes. El proceso más importante es las dificultades logísticas de conseguir las fresas a los clientes. Identificamos cinco retos principales para el desarrollo: (1) La falta de objetivos (2) La división del trabajo (3) El funcionamiento de la cooperativa (4) Las pérdidas de productividad (5) El mercado inestable.

***Palabras claves*:**análisis del agroecosistema, análisis de cadena de valor, fresas, Nicaragua

1

Introduction

Nicaragua is severely challenged by poverty as one of the poorest countries in Latin America (CIA, 2013). Agriculture is the cornerstone of the economy with approximately a third of the population working in the agrarian sector (United Nations, 2013) and more than 70% in rural areas (Departir, 2013).For the Nicaraguan farmers coffee is a traditional crop and one of the most important crops in the agricultural sector, representing as much as 30 % the agrarian sector's GDP (FAO, 2013). Therefore, many Nicaraguan families are highly dependent on the international coffee prices. Living conditions changed dramatically in 1998 when the world coffee trade prices fell as a response to global overproduction. The prices continued to fall and reached historically low levels in 2001, to prices where the production costs could no longer be covered (The World Bank, 2013). Farmers were forced into bankruptcy by the crisis and they had to find other ways of earning their livelihood in order to survive (Bacon, 2005:502-503). As a response to the crisis, researchers begun to investigate the possibilities to produce strawberries in Nicaraguaand they found suitable conditions in a couple of the northern regions (IICA, 2007).

Since strawberries are a non-traditional crop in the country, the farmers lacked both knowledge and experience of how to cultivate it. With support from the National University of Agricultural Sciences (Universidad Nacional Agraria; UNA) (Benavides González et al., 2012:75-79), farmers have for instance improved their ecological knowledge, i.e. their knowledge about strawberry cultivation and production techniques, which in turn has increased their production of strawberries. The cultivation of strawberries has been important for managing the coffee crisis.

A community with promise for strawberry cultivation is Las Sabanas, in the north-western mountains in the department of Madriz, where a couple of farmers first begun cultivating strawberries in the year 2000 with the assistance of UNA. Now, more than ten years later, the number of farmers has increased and in March 2013 they founded a cooperative, Cooperativa DeliFresa[1]. The farming system for the farms constituting the cooperative DeliFresa is the study object of this paper.

1MSc José Cisne Contreras, Universidad Nacional Agraria, information given during field visit in May 2013

1.1 Problem description

Having both a suitable environment for strawberry production and knowledge in production techniques, the farmers are now facing a situation that could be a breaking point for their business. With a product that has been introduced to the market at the same time as more and more farmers choose to cultivate strawberries, new demands and needs for development are arising. Finding those demands and needs, i.e. challenges, is therefore a key issue in order to develop the living situation for the strawberry farmers of DeliFresa and their families. Since these challenges consist of ecological as well as social and economical perspectives, further studies are needed that take the whole farming system in to account. Our study will contribute to such knowledge by focusing on the complex farming system for strawberries tosatisfy the need of economical knowledge and also integrate ecological as well as social perspectives.

1.1.1 Research questions

1) *What is the role of strawberry production in the farming system for the farms of the cooperative DeliFresa?*
2) *Which are the key actors and processes influencing the possibilities to develop the business for the farms of the cooperative DeliFresa and how are these influences seen?*

1.2 Objectives

The main objective of our study is to describe and analyse the farming system for the farms constituting the cooperative DeliFresa, in order to identify challenges for development of their strawberry production.

1.2.1 Specific objectives

- To describe the role of strawberries within the farming system and evaluate its potential for development, with focus on social and economical perspectives.
- To investigate processes and actors included in the value chain for strawberries produced by DeliFresa.

2 Background and theoretical framework

To put our study in a broader perspective, this section will start with introducing you to Nicaragua, followed by a more specific introduction to the study area as well as the theories behind the study (Agroecosystem analysis and Value chain analysis).

2.1 Study area

With an area of 130 700 km^2, Nicaragua is the largest country in Central America. It has a tropical climate with two major seasons: dry season (December-April) and wet season (May-November) (Nationalencyklopedin, 2013). Nicaragua has coastlines to the Pacific and the Atlantic Ocean and borders to Honduras in the north and Costa Rica in the south. The north-central part of Nicaragua, where Madriz and Las Sabanas are located, has a variable topography with mountains ranging between 1000 and 1735 m above sea level. It is an agricultural region and the economically most important crops are coffee, potatoes, beans and maize[2]. This is also a protected area as a part of the nature reserve La Patasta. In total, 11 % of Nicaragua is protected as nature reserves or national parks (Nationalencyklopedin, 2013). The climate varies with the altitude, where the valleys have a dry tropical climate while the mountains have a humid tropical climate. Las Sabanas community is centred in a valley, but the strawberries are cultivated higher up in the mountains, in the villages of El Castillito, El Encino and Buena Vista.

Figure1. Mapshowing the departmentofMadrizwhere the villagesof El Castillito, El Encino and Buena Vista arelocated. Map source: https://maps.google.se

2MSc José Cisne Contreras, Universidad Nacional Agraria, information given during field visit in May 2013.

These villages are situated at an altitude of approximately 1400 m, which creates a cool climate, suitable for strawberry farming. For example, El Castillito has 280 inhabitants, distributed on 67 families and 3 % of the inhabitants are involved in strawberry production (Cruz Roja, 2012:19). Throughout a year, the average temperature is 19,2 °C, the average precipitation 1350 mm and the average humidity is 37 % (BenavidesGonzález et al., 2012:75-79).

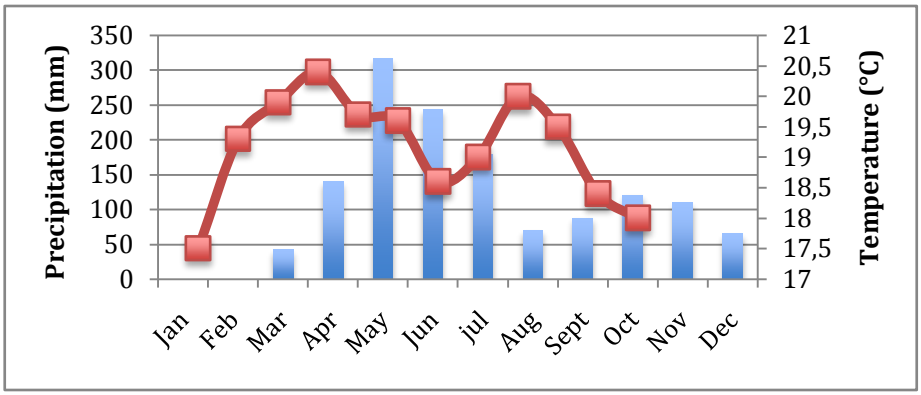

Figure1. Variation in averagetemperature and precipitationduring the year. Climate data source: Benavides González et al., 2012.

2.2 Agroecosystem

When introducing a new crop, detailed information about the ecological conditions is of course of high significance and its long-term survival. However, to understand the whole system and its function, more perspectives than just the ecological have to be taken into account. This complex system can be described as an agroecosystem, which includes agricultural as well as social, political, economical and ecological aspects and the relations between them (Conway, 1986). An agroecosystem analysis (AEA) is a multidisciplinary methodology for analysing agricultural systems with a systems approach. Using a systems approach means taking the different aspects of an agroecosystem into account during both data collection and analysis (Land Management Component, 2006:5). An AEA can be used for describing an agroecosystem as well as evaluating its potential for development (Conway, 1986:25). The results from the AEA can be useful when planning and prioritizing research, rural development and extension activities (Land Management Component, 2006:5).

The relationships between the aspects of an agroecosystem can be captured by four system properties; *productivity*, *stability*, *sustainability* and *equitability*. According to Conway (1986:23) *productivity* is"the net increment in valued product per unit of resource. It is commonly measured as annual yield or net income per hectare or man hour or unit of energy or investment". *Stability* is "the degree to which productivity remains constant in spite of normal, small scale fluctuations in environmental variables, such as climate, or in the

economic conditions of the market; it is most conveniently measured by the reciprocal of the coefficient of variation in productivity". *Sustainability* is defined as "the ability of a system to maintain its productivity when subject to stress or perturbation. Unfortunately, measurements of these properties are difficult and can often only be done retrospectively. Lack of sustainability may be indicated by declining productivity but equally, as experience suggests, collapse may come suddenly without warning." The fourth and last property is *equitability* and is described as "a measure of how the productivity of the agroecosystem is distributed among its human beneficiaries. The more equitable the system is the more evenly are the agricultural products, the food or the income or the resources, shared among the population of the farm, village, region or nation. It can be represented by a statistical distribution or by a measure such as the Gini coefficient" (Conway, 1986:23). Together these four properties describe the essential behaviour of agroecosystems (Conway, 1986:23).

The properties are related to each other and there is almost always some trade-off between them, meaning that if one increases another will probably decrease. Traditional agriculture systems tend to have lower *productivity* and *stability* than *sustainability* and *equitability*. When introducing new technology, i.e. developing the agriculture, the *productivity* of the agroecosystem tends to increase in disadvantage to *stability*, *sustainability* and *equitability* (Conway, 1986:25 f). The population pressure is one factor that influences the properties, for example a traditional agriculture with high population pressure tend to lower all its system properties compared to the same agriculture with low population pressure. The combination of low population pressure and the use of traditional cropping techniques, which is common found in traditional agricultures, generally leads to a high *sustainability* since the techniques support the buffer capacity for erosion and pest and disease attacks.

Deforestation tend to lower the *sustainability* since it increases erosion, commonly seen when the population pressure increases. When transforming the agriculture from traditional to cash cropping, *productivity* often becomes high and *stability* low due to pests and diseases. At the same time, *sustainability* decreases because of for example erosion and pesticide resistance and also *equitability* because of redistribution of land and proprietorship (Conway 1986:26). To overcome those decreases, Conway (1986:27) suggests interplanting of trees (agroforestry), which usually improves the buffer capacity of the area and thus the *stability* and *sustainability*. Conway (1986:26) presents two ideal cases for the relation between the properties in the agroecosystem depending on the quality of the land. For marginal land with little or no potential for profit because of for example soil conditions, the ideal case is medium *productivity*, high *stability*, high *sustainability* and high *equitability*. For best land, i.e. land with good

potential for profit, the ideal case for the relation between the agroecosystem's properties is high *productivity*, medium *stability*, high *sustainability* and high *equitability*.

2.3 Value chain

The value chain describes the full range of activities which are required to bring a product or service from the first conceptualization through production, delivery and to final consumers and final disposal after use (Kaplinsky, 2000:8). Analysing the value chain is helpful to explain why the poor may face barriers to trade and how to overcome these (Mitchell et al., 2009:iii). In order to be able to analyse the value chain, the working process can be divided into three parts; value chain mapping (VCM), value chain research (VCR) and value chain analysis (VCA).

VCM is a tool to create a visual representation of the relationships between businesses and market players within the value chain. VCM is useful for illustrating and understanding the process by which a product goes through as well as identifying and categorizing key market players (Herr & Muzira, 2009:65 f). A tool for understanding this process is the model developed by Porter (1991:103), see figure 3. Porter (1985) divides all the activities of a business into primary and support activities. Primary activities are the activities needed for the physical creation of the product as well as further transports and sales. Primary activities also include aftersales assistance when that is needed. Support activities support the primary activities and include for example human resource management and firm infrastructure (Porter, 1985:38 ff). The horizontal position shows that each supporting activity can affect each primary activity

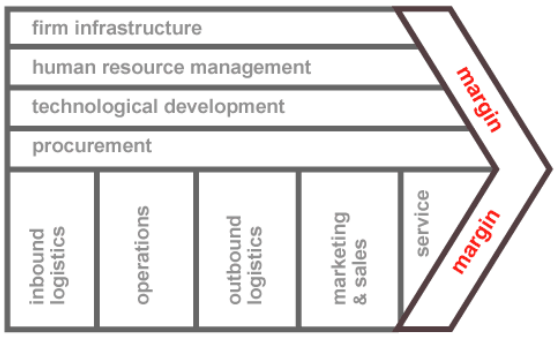

Figure2. Porter's (1991) model for Valuechainanalysis.

If value chain mapping is a tool to identify key market players, value chain research refers to the understanding of their roles and the relationships between them (Herr & Muzira, 2009:85). The third and final step is the VCA where the outcomes from the VCR is analysed and strategies for development are formulated. This step is the bridge between the reality and the possibilities to develop it (Herr & Muzira, 2009:138 ff). Focusing on relationships and the analysis of these helps to identify bottlenecks that are preventing a sector from achieving certain economic and social targets (Herr & Muzira, 2009:87).

3 Methods

The study consists of two parts - one Agroecosystem analysis (AEA) and one Value chain analysis (VCA). Information covering these two perspectives has been collected integrated with each other during the use of the data collecting methods described below.The work with the data collection, as well as the writing of the thesis, has been performed in close cooperation between us. The work reflects a collaborative process, where ownership is per definition shared in its entirety.

Frameworks for the study are set by the choice of performing an AEA in combination with a VCA. An AEA can be used for both describing and evaluating an agroecosystem and is therefore in line with the first specific objective of our study. The second objective aims to investigate processes and actors connected to a product, why VCA was chosen as method.

The choice of the AEA method is further motivated since it has a multidisciplinary approach, which is preferable to a single-discipline approach in order to obtain successful rural development (Conway, 1986). The use of different methods is also preferable since the methods can balance each other's weaknesses, which in turn increases data quality (Flick, 2009:37). The multidisciplinary approach is seen in two ways; the use of a combination of different data collecting methods and the use of the combination of different disciplines for creating the data collecting methods and further analyse the findings. The use of different data collecting methods was done in order to create a comfortable research environment for the farmers and the study was designed to include methods where the farmers have the possibility to participate. This is seen in the choice of using group meetings as well as the participatory observation.

Since this study aims to investigate a fairly unknown phenomenon and therefore create, rather than test, theories it is of an explorative nature with an inductive approach (Flick, 2009:78). The study has a qualitative approach since we study and take part of the farmers' own subjective histories and experiences (Kvale & Brinkmann, 2009:17). The qualitative method is

suitable because of the flexibility it allows and its higher level of spontaneity compared to a quantitative method. Our focus on the individuals' subjective selves, rather than statistical relationships, further supports the selection of a qualitative approach (Trost 2010: 32).

3.1 Sampling

Theoretical sampling (Bryman, 2008:434) has been applied in order to cover the three pre-defined categories of farmers; a) strawberry farmer and a member of the cooperative DeliFresa, b) strawberry farmer and not a member of the cooperative DeliFresa, c) post-strawberry farmer[3]. Since the aim is to describe the role of strawberries within the agroecosystem, these three categories were chosen because they represent the groups of farmers within the study area who today are linked to strawberry farming. The choice of three categories enable us to make comparisons and find cross case patterns (Eisenhart, 1989:357), which is an effective way to put the empirical information in a broader perspective.

We are aware of the unbalance of numbers of informants between the categories, although this is explained by the reality; there are no more strawberry farmers who are not members of the cooperative or post-strawberry farmers in the chosen study area, i.e. the coverage of these categories is 100 %. Moreover, we interviewed customers and potential customers in Estelí, the commercial and administrative centre of the Madriz region, where the majority of present customers to the Las Sabanas strawberry farmers are located today (Alcaldía de Estelí, 2013).

Table 1. Distribution of informants for the qualitative interviews.

Category of informants	Strawberry farmer & member of the cooperative	Strawberry farmer, not a member of the cooperative	Post-strawberry farmer
Number of informants	13	1	4
Percentage of possible informants	93 %	100 %	100 %

3.2 Data collection

Data collection was performed during three weeks between the 30 of April and 17 of May 2013 and included qualitative interviews, participatory observations and group-meetings.

3 Farmers who used to cultivate strawberries but who now have stopped.

3.2.1 Pre-visit

A couple of weeks before the study began (17 - 19 April) we performed a pre-visit in the village together with our supervisor José Cisne Contreras[4]. The main purpose of the pre-visit was to introduce us and our study to the farmers and also to get an overview of the site. All farmers were invited to a group meeting and we visited three farms.

3.2.2 Semi-structured interviews

A total amount of 18 semi-structured qualitative interviews were performed at the farmers' own farms or at the cottage were we stayed in El Castillito. The interviews lasted 60 to 90 min. Semi-structured interviews are an effective way to understand and capture the social reality and the personal experiences of the informants (Kvale & Brinkmann, 2006:17), which is in line with the aim of the study and motivates the choice of this method. The interviews were held in Spanish. Both of us participated in the interviews, where Linda, the more proficient in Spanish, led the interviews while Lina took notes. The division of labour between us allowed specialization and higher awareness to the circumstances. The interviews were discussed immediately afterwards, deepening our collective understanding (Repstad, 2007:111). To lower the linguistic barrier and ensure all relevant information was collected, we were assisted by an interpreter. The use of an interpreter might influence the precision of our data since information was analysed by a second part before we took part of it. Our interpreter was knowledgeable of the subject and had a previous relationship with the farmers, which might mitigate linguistic obstacle. The interviews were also recorded in order to enable future review of the material.

To understand a larger part of the value chain than the production, semi-structured interviews with one customer and seven potential customers in Estelí were held. The customer was a restaurant and the potential customers were two supermarkets, two cafés, one hotel and one restaurant. The interviews lasted 20 to 30 min. This smaller market investigation gave additional perspectives on the farmers' economical situation.

3.2.3 Participatory observations

Participatory observations were performed during the entire field study since we lived with the farmers and shared their daily life. We stayed three weeks in the area and the choice of staying for a longer period is motivated by the decreasing "research effect" which occurs when the actors, in this case the farmers with families, get used to having the researchers around (Repstad, 2007:81). We tried to fully integrate into the life of the farmers by working together with the farmers on the fields, one day in El Castillito and one day

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inEl Encino in order to further decrease the "research effect". Additionally, we regularly helped the women with their daily tasks and received their perspectives on the strawberry cultivation. A long-term stay also has the advantage of enabling the researcher the opportunity to earn the actors' trust. During the participatory observations, the flexibility of the qualitative method was clear since it for instance gave us the opportunity to interact with the farmers in an informal way as well as ask questions spontaneously (IICA, 2008:34). Observation notes were taken with the guidance of an observation guide during the working days and the experiences form the long-term observation were frequently discussed between us throughout the study.

3.2.4 Interview and observation guide

An interview guide covering each aspect of the agroecosystem and its system properties was developed, see appendix I. As mentioned in 3.2.2, the interview guide followed a semi-structured format. Since one of our specific objectives was to conduct a VCA, a part of the interview guide especially focused on the value chain. The value chain-section of the interview guide was developed in order to cover each element in the value chain model by Porter (1991).

An observation guide was developed to assure both observers focused on the same topics during the participatory observation studies, see appendix II. The observation guide was divided into themes, each covering relevant parts of the objectives.

3.2.5 Group meetings

In order to increase the level of participation, a total number of three group meetings were arranged. The first took place the 17 April, during our pre-visit in order build a brief understanding of the area and the farmers' situation, particularly their current challenges and hopes for the future. The second meeting was arranged the 1 May during the second visit and focused on building an understanding of the farmers' year in regards of amount of work, payment for the strawberries and yields. During the last day, the 16 May, a third meeting was held to give the farmers a last chance to share thoughts and ask questions about the study.

Picture 1. Group meeting in El Encino. Photo: Lina Cederlöf.

3.3 Analytical method

The empirical data has been analysed with open coding and pre-defined coding (Kvale & Brinkmann, 2006). This enabled us to create a balance between pre-defined and systematic search for information and open-minded analysis in order to find new and un-known patterns. The four system properties of an agroecosystem were used as the pre-defined codes. The open codes were categorized into clusters, which created the final coding scheme.

4 Results

In this chapter results are presented in relation to earlier given theoretic framework. The chapter is divided into two parts, where the first part represents research question 1) What is the role of strawberry production in the farming systems for the member farms of the cooperative DeliFresa? and the second part represents research question 2) Which are the key actors and processes influencing the possibilities to develop the business for the member farms of the cooperative DeliFresa and how are these influences seen?. We are aware that repetition of information might occur in the AEA-section respectively the VCA-section. This is to enable independent reading of these two sections.

4.1 Agroecosystem analysis

4.1.1 Socio-economic information

Table 2. Summary of socio-economic information for the interviewed farmers.

Information	Summary
Date of birth	Varies from 1947 to 1988, where the majority of the cooperative members are born in the 1980s.
Gender distribution	16 of the farmers are men and two are women.
Education level	Ranges from 1st grade primary school and completed high school education. Most common is an education up to 4th or 5th grade primary school.
Composition of the family	16 of the farmers have a partner and only two are single. Family compositions vary from couples without children to families with many children (eight at the most). The majority of the male farmers are indigenous, i.e. they are born in the village were they now live. The two female farmers have moved to the village from a nearby village.
Income generating activities	In addition to the income from the strawberry production most farmers have another source of income, for example sales of other agricultural products and construction work.

4.1.2.1 Cultivated crops and animals on the farm

Besides strawberries the most commonly cultivated crops within the agroecosystem are beans, corn and coffee and these are mainly cultivated for the household's needs but also for sales. Other common crops cultivated for self-consumption are chayote, ayote, onions and carrots but also fruits such as bananas and oranges. Animals found on the farms are mainly chickens, dogs and cats, but some farmers also have one or two cows, a horse and/or a pig. The chickens, cows, horses and pigs are mainly kept for the household's needs and not for production. Also the dogs are kept for a clear need - to guard the house.

Picture 2. One of the families at their house and their strawberry lot. Photo: Linda Norrman.

4.1.2 Social and economic situation

A typical day for a man

The day starts early, often around 5 am. The farmer takes his machete and heads off to the field. During harvest season he might harvest the mature berries ready for sales (if he is going to the market this day) or he cleans the land from weeds. After one or two hours of work, he heads back to the house where the woman in the house serves breakfast. A typical breakfast meal is gallo pinto (rice and beans) with tortilla and a cup of strong coffee. The working day then continues until lunchtime, when the biggest meal of the day is served. After lunchtime he might play some with the children and then heads back to the fields. The working day is often finished by 5 pm, dinner is served about an hour later and the day ends at 8 or 9 pm when the darkness arrive. The work in the field depends on where he is in the growing season, see table 3.

A typical day for a woman

The woman is often the one who gets up first in the morning, she is the one to make sure there is a fire and breakfast, most often re-heat beans and rice and make tortillas. Around 7 am, the water returns and she has to fill all the water carriers to make sure there is enough water for the day's need. Another duty that has to be fulfilled in the morning is the grinding of corn, a tough work for both arms and shoulders. After breakfast she takes care of the dishes and makes sure the children are prepared for school. Between finished morning duties and preparation of lunch she might do some washing or cleaning the house. Lunchtime arrives and afterwards more cleaning of the dishes has to be done. She always has to keep an eye on the fire and make sure it does not die. After lunch she might continue her house duties, give her husband a hand on the field or go for a bath. When her husband returns from the field she starts to prepare the dinner, does some more cleaning of the dishes afterwards and then finishes her day with her husband around 8 or 9 pm.

Picture 3. A womangrindingcorn for tortillas and three generations of men working on the field. Photo: Linda Norrman.

When studying the division of labour within the agroecosystem we found the man typically being responsible for the work on the fields while the woman is responsible for the house, but occasionally the woman also help out with lighter work on the field when possible. Examples of lighter work are watering, clearing weeds and covering the strawberry beds with plastic. No cases are found where the man works full time in the house as well as in the field, even though some men express that they do help with the household duties. Examples of those duties are collecting firewood and grinding the corn mill. There are a few exceptions where the man also cooks. The two female strawberry farmers have a different situation since they are working in the

house and on the field. These women express a feeling of shortage of time due to double responsibilities.

Despite the man typically having the main responsibility for generating the family's income, the majority of the families use a mutual decision process on how the income is used. In some cases the man takes all decisions on how to use the income. In these cases, the woman tells him what she needs for the house and he purchases it. One of the women who cultivates strawberries says she decides herself how money she earns is used even though they decide together about the family's common income.

The main expenses for the families are basic commodities such as beans, rice and corn. Other common costs are clothes, shoes and school supplies and uniforms for the children. A number of the families are able to save money, which is done at home, but none has a savings account at the bank, although many farmers hope to open a savings account in the future. Any available money is typically invested by buying a piece of land, a cow or chicken or to improve their homes. A minority of the families experience their income is sufficient for their needs. The most financially satisfied farmers tend to be the farmers who also have the largest number of strawberry plants. For the families where the income is hardly sufficient, the toughest months are June to August when there is no harvest and the workload is high see figure 5. Those farmers who are less financially satisfied also wish to expand their strawberry production. One farmer also emphasizes that the prices of basic commodities (rice, corn and beans) are constantly rising, which reduces the profit margins.

4.1.3 Strawberry production

There are two types of strawberries cultivated in the area; Elibray and Festival. Elibray is bigger and contains more water than Festival, which makes it more sensitive for transportation. Festival is smaller than Elibray but easier to transport.

Picture 4. The twotypesofcultivatedstrawberries; Elibray and Festival.
Photo: Lina Cederlöf.

The strawberry lots are mostly located close to the farmer's house. Since hills and mountains characterize the area, the lots are typically situated in a downhill and trees and other vegetation surround them. More detailed information about the production is found in chapter 4.2.2.2.

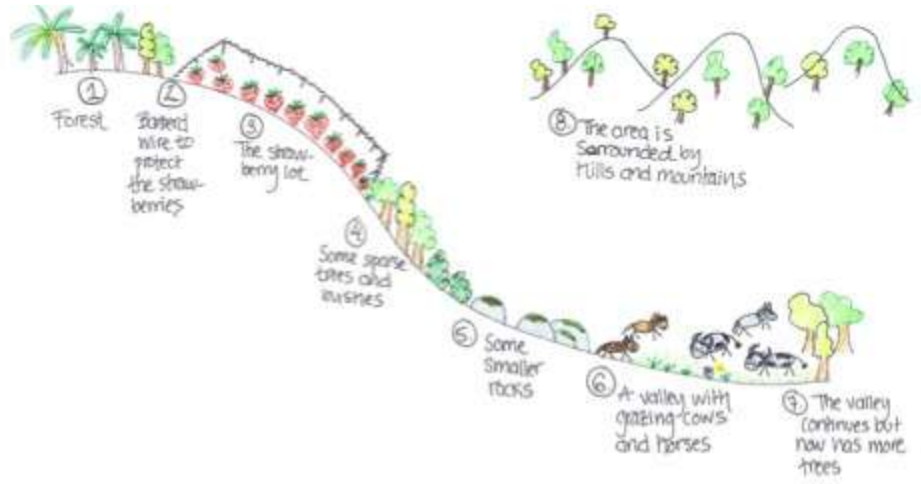

Figure3. A transectof a representative strawberrylot in the villageof El Castillito. Illustration: Linda Norrman.

The harvest season lasts from December to May (June), but the production requires work during the whole year, see figure 5 and table 3.

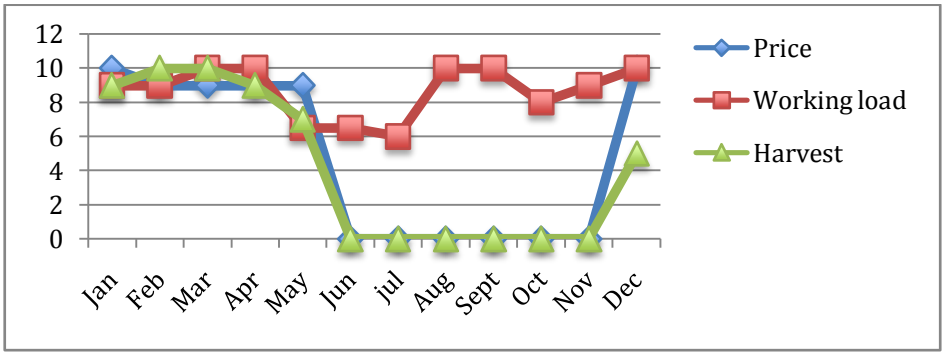

Figure 4. Graph showing the relative variations in price, working load and harvest perceived by the strawberry farmers.

Table 3. Work and activities required for the strawberry production during a year.

Jun – Sept			*Sept - Dec*	*Dec -Jun*
Preparation of strawberry beds for cutting *(1 week)***:**	**Maintenance of cuttings:**	**Preparation of land** *(1 week)***:**	**Maintenance of plants:**	**Harvest:**
Dig up the land	Irrigate	Clear the land from weeds and old plants	Irrigate	Harvest
Disinfect the land	Fertilize	Loosen the soil	Fight pests and diseases	Irrigate
Prepare cuttings beds	Fight pests and diseases	Disinfect the land	Add biologic fertilizer	Clear weeds
Take cuttings	Remove bad and damaged plants	Prepare strawberry beds	Clear weeds	Remove bad parts of the plant
Plant cuttings		Stabilize land	Remove bad parts of the plant	Guard the cultivation
		Buy plastic	Re-sow	
		Cover with plastic		
		Sow		

4.1.3.1 History of strawberry farming

The reason given by nearly all strawberry farmers when they describe why they begun to cultivate strawberries is more or less the same – it was a way to increase the income. This statement is also an expression of a wish to create better living conditions and a better future. The first farmers begun to grow strawberries in the year of 2000 with good results and since more and more farmers have decided to follow. A positive aspect of strawberry production is the fast payback, i.e. a farmer can harvest already during the first year, compared to the traditional cash crop coffee, which takes four years from plantation to first harvest. Many farmers express they simply think it is fun to grow strawberries and one of them describes his first year with strawberries as "I fell in love more and more". Moreover, strawberry farming is expressed to be a way for the farmers to develop their agriculture and try something new. One of the women describes that growing her own strawberries has been a way to earn her own money and create independency; now she can buy her own things. In addition to financial reasons, ecological conditions have also played an important role in the choice of cultivating strawberries. The combination of high altitude with other biotic and abiotic factors constrains the range of crops suitable for the area. Strawberries have shown to be suitable for the local conditions. When the farmers initiated their cultivation, most of them received assistance during the start-up; some had a family member who

already grew strawberries and others got support from an organisation. The majority of them got help from INPRHU[5].

4.1.3.2 Threats faced by the strawberry farmers

In the agroecosystem, there are four farmers who have stopped to cultivate strawberries. All of them describe external factors, rather than their own decision, forcing them to stop. They had great satisfaction from growing strawberries; it was fun and generated a good income. For two of the farmers it was the high workload and shortage of time that made them stop, even though they really wished to continue. The other two farmers stopped due to sudden shortage of water. All the post-strawberry farmers' incentives to begin to grow strawberries are similar to the incentives described by the farmers who still grow the crop; it was a way to increase their income.

The two farmers who gave up the cultivation due to water scarcity are expressing great disappointment since their financial situation has been negatively affected. One of the farmers is sure that the water shortage is a result of the pond that was built where the family had its water reserve. The decision to build the pond was taken by the municipality authorities in order to give more families in El Castillito access to the reserve. The decision was taken without consultation with the families who then utilized the water. The same farmer expresses uncertainty if the pond has given more families access to the water, or not. The second farmer who suffers from water shortage was not affected by the construction of the pond. He is also unsure about the reason behind the lack of water but speculates if it might be an effect the hurricane Mitch. During the hurricane a large number of trees were destroyed or cut down afterwards in order to restore the forest. He expresses confusion over the situation since he is born in the village and has never experienced water shortage before.

When possible threats to the strawberry production are discussed, three primary threats emerge; diseases, animals and climate changes. Among the diseases *Gallina ciega* and *Atracnosis* are most frequently pointed out as the biggest threats. Gallina ciega is a beetle whose larvae feed on the root of the strawberry plant, resulting in a significantly weakened plant and it might even lead to the death of the plant (FMC, 2008). *Antracnosis* is a fungal disease caused by the genus *Colletotrichum* and/or *Gloeosporium* and the fungi attack leaves, flowers and the fruit itself. The fungal infection might lead to death of the affected tissue and at great extent even the whole plant (Cornell University, 2013). Many farmers perceive a link between the experienced changes in the climate and a higher frequency of diseases. For example, farmers describe that the rain falls more intensively, which affects the plants negatively since the

5The Institute for Human Promotion, which is a christian non-profit NGO that promotes equal opportunities, civparticipation and the exercise of rights in Nicaragua (INPRHU, 2013).

risk of fungal diseases increases. Simultaneously the wet season has shortened. Earlier, refers about 10 years back, the wet season begun in April, now it begins in the middle of May. Moreover, the wet season used to end in December, now it usually stops raining in October or November.

The shortened wet season also results in a perceived water scarcity and many farmers describe how the water lasts only to the end of April, causing problems since the harvest of strawberries lasts until May. While water availability is experienced to have decreased, the farmers also experience an increase in temperature, further reinforces the challenge of water shortage. On the other hand, there are some farmers who do not experience any water scarcity. The water resources are geographically misallocated. For example, one farmer has production on two different areas where one suffers of lack of water and the other does not. During our visit, the farmer shows us his well, which is close to empty in early May.

Picture 5. A farmer'swaterwellwhich is almostempty in early May.

The change in local climate is considered to be a result of the large deforestation. Some farmers describe the deforestation as “before the hills were much greener”. There were simply more trees. Furthermore, the hurricane Mitch, which drifted through Nicaragua in 1998, exacerbated the situation when a large number of trees were damaged. Mitch is also regarded to impact the quality of soil negatively, with many farmers experiencing the soil having become less fertile. Some farmers also point out, that during a period of ten years, the number of strong hurricanes has increased. Regarding the threat from animals, these are primarily nocturnal animals that eat the strawberries, such as *Gatos*(cats). The farmers manage this threat by guarding their lots during night, which is tough and physically demanding because their sleep is adversely affected.

Picture 6. A typical tent for guarding the strawberry lot during night.

The phenomena described above areperceived as relatively constant threats to the farmers’ strawberry production. More specific and less frequent

disturbances are mainly experienced to be intense weather events such as hurricanes and hail. The recovery of the production from this kind of disturbances is however perceived as good. For example, the hail mainly affects the most mature berries, which gives a temporary loss but the plant then recovers. However, hurricane Mitch is experienced, as mentioned above, to significantly having affected the quality of the soil due to erosion and the soil quality has not yet recovered. To counter the effect from the hurricane Mitch, the farmers' need to use more compost, causing higher costs and/or higher workload.

4.1.4 The cooperative DeliFresa

One big and important actor in the studied agroecosystem is the cooperative DeliFresa, which is right now under development. The cooperative DeliFresa was founded in March 2013, more or less a month before our visit. Today the cooperative consists of 13 farmers[6] distributed on one president, two vocals, one secretary, one cash administrator and the rest of the members do not have a distinct role. The cooperative is an initiative that is driven by a strong belief in the power of working as a group. The farmers now hope to take the next step in their production and by working more organized and under a common name, create more benefits. Examples of desired benefits are the possibility to buy cheaper plastic and to manage to deliver larger amounts of strawberries to customers. The opportunity to get help from other members is mentioned as another reason why the farmers chose to join the cooperative. One of the women in the cooperative also emphasized that it was important for her to individually be a member of the cooperative. This is because she wants to create an independent position in which she as an individual is represented, not only her household by her husband. In the future the members of the cooperative hope to have a common fund where they share the income depending on how much strawberries each person deliver.

The members express strong belief in the cooperative's potential power, but some dissonance has been identified between the members and the president. All the members express that they experience a very good functioning of the cooperative; it is transparent and easy to take decisions. Not every member has a clear function, but this does not seem to affect their experience of its functioning. In this case, the person with the most power and the most decisions on his table, the president, is of another opinion. He expresses dissatisfaction about the functioning, experiencing that the members do not understand their roles in the cooperative and the responsibility that follows. He is also aware that many of the farmers are inexperienced when it comes to this

6The cooperative is still under development and the number of members is not fully defined. There are today two farmers in Buena Vista who are undergoing the process of being a member. In the study, they are treated as members in the cooperative.

kind of organizational work, a situation that probably affects the functioning of the cooperative.

The farmer who cultivates strawberries, but who not is a member of DeliFresa, explains that he already belonged to a cooperative when DeliFresa was founded. At that time, he had already been a member of the cooperative Orchids for three years. Right now he does not know if he is going to be a member of both cooperatives. He thinks it would be difficult to find time to participate in all given activities.

4.1.5 The future

What really strikes you when you meet the strawberry farmers of El Castillito, El Encino, Buena Vista and El Cipian is that there is hope glowing in their eyes. The farmers are curious about the future and they describe it in terms of development, brilliant and visions. In nearly all cases, these visions include an expansion of the cultivated land, an expansion they also describe as potentially troublesome since the farms are located in the nature reserve La Patasta. On the other hand, almost all farmers express that they are very proud of living and working in a protected area and do not see or consider the nature reserve as a problem.

Even though the farmers tend to show a strong belief in the future and express great visions, we have identified a lack of realistic goals about how to make the dreams come true. When one farmer gets the question about how he would describe his long-term work on the farm, we receive the following answer:

I work for the future! I want a better standard of living and that my daughters can study. Maybe I can buy some land. I would like to be independent and not in need of financial help.

The quotation shows the most common situation; the farmers are clear about that they want the situation to be better, but when the question comes to goals, there is no answer. For example, this farmer indicates that he wants to expand his production, but has no thoughts about when and how.

When it comes to the farmers' visions, it tends to be a difference between the farmers who today are cultivating strawberries and the post-strawberry farmers who now are cultivating coffee. The exacerbated situation for the coffee farmers, with high frequencies of diseases and decreasing prices, is also reflected in their eyes and their visions. This is for example seen when we are discussing the future with one of the post-strawberry farmers:

For me, I think it will be worse. The coffee is bad now. […] But I will continue to work, because I am where I am and I have the prerequisites. I just have to work a little bit harder.

Like the other post-strawberry farmers who now are cultivating coffee, this farmer expresses thoughts of an even harder future with more work and a reduction in life quality. He does not reflect about his possibilities to change and take control over the situation, only that he has to adapt to it. This feeling of lack of control is shared with another farmer who says he cannot do anything about the situation since he thinks it is the government who buys the coffee and decides the price. In contradiction the future described by the coffee farmers, the strawberry farmers are dreaming about a better life and expansion of their business. The creation of the cooperative can for example be seen as an action where the strawberry farmers intend to take more control over their lives.

4.2 Value Chain

The results from the VCA are here presented in accordance to Porters (1991) model (see Background). Support activities are presented first since we find the information from here essential for the further understanding.

4.2.1 Support activities

4.2.1.1 Firm infrastructure

The studied farms are all small-scale family businesses with varying degrees of cooperation within the family. A majority of the farmers own their own land, a handful borrow land for free and one farmer is renting the land. The business is predominantly run by the income generated from it, and only one farmer needs to take a monetary loan once a year. However, most of the businesses are today very young and have received a great amount of help, such as free plastic and plants, which have affected the economic situation in a positive way. Also, some farmers borrow plastic and pay back in money or crops. For four of the farmers, strawberries are the dominating crop based on cultivated area. Three of these four farmers grow strawberries on 100 % of their land. Besides strawberries, coffee, corn and beans are the most common crops. Of the interviewed farmers, 13 are members of the cooperative DeliFresa and one farmer is not. Instead, he is a member of the cooperative Orchids. When it comes to long-term work and business mind, many of the farmers express great visions, but show a lack of concrete goals. For further discussion seechapter 5.

4.2.1.2 Human resource management

As described in chapter 3, it tends to be a traditional division of work where the man is responsible for the fieldwork and the woman is responsible for the house. In many cases though, the woman also participates in the work at the field but still has the responsibility for the house. The situation is similar for the women who have their own cultivation - they still have the responsibility for the house even though they might work full time in the field. The children do help out in the field, but this tends to be after finishing the school day.

A majority of the farmers have an education from 3rd to 5th grade of primary school, where four of them have continued to high school and one to university. Most farmers employ labour and when hiring they usually select young people from their own village. The mentioned reason for not hiring is that the agriculture is so small that it is neither needed nor affordable. One farmer also mentions that he gets all the help he needs from his family. Several farmers express that they would like to employ in the future when (if) they expand their business. For the farmers who do employ labour, the experiences are predominantly good. Many of the farmers also point out that they only hire people who they actually like. Although, one farmer expresses difficulties since the workers tend to stop working when he leaves the farm. One of the women also expresses that she finds it difficult to give orders to the workers, something she needs to do when her husband is off the farm.

When it comes to updating the knowledgebase, most farmers have taken general agricultural courses or received training in the area and some have taken specialized courses in strawberry production. The reasons why some farmers not have had access to courses or training vary. Some say they are not in need of education since they already know everything they need to know and some say they get all the knowledge they need from close family members. One farmer emphasizes that he would very much like to take a course, but he is unable to leave the farm and hence it is not an option. Most farmers do not get any technical counselling about strawberry farming and the reasons are similar to the ones stated above. The farmers who do get counselling get this from UNA and INPRHU.

4.2.1.3 Technological development

The technical material needed for the strawberry production is the plastic for the strawberry beds, a machete, a pickaxe, a water hose and some also have sprinklers. Irrigation occurs, but is used without electricity and with the help of gravity. Almost all farmers own their own material, but share it either with friends/colleagues or family, and use bio-fertilizer or compost produced on the farm. Artificial fertilizers are seldom occurring. The rare use of artificial fertilizers is explained by the farmers as a result of them living in a protected area and they do not want to destroy the environment. Artificial fertilizers are also seen as expensive. Pesticides are of the same reasons rarely used. Several farmers emphasize for example that "the pesticides destroy the nature and the environment" and that "it would make the berries poisonous". Pest control and plant improving methods are mainly application of solutions prepared on the farm, for example the natural pesticide Nim, which is extracted from the Nim tree. However, it appears that some farmers use Cipermetrina, a chemical classified as a pesticide but allowed in Nicaragua for organic farming.

4.2.1.4 Procurement

The technology used on the farms are mainly bought in:

- Ocotal
- Somoto
- Estelí
- Las Sabanas (INPRHU is located here and this is where most farmers buy their plastic)

4.2.2 Primary activities

4.2.2.1 Inbound logistics

The main item of expenditure is, as mentioned above, the plastic. The farmers are not directly bound to a specific supplier, i.e. they do not have any written contracts. However, some farmers experience difficulties with purchasing the plastic since there is only one reseller in the nearby area, INPRHU in Las Sabanas. This creates a situation where they experience that they are indirectly bound to this reseller since they do not have any options. One of the most experienced strawberry farmers describes the situation below.

[...] Well, I guess that we are indirectly bound to a supplier. I, more or less, have to buy the plastic from INPRHU. Otherwise it gets too expensive. INPRHU can purchase bigger amounts of plastic which decreases the prices.

The quotation shows that there are economic factors that decide where he can buy his plastic. On the other hand, some farmers experience that INPRHU is expensive, but for them the infrastructure prevents them from buying the plastic from another supplier. Some farmers overcome the infrastructural challenges and buy plastic from resellers in Somoto, Estelí and Ocotal. Other inputs, such as pesticides, hoses and tools, are not mentioned as problematic when it comes to accessibility. Inputs are mainly transported to the farm by horse or by foot and when there are longer distances, bus is used. A few farmers also have access to a motorcycle.

Since the berries get easily damaged, the farmers try to harvest as close to the selling as possible. The farmers therefore often harvest the evening or night before selling. Some farmers harvest early in the morning. The majority of the farmers clean the berries, and some farmers also wash the berries with water. When it comes to washing, there are double opinions among the farmers since the farmers who do not wash their berries claim that contact with water quicken the decomposition.

All farmers pack the berries into buckets, in some cases also small plastic boxes or plastic bags, before transport and selling. Storage of the berries is not possible today since the farmers do not have access to a cool storage place. Today there is no processing of strawberries, i.e. they are sold as fresh berries.

However, the cooperative expresses that there is a wish to create secondary products, such as wine and jam, on the farms in the future.

4.2.2.2 Operations

The size of the strawberry lots ranges between 440 m^2 and 3520 m^2, where 440 $m^2$is the most common size. Also the number of plants varies widely among the farmers, from 500 to 10 000 plants. A couple of farmers explain that under optimum conditions, one plant can produce a maximum of 1 lb. (0,45 kg) of strawberries during the whole growing season. In reality, the conditions vary and a strawberry plant produces in average ½ lb. during the season. All farmers express that they have productivity losses and these vary between 10 and 60 % of the total harvest, with the majority having losses around 20 to 30 %. According to the farmers, the most common reasons for the losses are plant diseases and pests. Also difficulties with transportation, dryness and heavy rain are emphasized.

Another general experience that affects the amount of sold product, and therefore indirectly the losses, is the uncertain market and the increasing numbers of strawberry farmers. The increasing number of producersincreases the competition between them. Different infrastructural conditions further reinforce the competition since it affects the farmers' possibility to get to the market in time. This situation is mainly seen between El Encino and El Castillito and one farmer from El Encino expresses the situation with the following words:

We live further away from Las Sabanas than the people in El Castillito and the road is very, very bad. We are often late to the bus in Las Sabanas and therefore also late to Somoto. Arriving late to Somoto makes it harder to sell the berries because of the competition.

The situation described by the farmer above gets even harder if the farmer is going to sell the products in Estelí. Missing the bus to Somoto also means missing the bus to Estelí, where the biggest market is, and the farmer looses even more income that day. The different infrastructural conditions also creates losses since the strawberries get more damaged because of longer transportation and bad roads. Furthermore, the farmers of El Encino describe that they get both tired and hungry because of the hard transportation and claims that this affects their sales.

Table 4. Summary of size of strawberry bed, number of plants, estimated yield and experienced productivity loss for the 14 strawberry farmers within the agroecosystem.

Farmer	Village	Size of strawberry lot (m^2)	No. of plants	Estimated yield (lb/season)[7]	Experienced productivity loss (%)
1.	El Castillito	880	5000	2500	60
2	El Castillito	1760	4000	2000	30
3	El Castillito	440	3000	1500	-
4	El Castillito	1760	10000	5000	10
5	El Castillito	1760	2800	1400	10
6	El Castillito	1760	2000	1000	20
7	El Castillito	1760	2000	1000	-
8	El Castillito	1760	7000	3500	25
9	El Encino	Shares with farmer 10	2000	1000	10
10	El Encino	3520	5000	2500	30-40
11	El Encino	No info.	2500	1250	-
12	El Encino	440	500	250	20
13	Buena Vista	440	500	250	20

4.2.2.3 Outbound logistics

Transport from the villages to Las Sabanas is mainly done by foot, but also by horse or motorcycle. From Las Sabanas the farmers take the bus to Somoto where they get off to the market or change bus to Estelí or another retail location such as Ocotal or Condega. Somoto and Estelí are the main markets for the farmers. Here, the farmers sell their product directly on the street and only a few of them have oral contracts with restaurants and cafes today. However, all of the farmers are positive to create long-term partnerships in the future. The farmers have a generally good experience of selling strawberries directly on the street, an experience that has improved over time. In the beginning, the farmers emphasize that they experienced difficulties with selling a crop that the customers did not know about.

4.2.2.4 Marketing and sales

Today, the farmers do not have any organized marketing strategy, but they intend to promote the strawberries directly when selling them on the street. This is for example done by offering tastings and using key words such as "sweet", "good" and "organic" in order to show and convince their buyers of the quality of their product. Except for this direct promotion, the farmers rely on people spreading the word. The selling price for 1 lb. (0,45 kg) of strawberries ranges from 40 to 45 córdobas (NIO) (approx. 1,5 to 2 USD).

[7]Estimation based on the given information that a plant produces in ½ lb per season.

4.2.3 Customers and possible customers

As described earlier, the most common way to sell the strawberries is directly on the street. The farmers experience that they have very few retail locations and options, which in turn creates a competitive and almost saturated market for the direct selling. The farmers' wish to expand their business and get access to a more stable market leads this study to the market investigation, including perspectives from their present customers and possible future customers.

4.2.3.1 Perspectives from a customer

The customer runs a medium sized restaurant/café in Estelí that serves traditional Nicaraguan food. The strawberries are bought from El Encino (42 lb. (18,9 kg) every two weeks/once a month) and used for making strawberry-yoghurt, which is sold in the restaurant. The strawberry-yoghurt is very popular and the customer experiences it to be the most sold of all tastes. He experiences that there is a higher demand than what they can produce. The restaurant has bought strawberries for six months from El Encino (interview done 2013-05-18). The experience from buying these strawberries is very good and the berries are described as big, sweet and delicious. The first strawberries that the restaurant bought were from Jinotega, and according to the customer these were not as good as the ones from El Encino. The restaurant is thinking about developing its production of strawberry-yoghurt and is definitely positive to continue the cooperation with the farmer in El Encino.

4.2.3.2 Perspectives from possible customers

The interviews with potential buyers in Estelí showed that the awareness of Nicaraguan strawberries varied; a couple of businesses knew about the strawberry farmers in Madriz and some bought strawberries from Jinotega. Others did not even know that it is possible to grow strawberries in Nicaragua. In general, these potential customers experience a good demand for strawberries from both tourists and domestic people.

The two studied supermarkets sold fresh strawberries packed in plastic boxes of 1 lb. (0,45 kg) each. The price was 70.10 NIO respectively 89.75 NIO. One supermarket had strawberries from Nicaragua, but from Jinotega. The common challenge for the supermarkets with having domestic strawberries is expressed to be their dependency on the head office. The supermarkets do not have the possibility to purchase fruit themselves, the head office in Managua has the responsibility for purchasing. Another obstacle for domestic products is that the head office requires very big amounts of fruit/berries in order to ensure the supply of the product in the supermarkets. The two interviewed employees at the supermarkets are positive to buy locally produced fruits but, as mentioned, they experience a lack of power when it comes to these kinds of decisions.

A general opinion given by the possible customers is the aesthetic value of the strawberry. For some customers the size of the strawberries is highly important since they use fresh berries to market their own products, such as smoothies. It was also revealed that Nicaraguan strawberries are experienced as small and small strawberries are associated with acidity. This opinion is not shared with the farmers who claim that their strawberries are even sweeter than the imported strawberries. Because of this preconception, some of the potential buyers prefer imported strawberries since they have an idea of them being bigger and sweeter than the domestic ones.

Another reason mentioned for not buying Nicaraguan strawberries is the price, where two general cases are found. The first is simply that strawberries are experienced as too expensive compared to other traditional fruits. The second is that the purchaser does not experience that the price reflects the quality and value of the strawberries. One value linked to strawberries is for example the service given by the seller. Some potential customers who used to or once had bought strawberries from someone on the street point out that they have experienced a lack of good service, for example problems with punctuality.

4.2.4 Key actors

As presented in the Results more actors than the farmer him/herself influence the business of strawberry farming and its possibilities for development. The key actors influence different processes, which are illustrated in figure 6. The flow chart reflects today's situation with actors to the right and processes to the left. Most actors are found in the beginning of the value chain where for example knowledge exchange and material supply are important. Here, supporting organisations are particularly central. Also DeliFresa is found in the two primary processes but since DeliFresa is a new actor its influence on the production today is pretty low, although its potential to create benefits and stimulate a positive development gives it a peculiar role within the value chain. It is possible that DeliFresa will affect more processes in the future. Further on in the value chain, the farmer works more or less alone and the final key actor, customers, is found when it is time for sales.

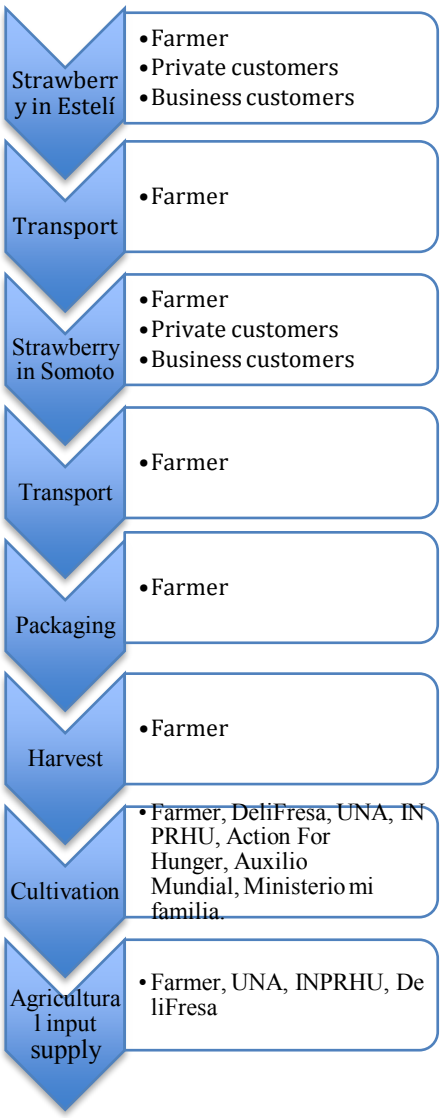

Figure 6. Flowchartillustratingkeyprocesses and actorswithin the valuechain for strawberriesgrown by DeliFresa.

4.2.5 The behaviour of the agroecosystem

To put the results from the VCA in relation to the whole agroecosystem analysis, table 5summarizes all the given information in relation to the four system properties for an agroecosystem given by Conway (1986). This section can therefore be seen as a continuation of the answer of research question number 1) and furthermore a tool in order to reach the main objective of the study; to describe and analyse the farming system for the farms constituting the cooperative DeliFresa, in order to identify challenges for development of their strawberry production. The table is dynamic and an estimation of the situation. Some aspects might overlap different system properties in the reality even though it is not illustrated here.

Table 5. Positive and negative aspects affecting each system property of the agroecosystem.

Positive aspects (+)	Negative aspects (-)
Productivity	
The abiotic and biotic conditions are adequate for strawberry production.	Constrains when it comes to expanding the land because of the natural reserve La Patasta.
There are opportunities to expand the strawberry production since there seem to be a demand from restaurants and cafes.	Experienced lack of water and water availability continues to decrease.
The relation to UNA creates a steady update of knowledge.	Diseases, pests and nocturnal mammals lead to losses.
The creation of the cooperative DeliFresa creates exchange of farming knowledge and experiences.	Bad infrastructural conditions create losses.
The cooperative also enables more long-term contracts since they can ensure greater deliveries.	Badly affected land by hurricane Mitch with decreasing levels of nutrients in the soil.
It is possible to harvest the same year as you plant.	
Sustainability	
Most farms have a diversified agriculture with more crops than strawberries.	Some farms are monocultures, which makes them more sensitive to disturbances.
The cooperative enables expanding to more market shares.	Competition from other strawberry cultivating areas causes reduction in market share.
The use of traditional techniques supports the buffer capacity for pest and disease attacks and erosion decreases (compared to non-traditional techniques).	Previous deforestation has increased the erosion.
Stability	
The price remains constant since it does not depend on the national or the international market price.	The winter rains increases the frequency of fungal diseases.
A high degree of cooperation within the family and the villages makes it easy to get help when work load is high.	A stressed economy makes it difficult to employ help.
Relatively similar harvest during the whole period of November to May.	The strawberry plants require high amounts of water.
Low use of technology such as artificial fertilizers, pesticides, machines and gasoline creates an independency of this part of the market.	The low supply of plastic resellers in the area creates a dependency to INPRHU.
Equitability	
Strawberry production creates working opportunities for women.	Access to water is a bit misallocated, some farmers experience a great lack of water while others do not.
The cooperative enables sharing of resources.	A high variation in the number of plants between the farmers (ranges between 500 - 10000).
There are employment opportunities linked to the development of the strawberry production.	The farmers of El Encino have bad infrastructure, which makes them disadvantaged with respect to market opportunities.

4.3 Main findings

To sum up, the results show that the strawberries have developed into an important cash crop for the farmers of the cooperative DeliFresa and the main reason for starting to cultivate strawberries was also economic; it was a wish to increase the income and improve their life situations. The strawberry production is now a central role for the whole agroecosystem. For example it generates working opportunities, mainly for young people since the farmers tend to employ these when help is needed. Moreover, it has also become a working opportunity for the women and a way for them to earn their own income. The strawberry production seems to have created a belief in the future that tends to differ from the farmers who, for instance, only cultivate coffee. In contrast to the coffee farmers the strawberry farmers now dare to dream, hope and make visions about the future.

Focusing on key actors the strawberry farmers possibilities for development we see that the farmers themselves play an important role for their own development. This since all farmers owns their land and run their businesses themselves within the family and there are no contract farmers. The next actor is the cooperative DeliFresa since it creates organizational benefits for the farmers, such as potential expanding of market share. Going beyond this actor, organisations giving support like knowledge and technological inputs are found, for example UNA and INPRHU. When it comes to key processes, the most important process is to get the strawberries into the market. This process includes the transport as well as marketing and sales.

When interweaving the AEA and VCA, we can identify five main challenges:

- The lack of goals
- Division of labour
- The functioning of the cooperative
- Productivity losses
- The unstable market

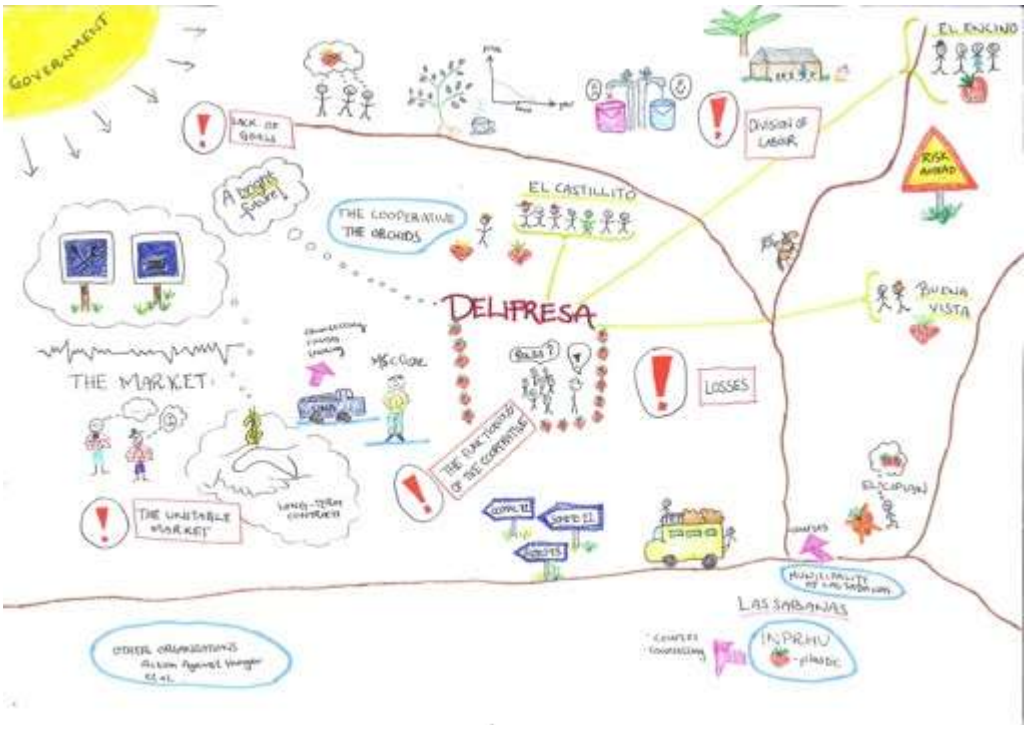

Figure 7. Mindmapsummarizing the mainfindings. Illustration: Lina Cederlöf & Linda Norrman.

5 D

iscussion

The starting point for the Discussion is the summary of the system properties described in Table 5 and their relationship. The Discussion will then continue with evaluating the potential for development by focusing on the five identifiedchallenges presented in chapter 4.3 (Results). Every highlighted challengewill further lead to suggestions for improvement. The Discussion ends with Conclusions and suggestions for future studies as well as methodological reflections.

5.1 The behaviour of the agroecosystem

Conway (1986:26) ranges the system properties of the studied agroecosystem from very low to very high. As far as we have understood the theory, there is no given reference values for what is high and what is low, even though Conway (1986) presents indicators for how to measure the properties.Therefore our interpretation is that it is the subjective understanding of the researcher as well as the relative given conditions that determine the outcome of the analysis. The discussion ofTable 5will follow given those conditions.

The studied agroecosystem is seen as a traditional agriculture. We are aware that this definition can be challenged since the farmers use both plastic and a

non-traditional crop. Although, when comparing the studied strawberry farms with a modern agriculture we consider the strawberry farms as traditional due tothe use of traditional farming techniques and lack of technology such as machines. According to Conway's (1986:25) description, a traditional agriculture tends to have a lower degree of productivity and stability than sustainability and equitability. However, the summary of the system properties in table 5shows a relatively equal distribution between the positive and negative aspects for each property. This means that we cannot clearly see the trade-off between the properties. Due to the subjective analysis stated above, this discussion is somewhat difficult since, for example, the assessment of *productivity* is different depending on if it is done in a local or a global context. In a local context the production can be seen as high since the strawberry production has generated in a higher income compared to before and also compared to the farmers who still cultivates coffee. Moreover, the inputs are low compared to the outputs since the use of technology is low and most of the inputs are made on the farms. In the present situation the *stability* can be assessed as high due to low dependency on external decisions and/or actors. On the other hand, the yield varies during the year because of fluctuations in climate and the natural life cycle of the crop, which in turn decreases the *stability*; see figure 5 and line for harvest.*Stability* is hence seen as medium.If the farmers reach their visions to expand their strawberry production and make it even more focused on cash cropping, i.e.increase the *productivity*, it is according to Conway (1986:25) possible that the *stability* will decrease due to the loss of the buffering effect produced by high biodiversity. As found in our study, some farmers already experience a higher frequency of diseases and pests, which they think is because of changes in the climate. Conway's reasoning about the relation between *productivity* and *stability* might be important to take into consideration when the farmers plan for future expanding. In the same way, the *sustainability* tend to decrease due to erosion and pesticide resistance. Since the farms are located in a nature reserve, La Patasta, and pesticides are prohibited, pesticide resistance will probably not occur. Erosion though is already experienced as problematic at some areas, due to hurricane Mitch, and another perspective to take into consideration if expanding the production. Today though, the sustainability can be assessed as relatively high, mostly since the short life cycle of the strawberries gives a short recovery if the production is exposed to a disturbance. Conway (1986:27) suggests interplanting of trees as one way to increase the system properties of stability and *sustainability*. In this case, the studied agroecosystem can be seen as it might have had a higher *sustainability* when the main crop was coffee. On the other hand, if coffee is exposed to disturbances it tends to have a long recovery period and thus lowering the *sustainability*. *Equitability* is also usually lowered when focusing on a sole cash crop (Conway, 1986:27). The clearest example that makes us assess the *equitability* as low is the different production conditions due to misallocation

of water within the agroecosystem. On a family level the *equitability* is assessed as medium since the distribution of for example income tend to be equally shared but in some cases handled only by the man. To close up, the area is evaluated as "best land" according to the concepts of Conway (1986:26) rather than marginal land. Best-case scenario for the relation between the properties is described as high *productivity*, medium *stability*, high *sustainability* and high *equitability*. Our aggregative but precocious assessment is although that the relation between the properties of the studied agroecosystem is: high *productivity* in a local context but low in a global context, medium *stability*, high *sustainability* and low to medium *equitability, see Table 6*.

Table 6. Summary of the system properties and their estimated value.

Property	Productivity	Stability	Sustainability	Equitability
Value	High (local context) Low (global context)	Medium	High	Low - medium

5.2 Challenges

5.2.1 Lack of goals

The Results show that the strawberry farmers have a great belief in the future, but they tend to not know how these believes can be realized; they have visions but no goals. Imagine that you want to go to a destination, but you have no idea how to get there. That is the situation found at the farmers of DeliFresa, a situation that can be very frustrating. In order to take advantage of this great belief and use the energy that the farmers show, our suggestion is to implement a project or training where the farmers are working with identifying realistic goals during a realistic timeline, i.e. creating their map to their destination. This will further help them to achieve their visions - to become better farmers. This work can advantageously be done at a family and/or a cooperative level. For instance, doing it with the whole family will integrate both man and woman in the procedure of setting frames for the future. Integrating all family members and/or the members of the cooperative in the goal setting training might also stimulate an even more equitable situation and furthermore give a positive impact on the whole agroecosystem when it comes to the system property of *equitability*.

5.2.2 Division of labour

The working situation has been identified as traditional where the man is in charge of the income generating activity and the woman is in charge of the house. During our study we have seen two strong examples where women now have their own cultivations, a development that we clearly highlight as positive in order to reach further *equitability*. Although, the work- and economic situation has to be seen in a broader perspective, taking the whole existing Nicaraguan culture into account, a culture that tend to be a very

machismo-influenced culture (very masculine). This cultural and historical heritage might influence the pace in which the women can challenge old norms and conventions and thus transform the villages in a more equal way. Today we see that even if the women do work in the field, the men do not work the same amount of time in the house. This means that the women work more and harder and they do also express lack of time. In a long-term perspective, this is something that might culminate in stress related sickness, which might decrease her strawberry production. In turn, this might affect the agroecosystem in a negative way, meaning that by trying to improve the *equitability* there seem to be a risk of decreasing the *productivity*. Encourage women into work is important but we believe that this cannot be done as an one-way process and without structural conditions. For example, we suggest that men also are included in this transformation of conventions and structural conditions could for instance be childcare.

5.2.3 The functioningof the cooperative

A dissonance between the members and the president was identified when it comes to the functioning of the cooperative. This dissonance is seen as important to deal with since the cooperative show to be a key actor in the development for the farmers and furthermore the development of the whole agroecosystem. The dissonance was due to lack of experience of organizational work for the members. Experience can only be achieved by experiencing and a possible way to deal with this challenge could therefore be to cooperate with other organizations that already have passed this process of initiating, and exchange knowledge. One example could be to invite an external person to give the cooperative practical training in organizational work. Another example of training is to focus on and clarify the roles within the cooperative and the responsibilities that come with them. Since there are many NGOs and other organizations linked to the agroecosystem today, it would probably be possible to cooperate with them. There are also other farmers within the agroecosystem who today are members of other cooperatives. This means that there might be a solution very close to the challenge. Two cooperatives within the villages are for example Cooperativa Orchidea (for all kind of crops) and PAC (for coffee).

5.2.4 Productivity losses

The three challenges presented are all more or less focusing on an increase in productivity, however there is no reason to increase productivity if you loose what you produce. As presented in the Results, the infrastructural situation does affect the farmers negatively, both by damaging the berries but also by creating misallocated conditions, mainly seen between El Castillito and El Encino, which lead to an increasing competition between the villages. Hopefully, by working together within the cooperative, this competition can decrease and cooperation and *equitability* instead be encouraged.

Another condition that sets the frames for the potential production within the agroecosystem is undoubtedly access to water. This becomes even more valuable when the cash crop transforms from mainly coffee towards strawberries since strawberry production requires irrigation, something that coffee production does not. In turn, more pressure is put on water as an ecosystem service and also on the need of allocating the water resources within the agroecosystem. Furthermore, the farmers' experiences of changes in climate are mainly described as changes in water conditions, i.e. heavy rain, droughts and general lack of water used for both irrigation and the households' needs. If these changes continue, greater demands on the water supplies might be faced in the future, a challenge that will probably be important to consider when planning for further development of both the individual farms as well as the cooperative and the villages. Long-term planning due to future access and need of water is seen as important since this resource might concern all four system properties of the agroecosystem; *productivity*, *stability*, *sustainability* and *equitability*. A way to meet the challenge with water scarcity and prolong the growing season could be to find methods for growing strawberries also during the wet season. Doing so might increase the *stability* of the agroecosystem since the yield would be continuous during the whole year, see figure 5**.**

5.2.5 The unstable market

The final challenge, and by the farmers most expressed challenge, is the unstable market for the strawberries. One way to overcome this challenge might be to cooperate with bigger purchasers, such as cafes and restaurants, and conclude long-term contracts. As described earlier, some farmers already do this but in a very small scale and still without written contracts. Expanding this part of the market, and doing it together in the cooperative, might generate benefits such as continuity in the business, a higher degree of cooperation between the farmers and higher amounts of sold product. This, in turn, might decrease the sensitiveness of the agroecosystem since the cooperation enables greater *equitability* and *stability* when the farmers together can guarantee to deliver a specific amount of strawberries during a specific amount of time. Long-term contracts might also decrease economic fluctuations, which may increase the *stability* even more. On the other hand, having a few but big contracts might affect the *sustainability* of the agroecosystem negatively since the risk then is divided on few actors instead of many small, i.e. the cancellation of one big contract affects the *productivity* more negatively than the cancellation of one small contract. Long-term contracts could also be a way to reach the international market. However, the present situation with infrastructural and storage difficultiesmake such a development unrealistic today.

The fact that the farmers do not work with marketing and only trust the good word to be spread is seen as another condition where improvement is needed

in order to overcome the challenge with the unstable market. As the result showed, many of the possible buyers did not know that the strawberry farmers of cooperative DeliFresa existed, which indicates that there is a need of a more focused marketing. We suggest a marketing strategy that focuses on 1) creating awareness about the strawberry farmers of DeliFresa and 2) convincing possible buyers about the good quality of their product and why they should cooperate with DeliFresa. Criterion number one can for example be achieved by a simple flyer, which is delivered directly to possible buyers (see Appendix III for an examplethat was used during the market investigation of our study).). If a possible buyer shows interest in the product, criterion number two can be achieved by having a more detailed pamphlet, which can be used as a sales pitch (see Appendix IV for an examplethat was used during the market investigation of our study). The work with marketing also makes higher demands on the level of service mind of the farmers. As stated in the Results, a possible buyer expressed the need of good service as a shortage and he/she choose not to continue the cooperation. This further confirms the need of developing social skills.

Creating long-term contracts, working with marketing and improve service mind are all actions which take their starting point in the existing strawberry production. Next suggestion to overcome the unstable market is therefore to turn their wishes about making secondary products out of the strawberries into reality. We see three main advantages with such a production. Firstly, it enables the farmers to use a higher percentage of the harvest since they can use strawberries that are not suitable for selling fresh. This, in turn, decreases the productivity loss. Secondly, the farmers are able to have an income during the whole year, which could be a solution to the tough months of June to August. And thirdly, secondary products might enable a bigger market share since for example supermarkets, tourist shops and other retailers can sell them. Secondary products as well as fresh strawberries can also be sold at the farms, a business that would open up for tourists and further broaden the business. Moreover, this might enable the farmers to be a part of the development of the ecotourism that Nicaragua is experiencing today. The area of El Castillito, El Encino and Buena Vista is pristine and unexplored by tourists and can therefore offer true and unique rural Nicaraguan experiences.

5.3 Conclusions

By investigating the complex farming system for strawberries and integrating ecological as well as social and economical perspectives we have now shown the importance of strawberries as a cash crop as well as a catalyser for social development. With the help from a multidisciplinary approach we gained a broad understanding of the agroecosystem, which further enabled us to condense this understanding into the five focused challenges. As described in chapter 1.3 Problem Description, the farmers are facing a situation that could be a breaking point for their business. When heading towards this breaking

point, these challenges could be used as guidelines for planning and prioritizing research as well as activities for rural development. The challenges include both problems and suggested solutions and improvements with a multidisciplinary approach, an approach that in conformity with sustainability takes a variety of perspectives into account. Therefore this study will hopefully contribute to a more successful, and sustainable, rural development in the area.

The focus on the economical part of the strawberry production has shown that the value chain for strawberries is quite simple with just a few actors involved between the production and the sales. Being a strawberry farmer in this agroecosystem means more than just farming; you also have to manage all post-harvest processes since it is the farmer himself who sells the strawberries. This makes business and social skills even more important. By investigating the demands of the buyers and potential buyers, and at the same time relate this information to the needs expressed by the farmers, we now know that there primarily is a lack of knowledge when it comes to marketing and sales. This in turn limits the possibilities for further expanding. Defining this challenge means that it is now highlighted where effort should be put in the value chain in order to further develop the strawberry business.

5.4 Future studies and developments

The discussion above shows that there are areas where more knowledge is needed and we therefore suggest further studies and developments in the following areas:

- Packaging and transportation of the strawberries in order to decrease the losses and make the process more efficient.
- Production of secondary products out of strawberries; what can be done and how to make it sustainable?
- An investigation of the water resource situation in the area, in order to enable sustainable and further planning of the strawberry production.
- An extended and deepened market investigation; how to meet the demand for big and sweet strawberries and how to deal with the national and international competition?

5.5 Methodological discussion

Qualitative studies always contain a certain amount of interpretation (Trost, 2010:133). This means that the analysis always will be coloured by the prejudice of us as writers. The methodological design of our study aims to overcome this by the combination of methods, where we are able to validate the information from the interviews, and our analysis of these, against the experiences from the three week long observation study.

Furthermore, our influence on the study is seen in the choice of semi-structured interviews, meaning that we as researchers have pre-decided what the interview should focus on. This could be problematic since the study aims to highlight the challenges the farmers are facing today. By pre-defining the questions, we also pre-define what to focus on which might limit the farmers' possibility to raise other questions. This situation could have been overcome by the use of open interviews. However, the choice of semi-structured interviews was based on its strength of the combination of structure and openness. We consider this important since the choice of doing a VCA requires specific questions while the AEA is more open to its nature. Furthermore, structure was required in order to meet the language barrier. The language barrier might also have coloured the results since the stories of the farmers have been interpreted by a third part. However, the information given by the interpreter could be validated by one of us due to good language knowledge. Finally, since the study is based on stories and experiences from persons, the sampling of informants is of course of high significance for the results. We chose actively to only interview the person in the family with the main responsibility for the strawberry production since this limitation was considered to generate the required amount of information due to our relatively short stay in the village. Interviewing other family members would probably strengthen the social perspectives of the AEA, but once again, by living with the families we consider that we might compensate for this potential loss. Being a part of the families everyday life enabled us to communicate and interact with the families outside the frames of the interviews. To close up, someone might reflect over the rare use of quotations in the Results, this in contrast to the relatively humanistic study. It is an active choice by us since the language barrier might have affected the precision in our interview notes and we want to prevent misquotations.

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7 Appendix

7.1 Appendix I. Questionnaire - Individual interview

Date…… □ El Castillito

□ El Encino

Name……

SOCIO-ECONOMIC STATISTICS

1. Gender ……
2. Age of respondent ……
3. Household size and composition ……
4. Education level ……
5. Profession/Occupation ……
6. Residence status (indigenous/migrant) ……
7. Main income generating activities:

BACKGROUND

8. Do you own your agricultural land?
    a. What size?
        i. What is the size of the strawberry bed?
9. How did you receive the land?
10. What do you cultivate/produce?
11. Which animals do you have?
12. What percentage of the crops are strawberries and what percentage are other crops?
13. How much of your yearly income is represented by the strawberries and how much comes from other products?
14. Are you working with any standards and/or certification?
15. Why did you start cultivate strawberries?
    a. Did anyone help you?
        i. If yes, who?

THE FARMING SYSTEM

Social situation

16. How would you describe the division of labour between man/woman/child on your farm?
17. Who in the family decides how the income is used?
18. How do you use the income from your production?

19. Do you employ help?
    a. If yes, whom? What is your experience of this?
    b. If no, why?
20. Do you have the possibility to work actively with updating your knowledge base?
    a. If yes, how? (Courses/Education/training)
    b. If no, why?
21. Does the farm get counselling in any area?
    a. From whom?
22. Is the production enough for your household's needs?

Technical conditions

23. What kind of technology is used at the farm?
    a. Water irrigation/tractors/solar panels/etc
24. Do you use artificial fertilizers?
    a. If **yes**:
        i. Why?
        ii. What kind?
        iii. From where do you buy them?
    b. If **no**:
        i. Why?
25. Do you use pesticides?
    a. If **yes**:
        i. Why?
        ii. What kind?
        iii. From where do you buy them?
    b. If **no**:
        i. Why?
26. Do you own your own technical material?
27. From where do you buy the technology? (Focus on place rather than person)
28. Are you bound to any particular supplier?
29. How would you describe the access to these inputs?
    a. Good/bad?
        i. Why?
30. How are the inputs transported to the farm?
31. How do you treat the berries between harvest and sale?
    a. Are they stored somewhere?
        i. Are there any problems when it comes to storage?

Production

32. How many strawberry-plants do you have?

a. How much is produced per 1000 plants (kg strawberries and income)?
b. How many working hours are required?
c. How high are your costs for the production?

33. How high is your productivity loss?
    a. Which are the main reasons?
34. Which are the biggest threats to your production?
    a. Diseases/animals/other?
        i. Can you identify any differences if you compare this situation with 10 years ago?
35. Have you experienced any greater disturbance in your production, such as pests, floods, diseases, hurricanes or other?
    a. Which part of the production was affected?
    b. Was the strawberries affected?
        i. How?
    c. How did your production recover?
36. Do you experience a change in climate if you compare today with 10 years ago?
    a. How is this seen?
37. Does the production have insurance?

Marketing and sales

38. Do you sell your products yourself on the local market? (Notice: Somoto or Estelí?)
    a. If **yes** - what is your experience of this?
        i. Good/bad?
            1. In what way?
    b. If **no** - where do you sell them?
        i. How do you get the strawberries to your buyers?
        ii. How would you describe your relationship to your buyers?
            1. Good/bad?
                a. In what way?
39. What is the price for one pound of strawberries?
40. How do you work with marketing today?

The Cooperative

41. Why are you a member of the cooperative?
    a. Since when?
42. What do you think about the functioning of the cooperative? (equity/transparency/distribution/decision making etc.)

43. How much of the income from the harvest do you get yourself and how much goes to the cooperative?
44. Do you have a village development fund?
    a. If yes:
        i. How does it work?
        ii. Have you benefited from the fund?
    b. If no:
        i. Why?

Future

45. How would you describe your long-term work with the farm?
    a. Do you work with long-term goals? (Do you work only focusing on the day or also focusing on the future?)
46. What do you think you would do if you could not produce strawberries?
47. What are your thoughts about the future?

7.2 Appendix II. Participatory observation study

Date and time of the study: ..... □ Castillito

□ El El Encino

Name (or farm) .....

Communication and relationships

How is the communication and interaction with the neighbours who grow strawberries?
How is the communication and interaction with the neighbours who not grow strawberries?
How is the communication and interaction with other farmers (outside the study area)?

Experience of the whole day

How smooth is the workflow?
What challenges are faced?

Division of labour

How is the division of labour between the different people? Who is working?
How is the division of labour between the sexes?

Labour Day arrangements

Start:
Rests:
End:

Do they have time to eat? When?

What activities are included during the day and how long does each activity take?
How is the workload of the various activities (heavy/medium/light)?

Concluding thoughts

7.3 Appendix III. Folleto de DeliFresa

Cooperativa DeliFresa

Producción **organica** de fresas en las montañas de Las Sabanas, Madriz.

Las fresas se cultivan en una altitud de 1.400 m, un ambiente que crea una baya muy dulce y jugosa con buenas cosechas. ¡Hoy en día la cooperativa está representada por 12 agricultores, tanto hombres como mujeres, pero estamos creciendo más grande! Las bayas son aptos para el consumo directo, así como batidos, yogures, cócteles y más en.

¿Está interesado en la compra de fresas cultivadas localmente y orgánica de alta calidad? ¡No dude en ponerse en contacto con nosotros para sugerencias de precios y posibilidades!

Contact: Macario Felipe Castellón Centeno, President of DeliFresa
Telephone: 8914868 12

Este folleto es producido por los estudiantes Linda Norrman y Lina Cederlöf, con las reservas para posibles errores lingüísticos.

7.4 Appendix IV. Sales pitch DeliFresa

Cooperativa DeliFresa

- **Organic** strawberry production in the mountains of Las Sabanas, Madriz.

DeliFresa in El Castillito & El Encino

Facts and **numbers #1**

Today the cooperative contains of **12 farmers** from El Castillito & El Encino in the community of Las Sabanas, Madriz.

Both men and women are cultivating!

Facts and **numbers #2**

The **altitude** of 1400 m offers a climte that creates a sweet and juicy berry with very good harvests.

Facts and **numbers #3**

Organic production in the areas of the nature reserve La Patasta.

The farmes make most of their compost by **themselves**.

To sum up...

... There are **perfect** conditions for **strawberry farming**!

Why strawberries?

Decreasing coffe prices forces farmers to find new ways to earn their livlihood...

A non-traditional crop creates a new market!

Strawberry production has become a way to increase the income.

The strawberry farmers have been supported by **Universidad Nacional Agraria (UNA)** and **INPRHU** in order to initiate the production.

Plans for the **future**

The farmers are right now in the process of initiating their cooperative DeliFresa. With an organized group they're hoping to create one unite voice and **new possibilities** for their crop.

One possibility is to **start processing** the strawberries at the farm and potential products right now are for example **marmelade** and **strawberry wine**!

Contact

Macario Felipe
Castellón Centeno

The president of
DeliFresa

Telephone: 8948 68 12

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