

# **Broilers in Swiss vineyards, an agroforestry solution to tackle environmental, social and economic sustainability.**



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## List of abbreviations

BTS	= Besonderst Tierfreundliche Stallhaltung = Particularly Animal-Friendly Barn Keeping
Chf	= Swiss Franks
g	= Grams
ha	= Hectare
K	= Potassium
Kg	= Kilo
LW	= Live-weight
Mg	= Magnesium
N	= Nitrogen
P	= Phosphorus
RAUS	= Regelmässiger Auslauf im Freien = Regular Outdoor Space Availability
SW	= Slaughter-weight
UBL	= Unit of Big Livestock (dairy cow = 1 UBL)
€	= Euro
\$	= US Dollar

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## Abstract

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The world population is expected to reach 9 billion people in 2050, mostly in developing countries, and global food demands will increase up to 100%. Among the solutions to produce more food there is “sustainable intensification”, where the goal is to produce more with less thus reaching higher yields per hectare.

In 2019, vineyards were the second largest agricultural commodity in Ticino. The local livestock sector, on the other hand, only saw an increase in the broiler business between 2003 and 2018. Knowing this, Enzo Ortelli, manager of the wine company Ortelli Vini SA of Corteglia, wanted to set up a silvopastoral experiment in which broilers were introduced into his vineyards to improve the sustainability of his wine production. The major sustainability topics the company was concerned with were environmental (high use of diesel and chemical inputs), social (the high amount of workload of his workers), and economic (generation of additional income).

The following research question was developed: how can broilers increase the environmental, social and economic sustainability of conventional wine producers in Ticino?

First, a literature review was performed to understand the ecosystem services and the potential of silvopastoral systems. Secondly, two semi-structured interviews were conducted with Farm Biohof Trutigen and Azienda Vitivinicola DiFilippo, who already implemented production systems with poultry under trees. Lastly, a simulation of the production system was performed with a self-constructed broiler mobile barn and 62 broilers. Calculation tools for the profitability and the feasibility of the project supported the production system simulation, ending with a consumer appreciation test, which was performed when the broilers reached slaughter age.

The results showed that, from an environmental point of view, broilers had the ability to decrease vineyards inputs such as phytosanitary products, fertilizers, diesel and herbicides. At the same time, fewer machinery hours would be needed, decreasing compaction risks. From a social sustainability point of view, the welfare of poultry is increased by the pasture availability with a lot of shelters (wine trees) for shade and predator protection. Besides that, on the same surface it is possible to produce grapes and poultry meat, leading to an increase in food produced per hectare. Lastly, from an economic point of view, broilers generated additional income and reduced system expenses. To conclude, this production system is a viable option for Ticino wine producers from an environmental, social and economic point of view.

Key words: Broilers, Vineyards, Agroforestry, crop-livestock integration, free-range.

## 1. Introduction

In 2050, the world population is expected to reach 9 billion people (FAO, 2009). The population increase will mostly happen in developing countries. With population growth, together with an accelerated urbanization process and higher income levels, increased food production will be required in order to feed the planet. To meet this future food demand, food production levels should increase between 70-100% in a sustainable and durable way (FAO, 2009; United Nations, 2017; Godfray et al., 2010). For animal-source food, all the “Big Five” livestock species will be impacted. Specifically, between 2013 and 2050, it is suggested that poultry meat consumption will increase from 105 million tons to 181 million tons per year and egg consumption will increase from 64 million tons to 102 million tons per year (Van Zanten, 2019). Some solutions to increase the food availability in future are explored by Van Zanten (2019), such as aiming for higher yields per hectare (ha), improving livestock feed efficiency, improving the productivity of livestock in a lifetime and feeding food waste to livestock.

Regarding “higher yields per ha”, Brooker et al. (2015) explored the silvo-pastoral systems of woody pastures in Switzerland, to produce meat, milk and wood on the same land, and the Italian “coltura promiscua”, where poultry were grown on the same surface as olive trees. In both systems, the horizontal production was complemented by a vertical production. In other words, crops of different heights on the same surface produce more kg of output per ha and year. According to Smith and Gregory (2013), this food production increase should happen in a sustainable way. Sustainability of food systems has to be understood as the interconnection between three domains (de Boer, 2019):

- Environmental sustainability: a system has to avoid overloading the environment with pollutants or excessive energy use.
- Social sustainability: a system has to be accepted by the society regarding, for example, production practices and working conditions.
- Economic sustainability: a system should be profitable or at least break even.

Ticino, the Italian Speaking Canton (= province) in the south of Switzerland has dense urban areas and geography that makes it challenging to produce food. Here, there is great concern for the sustainability of food production systems.

As of 2018, Ticino had 353,343 inhabitants, with 92.8 % of them living in urban areas, which is the 5.6% of the total Cantonal surface. Ticino has a unique topography, with 50.7% of the Cantonal surface made up of forests and woodlands, 30.7% non-productive areas (urban areas, glaciers, stony alps, lakes and rivers) and only 12.9% used for agriculture (BFS, 2020).

According to Ustat (2019) in 2018, there were 13,719 ha of useful agricultural surface in Canton Ticino. Natural meadows (alpine and pre-alpine summer pastures) composed 80% of this land, followed by 832 ha of vineyards (6.1%) and 664 ha of cereals (4.8%).

The large presence of pastures gives Ticino farmers the opportunity to raise livestock, specifically ruminants. However, data from the Ustat (2020) shows that the numbers of cattle (dairy and beef), sheep, goat and pigs decreased between 2003 and 2018, while poultry was the only livestock sector that saw a strong increase in terms of the number of grown animals. Additionally, although the Cantonal inhabitants only make up 4.1% of the Swiss population (BFS, 2019), Ticino is the fourth largest wine producer in Switzerland (Statista, 2020), preceded by the French speaking Cantons Wallis, Vaud, and Geneva. In 2018, 91% of the Ticino vineyards planted red wine varieties, designated to produce mostly Merlot wines; the remaining 9% were white breeds to produce mostly Cabernet wines (BLW, 2019). Between the districts of Ticino, Mendrisiotto is the Cantonal leader in wine production and, according to Ustat (2007a), in 2005, Mendrisiotto accounted for 34.9% of the Cantonal vineyard land, followed by district Locarnese (17.8%) and Luganese (17.8%), and the 40% of the Cantonal wine production happened in the district capital Mendrisio’s borders (Città di Mendrisio, 2018).

### **The problem of Ortelli Vini SA**

Ortelli Vini SA is a family-managed company in Corteglia, located in the district Mendrisiotto. Founded in 1985 by Mauro Ortelli, he still manages the company with his wife Luigia, and two sons, Enzo and Lucio. Enzo and Lucio Ortelli actively started taking part in the company after their studies in Agricultural Economy in Zollikofen (Canton Bern) and Viticulture and Oenology in Changins (Canton Vaud), respectively. The company owns 1.3 ha and rents 6 ha of vineyards (15 years contracts). Additionally, they sell services related to vineyards (e.g. harvest logistic management and phytosanitary treatments) and forestry (e.g. fencing and footpaths maintenance) to private companies and municipalities mostly in the district Mendrisiotto. Their annual wine production is 20,000 litres of red wine and 10,000 litres of white wine from the varieties Merlot, Cabernet Sauvignon, Chardonnay Sauvignon, Semillon and Chasselat. Their wine is sold to restaurants, private consumers and wholesaler under the brands “i Trii Pin”, “Corteglia”, “Novi dal Drumpa Merlot” and “Novi dal Drumpa Sauvignon” (Ortelli Vini, 2020).

Fully operational vineyards of Ortelli Vini SA produce on average 8 tons of grapes per year with harvest losses of 5% on average in good years, and losses up to 40% in bad years; the harvest lasts from the beginning of September to mid-October. Grapes are grown at a minimum height of 80cm above the ground in rows that are 1.4m to 1.8m apart. Under the wine trees, unwanted grass is conventionally treated chemically or mechanically, which creates stress for the environment and a negative image for costumers, unwanted expenses, and extra labour. Another cost in the wine production are fertilizers, which Switzerland regulates to a maximum fertilization of 50 kg of nitrogen (N), 20 kg of phosphorus (P), 78 kg of potassium (K) and 25 kg of magnesium (Mg) per ha and year (Agridea, 2012) but the Ortelli Vini SA tries to reduce the use of purchased fertilizers.

Based on the regional project called “The vineyard egg” in Region Basso Ceresio, Enzo Ortelli contacted the crop-agronomist Davide Croci and myself, wanting to tackle the following sustainability problems in his company:

- From an environmental point of view, he wanted to decrease the use of chemicals, fertilizers and machinery diesel of his company
- From a social point of view, he wanted to decrease the workload of his employees and wanted to make the harvest losses available for human consumption by feeding it to livestock. Additionally, he wanted to fulfil Article 104 of the Swiss constitution (2020), which states: “The Confederation shall ensure that the agricultural sector, by means of a sustainable and market-oriented production policy, makes an essential contribution towards:
  - o the reliable provision of the population with foodstuffs;
  - o the conservation of natural resources and the upkeep of the countryside;
  - o the decentralised population settlement of the country.”
- From an economical point of view, he wanted to develop a system that required a low amount of additional working hours, that covered his own production costs and that decreased the company’s expenditures in fertilizers, phytosanitary products and machines.

To confront these problems, Enzo Ortelli became interested in broilers, wanting to setup an agronomic plan and an initial experiment to understand if and how broilers can increase the environmental, social and economic sustainability of conventional wine producers in Ticino. This paper will consequently answer the following research question: how can broilers increase the environmental, social and economic sustainability of conventional wine producers in Ticino?



## 2. Materials and Methods

### Silvo-pastoral systems

A literature review was carried out to understand the functions and the benefits of the silvopastoral systems in Europe, keeping track on their influence on social, environmental and economic sustainability.

### Study cases in Europe

Two study cases were carried out on silvopastoral systems in Europe. The interviewed, analysed and visited farms were farm Biohof Trutigen in Sursee, Luzern (CH) and the winery Azienda Vitivinicola Di Filippo, Montefalco, Perugia (IT). The questionnaire is available in appendix 1.

Toni Stalder and his wife Monika managed farm Biohof Trutigen. Their children Aurelian (researcher for Andermatt Biocontroll), Salome (veterinarian in Canton Luzern) and Annina (finance and management co-worker for Red Bull) supported them. Biohof Trutigen produced a large variety of organic foods such as cow milk, vegetables, fruits and beef. Additionally, they kept 500 dual-purpose poultry with outdoor access under the fruit trees of the farm.

The second study case analysed the Azienda Vitivinicola Di Filippo winery managed by siblings Roberto and Emma Di Filippo. The focus of their company was wine production, but every February they introduced 350 to 500 meat geese into the vineyards to increase the efficiency of weeds control.

### Agronomic plan for Ortelli Vini SA and production system simulation

In order to meet Enzo Ortelli's sustainability goals, an agronomic plan for the introduction of broilers to two wine parcels near the main building of the winery in September 2020 was set up in order to assess the feasibility of this project. The knowledge necessary to create an agronomic plan for this new production system was collected through the previous literature review on silvopastoral systems and the previous study cases. Additionally, technical information was compiled from the Wirz Kalender (the Swiss Agri-Bible) of Agridea, the book "Geflügel im Mobilstall" by Jutta van der Linde (Chamber of Agriculture Nordrhein-Westfalen) and Henning Pieper (Chamber of Agriculture Niedersachsen) and from the Swiss poultry research centre Aviform in Zollikofen.

In the agronomic plan, a calculation of the potential savings from decreased herbicides, fertilizers and machine use (fuel) was performed to assess the environmental impact of the system and the cost stress related to these inputs. Secondly, the Paracalc calculation sheet of Agridea and the calculation model for poultry farm construction of HAFL professor Dr. Peter Spring was used to assess the economic sustainability; both calculation sheets gave the opportunity to foresee income, variable costs and fixed costs of poultry production.

Lastly, a simulation of the system was carried out to decide which partners were most appropriate to run such a production system. The simulation of the system begun on 12.05.2020 with 62, 28-day old free-range brown broilers from the breeds ROSS308, SASSO and Cou-nu pate-noire ordered from the company Geisser-Trupro AG in Sankt Gallen. The broiler housing was a homemade mobile barn with installations of Arion Fasoli (IT) and Hauptner (CH) and it respected the BTS-RAUS regulation for animal welfare (details about the regulations in the internship report).

Eight ROSS308 broilers were slaughtered and cooked by Lucio Ortelli to understand the consumers appreciation of the meat, the invited people were:

- Randomly selected inhabitants of District Mendrisiotto.
- The director of the regional meat factory "Salumificio del Castello" Emanuele Scotti and a representative of "Bell AG" Nadine Beierlein to represent the meat processing sector.

During this meeting, 12 guests were invited to taste the chickens, to assess how they like the meat and which price they would be ready to pay for such a product. Seeing that in September, during the grapes harvest, 60 broilers were planned to be introduced in the vineyards of Ortelli Vini SA, the findings of the stakeholders meeting helped to decide the final weight of the broilers and consequently other technical aspects as the growing time, the feed quantity, the influence on the vineyards, and so on. Additionally, prices were decided, and contracts were signed with the Salumificio del Castello, which was the responsible for stocking and distribution of meat to restaurants and private consumers.

## 3. Results

### 3.1. Silvo-pastoral systems

Silvo-pastoral systems, defined as the raising of trees and livestock on the same surface simultaneously, represented an agricultural combination that began in central Europe about 7500 years ago. These kinds of agricultural systems lost importance in the last century with the industrialization and the specialization of the production systems aimed for the food supply of a fast-growing population (Rosati et al., 2015).

The animals raised in silvo-pastoral systems were associated with a high pasturing capability, the use of pasture giving the animals vitamins and antioxidants such as  $\alpha$ -tocopherol,  $\beta$ -carotene and polyphenols. Additionally, the feed available on the pastures delivered  $\alpha$ -linoleic fatty acids, which positively influenced acidic composition and oxidative stability which helped conserve meat quality. Finally, the intense motor activity of the animals led to lean meats rich in iron and with good texture (Rosati et al., 2015). Livestock also delivered services to the vegetation of the environment. Firstly, livestock transformed the plant nutrients, which had lower absorption, into easily accessible nutrients through the digestion process and into excrements (Rosati et al., 2015). Moreover, livestock could feed on insects and pests damaging to trees and bushes. Finally, livestock could feed on grasses and weeds, decreasing the competition stress of the target vegetation. This helped control unwanted regrowth of the target plants, like the clones of olive trees that budded every year from the bottom of the trees. Indirectly, all the mentioned points decreased production dependency on pesticides, herbicides and purchased feeds while still producing high quality animal food (Rosati et al., 2015).

The vegetation which best delivered benefits to poultry and, consequently, to the pasture-based production system were trees and bushes, which performed the same functions at difference heights, and grasses (Rosati et al., 2015). These benefits are listed in the following chapters.

#### **Environmental sustainability**

Livestock were responsible for 15% of anthropogenic greenhouse gasses emissions, 70% of the agricultural land use and 8% of the global water withdrawals (De Boer et al., 2019). In the case of monogastrics, more than 50% of the environmental impact was attributed to the feed production, followed by energy for progeny raising and losses from manure management (Van Zanten, 2019).

Trees and bushes in silvo-pastoral systems, through shade, humidity and wind breaking capabilities, promoted early vegetation growth in winter and promoted a longer vegetation growth in autumn, permitting soils to stock more carbon thanks to the longer vegetation period of the grasses under the trees. The roots of trees and bushes delved deeper than grasses and consequently accessed deeper groundwater and nutrient sources, pumping them up to the soil surface in form of leaves. In autumn, for example, the dry leaves falling from deciduous trees functioned as bedding that kept the soil clean and dry. The dry leaf layer decreased the risk of soil compaction caused by animal trampling and functioned as long-term fertilizers, reducing the need for commercial fertilizers on the pastures and under the trees. Finally, on the leaf layer, poultry found a comfortable place to lay down and to perform natural behaviours like scratching and pecking (Rosati et al., 2015).

Grass, on the other hand, had the important function of enriching the environment, fostering growth of micro-fauna like insects, worms and other little species that guaranteed porous soils (Rosati et al., 2015). With good water storage capacity, the negative effect of summer droughts was mitigated and decreased the need for irrigation while it preserved the global water reserves. On the soils surface, the presence of grass protected the soil from water and wind erosion. Moreover, grass enhanced the soil with organic matter contributing to the soil fertility and, again, the water storage capacity of the soil. Finally, grass increased the carrying capacity of the soil (Rosati et al., 2015).

#### **Social Sustainability**

One major topic, which concerned consumers, policy makers, retailers, scientists and farmers, was animal welfare. These stakeholders all had different perceptions of animal welfare (Vanhonacker et al., 2007). Farmers, for example, were more concerned with good animal health and good feeding while consumers were concerned with animal suffering, freedom to move, animal stress and the ability to perform natural behaviours (Vanhonacker et al., 2008). A second topic of social concern related to livestock were the negative impacts on the world food security. 86% of the feed used for the livestock production was

composed of human-edible components. Livestock had a low feed efficiency (Mottet et al., 2017). On average, 3.2 kg human edible food was required to produce 1 kg of boneless monogastric meat. Additionally, livestock was estimated to need 2.5 billion ha for production, which otherwise were used for the production of human-edible food.

Poultry based silvo-pastoral production systems satisfied the social needs connected to animal welfare through the following aspects. At first, access to pastures and upgraded pastures with trees and bushes created a living environment similar to a natural poultry environment, decreasing the risk of feather pecking and cannibalism (Rosati et al., 2015). Trees and bushes cast shadows onto the pasture, which lowered the heat stress. This motivated the animals to walk more in the pasture for the feed foraging with shade guaranteeing more hours of pasture even during warm days. Secondly, trees and bushes protected poultry from strong winds, low temperatures, and other atmospheric elements such as rain, snow and hailstorms. The poultry welfare was also impacted by predation, causing injuries and, in some cases, death. Trees and bushes acted as active protection against aerial predators, which could not see prey under the trees and could not easily land in the bushes. Trees and bushes also gave a certain security to poultry, which easily escaped under the dense vegetation, this decreased the stress caused by predation (Rosati et al., 2015).

Poultry related silvo-pastoral systems also fulfilled social needs in terms of food security. Poultry, trees, bushes and grasses were grown on the same surface, permitting the production of more human edible food (fruits, eggs, meat and roots), thus increasing the food output per ha, sustainably. Additionally, these systems were applied to surfaces not suitable for food-crops production. Finally, the grasses, non-edible fruits, leaves and micro fauna of these systems covered a big part of the poultry nutritional needs, lowering the need for human edible food in poultry diets (Rosati et al., 2015).

### **Economic sustainability**

Combining animals and trees generated additional income. Besides eggs and poultry meat, fruits were sold for human consumption, consequently creating an alternative business opportunity. Another aspect that generated income for a farmer was the lumber from the trees (Rosati et al., 2015).

As mentioned in the previous chapter “Environmental Sustainability”, trees and bushes increased the vegetation period of grasses under them. In addition, the vegetation developed in partial shadow was more tender and consequently more nutritious and digestible compared to vegetation grown in full sunlight. This permitted the feeding of less high-quality purchased feeds, further decreasing expenses.

Trees and bushes also delivered feed through their leaves, which were mostly palatable and nutritious for poultry. Leaves on trees and bushes were available as feed even during droughts and, in the case of evergreen species, during cold seasons, which was not the case for grasses. Some species of trees and bushes were able to produce fruits palatable for humans and for poultry. The energy content of fruits was higher than of leaves and better substituted commercial feeds. Unlike bushes and trees, the primary function of grass was feed production. Grass delivered feed directly as green foliage and as seeds from matured grasses while indirectly, grasses stimulated the development of a diverse population of micro-fauna, which was an important high-value protein source for poultry (Rosati et al., 2015).

Using trees, bushes and grasses as a feed substitute, Jakob (2020) fed only 200g of purchased grains per day to 250 organic laying hens. This was a huge saving strategy that brought to a small decrease in egg production but an important increase of the economy of the egg business for Jakob (2020). He also mentioned that a benefit of poultry was that the consumption of poultry products was not influenced by religion beliefs, consequently almost 100% of the world population wanted to consume it (excluding population with non-omnivorous diets as vegans, vegetarians in case of meat and other dietary minorities).

### 3.2. Study cases in Europe

#### **Biohof Trutigen in Sursee, Luzern (CH)**

The company Biohof Trutigen produced Organic Demeter animal and plant products on 34 ha near the Sempacher Lake. Their production was diverse and aimed to reach the optimal interaction with nature through Organic-Demeter principles. They sold milk, calf and cow meat, broiler and hen meat, live poultry and bovines, eggs and they were beginning to build up experience with goats for goat meat. In their greenhouses and on their fields they produced a large variety of fruits (apples, pears, apricots, peaches, prunes and cherries), vegetables (zucchini, cucumbers, tomatoes, salads, celery, onions, garlic, pepperoni, hot peppers, etc.) and crops (cereals, grassland, pasture, sweet potatoes, potatoes, colza, etc.).

The main goal of the poultry production was to generate revenue for the farm, followed by valuing household food losses (the food losses of the fruit and vegetable production were not fed to poultry but to dairy cows). To solve the social problem of the male chicks killed at their first days of age, Biohof Trutigen worked with the robust double purpose breed SUSSEX, which permitted the selling of male chicks at the age of four months, guaranteeing an acceptable life length for the broilers (figure 1).

Biohof Trutigen bought chicks mainly from the company Geisser-Trupro AG in Canton Sankt Gallen at 1-3 days of age. Their goal was to keep 500 laying hens and purchase new chicks depending on when and how many laying hens they wanted to slaughter. Biohof Trutigen raised male and female chicks together until 5 months old. When the juvenile chicks reached 5 months, the females began to lay eggs and were placed in the laying barn. The males were raised as broilers until the slaughter in the same barn. The laying hens were kept until they look old and ugly; there was no average slaughter age, but the goal was to reach the 4<sup>th</sup> or 5<sup>th</sup> production year with a yearly average of 200-250 eggs. Broilers were slaughtered with 4-6 months of age depending on the demand, aiming for two to three slaughters per year.



*Figure 1: Herd of SUSSEX poultry at 4 months of age, just before bringing the females into the laying gens barn. The males stayed in this barn until the slaughter.*

To guarantee a production system with the Demeter certification, all inputs must be certified Demeter too. When it was not possible to get Demeter inputs, the farm used organic inputs, and if organic inputs were not available, they used conventional inputs with the permission of the Research Centre for Organic Production (FiBL) in Frick, Canton Aargau. It was rare that Biohof Trutigen needed this kind of permission.

For poultry feed, there was only one Demeter certified mill in Switzerland, the Lehmann Mill in Canton Sankt Gallen.

They bought spelt skins for the laying hens and out-dusted wood shavings for the chicks in the start phase (1-14 days) and for the juvenile animals (figure 1), to avoid bedding related respiratory problems. These products were available in the LANDI stores all over Switzerland. They avoided working with chopped straw or normal straw because it contained too much dust.

As mentioned before, the laying hens produced 200-250 eggs per year. The eggs were sold in 4-egg packages directly to private consumers through farm visits and at the markets in Sempach, Sursee and Luzern or to intermediaries and little regional stores. Stalder (2020) proudly mentioned that they had 0% eggs losses, because family members consumed broken and deformed eggs (10 to 20% of total production). When the eggs were sold directly, the price was 4 chf for 4 eggs; if the eggs were sold to intermediaries, family Stalder received 0.69 chf and the intermediaries sold 4 eggs to private consumers for 4.40 chf.

The members of the Stalder family did the slaughtering. To stun the animals, they used the rotation technique, in which the blood pressure in the head got so high that they passed out. Once they were stunned, the head was cut off with a knife or an axe. The broilers slaughtered at four months of age weighted on average 2 kg and produced a carcass of 1 kg (slaughter performance 50% instead of 70% as seen with intensive broilers) while the older broilers reached a carcass weight of 2.5 kg maximum. Broilers were sold as whole carcasses for 25 chf/kg. Old laying hens were sold as whole carcass soup hens for 19 chf/kg.

Toni Stalder constructed both barns while the company Inauen Geflügel of Canton Zürich provided the installations. Both barns were occupied year-round; Stalder (2020) admits that it was not optimal from a hygienic point of view and it was better to schedule a yearly sanitary break where no hens or chicks were raised. However, their markets needed a constant egg production and so they were not putting the sanitary break into practice.

Most of the excreta was ejected from the barns and removed once a month. The manure was then stored in the cow slurry hole to avoid N losses and to increase the P and N content of the cow slurry. This practice led to the problem of sand storage at the bottom of the slurry hole, which was emptied out completely and cleaned every 10 years.

Access to pasture was available only in the warmer months of the year. From November to March, the poultry at Biohof Trutigen had access only at the outdoor climate area (explained later in chapter “Particularly Animal-Friendly Barn Keeping BTS”). The doors were opened manually at 12:00 for two reasons: firstly, the hens laid eggs mostly in the morning and family Stalder wanted to avoid eggs laid outside the barn and secondly, the morning dew increased the risk of parasites. In the evening, the doors were closed at 21:00 but the hens were usually already inside the barn because of the dark.

Seeing that the barns were fixed, the pastures were always the same and Biohof Trutigen rotated the pastures with the main goal of preventing parasite development. The pastures were mainly located under pear trees which produced Demeter pears for human consumption. In one parcel, there was also a small kiwi plantation. Biohof Trutigen did not have problems with chickens jumping and ruining the fruits, while pears that were non-sellable were thrown on the floor and fed to the poultry. The trees were used as shelter and as protection against avian predators. In these parcels where there were fewer trees, the poultry were less bold and mostly stayed around the building. Stalder (2020) noted that the broilers walked around less than the laying hens.

The enclosure was a poultry adapted flexi-net with electricity, helping prevent attacks from ground predators. In some exceptional cases, female foxes with young might attack during the day too. Nevertheless, family Stalder suffered from fox attacks only when they forgot to close the pasture entrances at night. On Biohof Trutigen, the electric flexi-nets did not move often, leading to vegetation growth around the fences and decreasing electrical conductivity. The only plant that was not consumed by their poultry were nettles, which had consequently to be mowed once to three times a year.

Family Stalder did not intend increasing the poultry production. The Sempacher Lake had a greater than average P content and the Government of Canton Luzern set up measures to decrease the P content of the water. Farms around the lake were partly responsible for this high P concentration, even if they produced (through animals) or spread (through fertilizers) within authorized and legal P quantities. To decrease the P spreading of farms, the Canton paid to farmers an amount of money for the difference between allowed P amount and actual P amount that farmers put on the fields. This amount of money was so high that increasing the poultry herd was less profitable than the Cantonal incentive for the Biohof Trutigen.

### **Azienda Vitivinicola Di Filippo in Montefalco, Perugia (IT)**

The company Di Filippo produced certified organic wine on 30 ha and was founded in 1994. To guarantee the environmental sustainability of their farm, they used experimental methodologies to decrease the use of machines (mainly vineyard-tractors). Two practices that the company used were weeding and harvesting with horses as moving power and secondly, on 5 ha near to the winery, they pastured geese under the wine trees to control weeds.

The main role of livestock in the vineyards of Di Filippo was to control weeds without compacting the soil and/or disturbing the soil fauna. In collaboration with the University of Perugia, the company Di Filippo decided to set up trials with geese because of their herbivorous diet, deciding against chickens because of their omnivorous diet negatively affected the earthworm population in the soil.

Depending on the seasonal demand for geese, the company Di Filippo raised 350 to 500 Romagnola and Tolosa geese (figure 2), with an average of 70 to 100 geese per ha. Di Filippo (2020) said the company preferred the Romagnola geese because their weeding performance was better, and consumers preferred their meat compared to the Tolosa breed. The Tolosa geese were more static and did not walk far from the barn.



*Figure 2: Romagnola goose on the left and Tolosa goose on the right.*

The goose chicks were bought at 3 days old in 50 heads flocks once a month, beginning in February. Most geese were slaughtered at 6 months of age, with 4.5 to 5 kg live-weight (LW) and with 3 kg slaughter-weight (SW); they were sold to restaurants, butchers and private consumers as whole carcasses. Some geese were kept until 10 months of age for innovative goose salami and some were sold alive as hobby animals. The period with the highest goose demand was before the 15 of August when the festivity Ferragosto (the Assumption of Mary) took place where Italians and Sammarinese traditionally consumed goose.

The barn was a 28 m<sup>2</sup> fixed barn built by the Di Filippo team to decrease construction costs. The barn had two closed walls and two open walls to guarantee air circulation and the available barn area was covered by a roof for three quarter. Under the drinkers, they constructed a concrete basement because geese spill large quantities of water; the concrete basement made cleaning and drying of the drinking areas easier. The barn had an electrified net to protect the geese from foxes. In 2019, foxes attacked the geese in the pastures during the day, halving the goose herd. That's why the company Di Filippo invested in anti-fox flexi-nets to avoid future attacks. They were also considering monitoring the barn with a camera because ten days before Ferragosto 2019, 15 geese were stolen.

The pasture was composed of 5 ha of vineyard under which geese freely grazed on grass and herbs. Additionally, company Di Filippo seeded barley and broad beans under the wine trees so that they were available for the geese. Geese had access to the pasture from March, when the first flock reached one month of age, to August, before the grapes began to mature. Geese caused serious damage to the vineyards by eating sprouts and grapes. No damages were reported to the leaves of the wine-trees.

Company Di Filippo worked with automatic barn doors that opened at 08:30 and closed at 19:30, selecting these hours because daylight was strong, and predators were less likely to attack. Finally, company Di Filippo did not make any nutrient calculation regarding the geese manure because the quantity of excreta was minimal.

In Switzerland, one goose had a value of 0.012 UBL (Units of Big Livestock). Consequently, company Di Filippo kept yearly from  $0.012 \times 350 = 4.2$  to  $0.012 \times 500 = 6$  UBL in form of geese on their 5 ha pasture making a livestock density of 0.84 to 1.2 UBL per ha. In terms of broilers, which had a UBL value of 0.004, it meant that they kept from  $0.84 \times 0.004 = 210$  to  $1.2 \times 0.004 = 300$  broilers per ha.

Unlike faeces, company Di Filippo performed calculations regarding feed rations. Seeing that the geese received a meal ration once a day in the evening (motivating them to return to the barn at night), they were forced to exit the barn to search for feed in the pastures during the day. The meal they received in the evening was a mixture of corn, barley and broad bean and in the first month of life it was about 300g/animal/day. During the pasture period, they received 100g/animal/day and during the last fattening

period before slaughter they again received 300g/animal/day. Wine production waste (pressed grapes) was not fed to the animals.

New experiments and innovations that company Di Filippo wanted to apply were the self-goose rearing and the grandmother goose practice.

Firstly, they wanted to rear geese on their own. They already tried an incubator, but the performance was too low and only reared 60 goose chicks. That was why they wanted to introduce female turkeys as surrogate mothers to incubate the goose eggs. Additionally, the goose chicks that they raised in the first experiment did not have antibiotics resistance, compared from purchased animals.

Secondly, they observed that young chicks had some difficulties when introduced to the pastures. Company Di Filippo wanted to grow some hearty geese with good observed maternal behaviours older than 10 months and give them the responsibility of teaching the 1-month-old chicks entering the pasture what and how to eat while protecting them from potential terrestrial and aerial predators.



### 3.3. Broiler production systems in Switzerland

According to the Swiss Federal Council (2008), everyone that kept or wanted to keep more than 10 UBL must be trained in agriculture. Broilers, for example, equal to 0.004 UBL and so, an agricultural trainee (3 years farming apprenticeship or 3 years bachelor in agricultural science) was required in order to be allowed raise more than 2,500 broilers. Between 500 and 2,500 broilers, it was sufficient to participate in a two weeks training to get a certificate of competence. Under 500 broilers, no official agricultural training certification was needed (Agricon, 2010; Brodmann and Roth, 2017).

#### **Conventional production system**

The Swiss conventional production system was free run broilers in an industrial shed and was based on the Animal Welfare Ordinance of the Swiss Confederation. This meant a maximum 18,000 broilers aged more than 43 days (table 1) kept on a thin layer of bedding with no other installation available aside from drinking and feeding spots. Sitting bars were not compulsory in conventional broiler farms, the reasoning being that the animals did not use it because of their weight. The light intensity in the stables must be minimum 5 lux and lasted a maximum 16 hours per day. Consequently, the broilers must benefit from 8 hours of night rest. The broilers were delivered with the age of 1 day to the production plants with an average weight of 60g and were not kept in extreme climates; the ideal temperature at the beginning of their life was 33°C (Agricon, 2010; Brodmann and Roth, 2017).

*Table 1: Maximum allowed herd size in the Swiss conventional broiler husbandry (Brodmann and Roth, 2017)*

Age (days)	Maximal allowed herd size (boilers/farm)
≤28	27,000
29-35	24,000
36-42	21,000
≥43	18,000

The maximum allowed stocking density in conventional systems with more than 80 animals was 30 kg LW/m<sup>2</sup>. As conventional systems aimed for a final LW of 2 kg, it meant that 15 broilers/m<sup>2</sup> were raised under conventional conditions, in other words they had 660 cm<sup>2</sup>/broiler available. The goal was to reach 2 kg LW at the 35 days of age. This fast broiler growth resulted in 9 cycles of broilers per year. Normally, farmers raised more chicks than they had room for; the surplus chicks were slaughtered at 20-28 days to become a so-called Mistkratzerli or galletto, a broiler younger than 28 days with a SW of 400 to 750g (Agricon, 2010; Brodmann and Roth, 2017).

To improve animal welfare in conventional production systems, the Confederation started Governmental livestock raising programmes in which animal-friendly livestock husbandry was rewarded with Direct Payments. The only two Governmental programmes were the Particularly Animal-Friendly Barn Keeping (BTS) and the Regular Outdoor Space Availability (RAUS) (Agricon, 2010; Brodmann and Roth, 2017).

#### **Particularly Animal-Friendly Barn Keeping BTS**

In 2014, 92% of Swiss broilers were raised under the BTS-program. Some additions of the BTS-program to conventional production systems were, for example, the use of elevated sitting areas, like laying bars or elevated plastic grids. Furthermore, animals were no longer slaughtered before their 30th day of life to become Mistkratzerlis. From the 21th day of life, the broilers had a daily access to an outdoor climate area (figure 3), which was covered, giving the broilers greater mobility and space (Agricon, 2010; Brodmann and Roth, 2017).



*Figure 3: Example of Outdoor Climate Area in a Swiss broiler barn.*



### Regular Outdoor Space Availability RAUS

In 2014, only 8% of the Swiss broilers were kept under the RAUS programme. An important addition from this program was the access to a pasture for a minimum 5 hours per day, with pastures defined as a surface with grasses and herbs and some kinds of protection as bushes, trees and shelter. Broilers were not left outside in case of stormy, rainy and cold days and in these cases, access to the outdoor climate area was sufficient. To accomplish the RAUS regulations, broilers were slaughtered earliest at 56 days (Agricon, 2010; Brodmann and Roth, 2017).

### Organic production

To produce organic broilers in Switzerland, farmers had to respect the Bio Ordinance. In addition to the organic rules, the organic farms had to respect the BTS and RAUS programmes too. In organic, as in free-range systems, slow growing breeds were used, like the SASSO and Hubbard

JA57 breeds (figure 4), which had an average daily gain of

27.5g/day instead of the 60g/day of conventional, intensive breeds.

The slower growth was important to allow the animals to profit the most from the longer fattening period and from the pasture access. During the pasture rotation, the pastures hosted broilers only twice a year with a minimum break of 12 weeks. The minimal age at slaughter was 63 days for Bio-Suisse and 81 days for the Bio Ordinance, while the allowed stocking density in organic broiler barns was 20 kg LW/m<sup>2</sup> (Agricon, 2010; Brodmann and Roth, 2017).

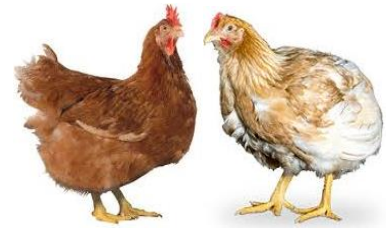


Figure 4: Hubbard JA57 (left) and SASSO (right)

### 3.4. Broiler housing and feeding

#### Barn types and installations

The barns that host poultry were high cost, middle cost and low cost stables. High cost barns were traditionally for large herds up to 18,000 broilers and consisted mostly of Hangar type barns, as shown in figure 5 (Arion Fasoli, 2019).



Figure 5: Poultry Hangar for maximum 18.000 broilers offered by the Italian Company Arion-Fasoli

Secondly, in the category of the middle cost poultry barns, there were the mobile barns, which were moved on wheels or on metal planks (figure 6). The German company Hühnermobil.de, for example, offered the model HüMo Basis 225 for 225 organic laying hens for 40.000 € (Werro 2019). The German company ROWA-Melle asked 19,114.60 chf for the model ROWA 100 for 120 laying hens and 18,822.45 chf for the model Rowa Flotter Hahn 100 for 214 broilers (Michel 2020).



Figure 6: Mobile barns model HüMo Basis 225 (left), ROWA 100 (middle) and Rowa Flotter Hahn 100 (right)

Finally, the low-cost barns are mostly homemade installations with low automatism such as chicken tractors, modified construction site trailers and homemade mobile and static barns (figure 7). Peppe (2020) from Naples (IT) asks 2500-3000 € for his homemade trailers with 50-100 laying hens, while Rose Duncan in Georgia (US) builds his own chicken tractors for 5 \$ on average, where 15 laying hens can be kept (Rhodes 2017).



Figure 7: Homemade chicken tractor (left), homemade mobile barn (middle) and homemade static barn (right)

The FiBL (2017) gave clear instructions for the number and size of installations and surface areas of organic barns. It was required, for example, to offer roosting areas where broilers could perch and sleep during the night. The minimum perch availability must be of 5 cm per kg LW, with perches a minimum 15 cm from barn walls, with 25 cm between each other and 30 cm from the floor.

A minimum 2/3 of the floor must be composed of scratching surface and the ground slope in the barn must be 0%. The barn's ground surface must be properly bedded. Agricon (2010) described a proper bedding as materials which do not interfere with the health of humans and animals. Some materials to avoid it were, for example, newspaper, peat and other high dust producing beddings. Chopped straw, wood chips and straw pellets were examples of good bedding materials (Pieper and van der Linde, 2018). The bedding must help satisfy the poultry's need for scratching and pecking (exploration behavior) and dust bathing (Agricon, 2010). Pieper and van der Linde (2018) advised between 1 and 1.5 kg/m<sup>2</sup> bedding material with a bedding height between 3-5 cm. This amount of bedding could be left in the barn throughout the entire production period but for instances of highly dirty and highly moist spots, additional bedding should be applied. Pieper and van der Linde (2018) underlined the important water binding function of the bedding. Bedding should never capture and store the total moisture of a barn, only from the respiration of the broilers and rain days 100 liter water were produced per m<sup>2</sup> barn. To keep the bedding dry, an important factor was keeping the floor warm and isolated to promote microbial activity. The microbial activity was promoted through constant agitation and aeration of the bedding.

If the bedding also stimulated scratching and pecking behaviours, these activities guaranteed that enough air entered the bedding to bind moisture and to make it available to be removed from the barn (Pieper and van der Linde, 2018).

### **Barn climate**

To guarantee a hygienic and comfortable living space for the broilers, bedding was not the only factor to consider. The building and the installations had to be cleaned, disinfected and dried after every production cycle. The process used a high-pressure cleaner that washed the roof with low water pressure first, then the barn walls and the installations and finally the floor. After this process, called the main cleaning, the barn was dried then disinfected. Crivelli (2020) advised to use the product DS 60 disinfectant offered by FELA (see chapter "Feed and Water"). These products were used for water tubes too, to prevent the build-up of bacterial films, with the disinfectant staying in the tubes at least 24 hours. The disinfectant had to be removed from the tubes before the arrival of the next broiler batch. Once the disinfestation was complete, everything was dried a final time.

Just before the arrival of the broilers, it was important to aerate the barn, and to pre heat the barn to the optimal temperature. The optimal temperature changed depending on the age of the broilers and was outlined in table 2, translated from DLG (2017).

*Table 2: Advised barn temperature in broiler production*

<b>Age (days)</b>	<b>Target temperature with heating radiators (°C)</b>	<b>Target temperature with whole room heating (°C)</b>
1-2	31-32	32-34
3-4	30	31-32
5-7	28-29	29-30
8-14	26-28	27-29
15-21	25	25-26
22-28	24	23-24
29-35	20-22	20-22
36-42	19-21	19-21
>42	18-20	18-20

Another important climatic factor was air humidity, which increased with the length of the fattening period due to the respiration and the excreta of the broilers (Pieper and van der Linde, 2018). Air humidity was controlled through heating and air circulation. In summer, decreased air humidity and barn temperature was

achieved by sprinkling water on the roof of the barn (Pieper and van del Linde, 2018). The optimal air humidity in broiler barns is given in the following table 3, which was translated from DLG (2017).

*Table 3: Target relative air humidity in broiler production*

<b>Age (days)</b>	<b>Target relative air humidity (%)</b>
1-6	>55
7-13	60
14-20	67
>21	≤ 70

The last relevant climatic factor in broiler barns was light. The Swiss regulation imposed a minimum light intensity in the barns of 15 lux, with lower light intensities only during sleeping time (night) and in specific rest and retreat areas (Agricon, 2010). According to FiBL (2017), the maximum day length accepted for broilers was 16 hours and the light was delivered, preferably, with light bulbs or with high frequency light lamps to prevent flickering, which caused unrest for broilers and, in the worst case, feather peaking (Agricon, 2010; Pieper and van der Linde, 2018). Generally, the illumination technique had to fulfil the following criteria (Pieper and van der Linde, 2018):

- flicker free
- dimmable from 100 to 10%
- low maintenance costs
- easy automatization
- high energy efficiency
- acceptable investment costs

### **Outdoor areas**

FiBL (2017) gave precise directions for the outdoor climate area and the pasture. Both of them had to be accessible from the 21<sup>th</sup> day of life and the accesses must be the same for both pastures and outdoor climate areas: minimum width of 70cm per door and minimum 40 cm height. The surface of the outdoor climate area must be 50% of the barn floor minimum, while the minimum area of the pasture must be 1m<sup>2</sup> per kg LW. Additionally, the pastures had to offer shelters, like bushes, trees, under which they could hide if a predator was around (FiBL, 2017).

Enzo Ortelli wanted to use vineyards parcels 1600, 641 and 642 as outdoor poultry areas. The selected parcels were near the winery buildings (parcel 1581). In these parcels, he designed three areas for the broilers production (figure 8):

- vineyard West, 4005.87m<sup>2</sup> area and 264.75 m perimeter
- vineyard East, 952m<sup>2</sup> area and 163.73 m perimeter
- pasture without vineyard, 1059.34m<sup>2</sup> area and 198.77 m perimeter

The two vineyard sections (in blue) were two years old and produced 50% of the full harvest. The distance between rows was 1.80 m and the lowest grapes were expected to grow about 80 cm above the soil. These two blue areas were harvested at the beginning of September. The pasture (in red) could be used as outdoor area during the grapes harvest, so that the poultry was not disturbed. Additionally, from mid-April to mid-July the phytosanitary treatments were performed in the vineyards and the poultry could graze on the pasture marked in red (figure 8).





Figure 8: Surfaces of Ortelli Vini SA available for the broiler fattening.

Some main risks were connected with pasturing the broilers under these vineyards:

- picking of grapes before harvest
- compacting the soil
- predators as foxes, dogs, hawks, martens, badgers, crow birds and sea eagles (Pieper and van der Linde, 2018)

In case of predation or other losses, broiler carcasses could be delivered to the Eco-Center of City Mendrisio, which was responsible for the elimination of the dead animals (Città di Mendrisio, 2020). Unfortunately, it was not possible to purchase an insurance for the broiler flocks against predator attacks, only the broiler grower carried the risk of predation (Cambieri, 2020).

### Nutrients and fertilization

Ortelli Vini SA usually did not use fertilizers in vineyards because the parcels stock nutrients coming from the mowed grass originated from the weeding practices. They used fertilizers only in young vineyards (as in figure 8). Even with the maximum amount of nutrients applicable per ha in Swiss vineyards was 50 kg N, 27 kg P, 78 kg K and 25 kg Mg (Agridea, 2012), Ortelli Vini SA never applied more than 30 kg N and usually applies 250 kg/ha of the fertilizer Landor Special 6.8.21.

According to Agridea (2012a), 100 intensive 2kg LW broilers in a system with 8.5 flocks per year produced 800 kg of manure with 650 kg dry material. Every ton of manure contained 34 kg N, 20 kg P, 28 kg K and 5.6 kg Mg (Agridea, 2012a). Spring (2020) stated that free-range broilers eat on average 50% more feed than intensive broilers, that was why free-range broilers expelled 1.5 times more manure than intensive broilers. According to Ritz and Merka (2019), intensive broilers emitted on average 1.14 kg of manure per head. 1-6% of this manure was expelled into the outdoor areas in spring and summer, while in winter and autumn only 0.8-5% of this manure was expelled outside the barn (Menzi et al., 1997). These percentages varied from the flock sizes and the utilization of the outdoor areas (table 4). In a pasture-based system, the N stemming from the insects and the grass of the pasture was recycled and was not considered as an extra input for the fertilization of the wine trees. On the other way, N stemming from purchased feeds was an additional input to the production system.

*Table 4: Maximum reached % of animals using the outdoor area in three different experiments.*

<b>Highest % of animals using outdoor areas</b>	<b>Animal</b>	<b>Flock size (Animals x repetitions)</b>	<b>Source</b>
12.9	Laying hens	17 x 4	Fanatico et al., 2016
43	Broilers	20,000 x 40	Stadig et al., 2017
15	Broilers	20,000 x 40	Dawkins et al., 2003

According to Spring (2020), the values in table 4 differ greatly because the outdoor areas were differently enriched with trees or installations protecting the broilers and the laying hens from avian predators.

### **Feed and Water**

The amount of feed needed per broiler was measured with the feed-weight factor, which in free-range poultry was between 2.4 and 2.7 (Pieper and van der Linde, 2018). The cooperative FELA in Cadenazzo was the biggest agricultural cooperative in Ticino and sold feed from the company UFA. UFA offered feed specifically for free-range broilers depending on their production phase: UFA 636 broiler complete feed in crumbs and UFA 637 broiler complete feed in 3mm pellet (UFA, 2020). To feed broilers, the indications given by FiBL (2017) suggested that broilers in organic conditions should have at least 2.5 cm feed trough space per kg LW. In circular feeders, broilers should have 1 cm space per kg LW available.

Pastures were a source of feed too, as pastured broilers could eat grass, insects and harvest residues (Rosati et al. 2015; Stalder, 2020; Werro, 2019; Jakob, 2020). Jakob (2020) fed his laying hens 1 kg wheat meal for every 250 hens, with the rest of the intake provided by the pastures. To permit an acceptable protein intake, Jakob (2020) putted around 100 kg of fresh manure under the fruit trees four months before putting the hens in the pasture. The worm population in the manure increased during these four months and was available for hens to help, in addition to feeding, fulfilling peaking and pawing behavioural need.

Aside from feed, water was a basic need for broilers and in Switzerland, it costed 0.002 chf/l (SSIGA, 2018). The water needs for broilers were outlined in the following table 5, translated from DLG (2017).

*Table 5: Average water intake of broilers*

<b>Age (days)</b>	<b>Daily water need for 1000 broiler (litres)</b>
7	58 – 65
14	102 – 115
21	149 – 167
28	192 – 216
35	232 – 261
42	274 – 308
49	309 – 347
56	342 – 385

For the water supply, FiBL (2017) suggested offering at least one nipple-drinker for every 15 animals, while in the case of circular drinkers, the minimum accepted for organic farms was 0.8 cm per kg LW.

### 3.5. Value chain

The first important input into a broiler farm were the broiler chicks. The company Wüetricht sold 1-day old broiler for 2 chf/head with home delivery (Wüetricht, 2020), while the company Geisser-Trupro sold 21 days old chicks of the breeds SASSO, ROSS, REBRO and others for 5 chf/head. The transport costed 30 chf/batch (Geisser-Trupro, 2020; Minoggio, 2020).

In Ticino, there were three weights at which poultry was easily sold: the “galletto” form, between 450 and 700 g SW, the normal Swiss broiler, between 1.1 and 1.5 kg SW and finally the “cappone”, big broilers of 2.5 kg SW consumed mostly at Christmas (Scotti, 2020). On average, the SW was 70% of the LW (Schäublin, 2019).

Once the desired weight was achieved, the broilers had to be slaughtered and packaged by certified poultry slaughterer and poultry meat processors (Scotti, 2020; Swiss Federal Council, 2008a). In Ticino, only Claudio Guerra of the farm La Ciossa in Cadenazzo offered this service. Guerra (2020) asked 5 chf/broiler, with additional services like packaging, cutting the carcasses, and vacuuming costing 1 to 2 chf pro broiler more. Kopp (2020) in Canton Bern asked 2.70 chf/broiler. The slaughtering with vacuum packaging costed in total 5 chf/broiler. He additionally asked 2.70 chf/broiler for the processing in pieces and 0.60 chf/wing for the wings deboning. Finally, in Lenzerheide, Canton Graubünden, Leppkes (2020) could slaughter 200 broilers per day for 5 chf/broiler, but he did not offer any transformation and packaging service. Leppkes (2020) was involved in an innovative project in Switzerland. His idea was to deliver a slaughter service to the producers with a 3.2 tons heavy mobile poultry slaughterhouse that could slaughter 800 geese, ducks, chickens, broilers and quails a day. He asked 12, 8, 5, 5 and 3.5 chf/head, respectively, plus a flat displacement fee of 200 chf. He had all the permissions and certificates necessary to start the project and the only thing missing were 80,000 chf for the mobile poultry house. The benefits of this mobile slaughter system were that the added value of the poultry meat stayed on farm and the farmers had no costs of transportation and displacements.

Once the poultry was slaughtered, the mid-size meat processor in Castel San Pietro “Salumificio del Castello” offered to stock the already packed broilers in their industrial freezers. They asked 20 chf to put a euro-pallet into the freezer and 20 chf to remove it. Additionally, they ask 0.6 chf/kilo stored goods/year (Scotti, 2020).

Scotti (2020) stated he was interested in buying all the produced broilers and be responsible for sales, so that Enzo Ortelli did not need to lose time with marketing. Normally, he sold broilers to other butcheries for 13.5 chf/kg but in the case of Enzo’s broilers, he aimed to sell the broilers at least for 18 chf/kg.

#### Value chain simulation

The main focus of Ortelli Vini SA had to be the wine, which was why broilers should require as little time as possible for the company workforce. At the same time, Enzo Ortelli wanted to keep the broilers in the most sustainable way as possible. Every decision was made based on Organic regulations, if decisions were impossible to put in practice, RAUS regulation were followed, followed by BTS, and by conventional regulations.

Keeping this in mind, it was decided to keep the broilers with a homemade mobile barn constructed by Enzo Ortelli and his brother Lucio Ortelli (figure 9). This mobile barn was constructed on a 4x2 trailer; however, the available indoor area for the broilers was 11m<sup>2</sup> because Enzo Ortelli constructed an additional floor at 70 cm height to respect the indication of FiBL (2017). The available surface allowed raising 150 conventional broilers or 100 organic broilers with 2.2 kg LW. For the initial simulation, only 62 broilers were purchased.

Enzo Ortelli purchased the construction material mainly from the company Rezzonico SA and some material was available directly from friends. The feeders, the drinkers and the heating lamps were purchased from the Italian company Arion-Fasoli, while the hay feeder, the mineral pick stone, the automatic door opener and the solar panel for the electric fence were purchased from the Swiss



Figure 9: Unfinished mobile broiler barn during the first driving test.

company Hauptner AG. The fencing material was purchased from Rovagro AG.

The company Geisser-Trupro AG delivered 62 broiler chicks; 33 ROSS308, 16 SASSO, 10 Cou-nu pate-noire (Naked-neck black-paw) and 2 undefined breeds (figure 10) on 12.05.2020.



Figure 10: From the left: ROSS308 broiler, SASSO broiler and Cou-nu pate-noire broiler.

The ROSS308 broilers were an intensive breed, the SASSO broilers were a semi-extensive breed while the Necked-neck black-paw were an extensive breed. Weekly weightings (figure 12) that showed a better fattening performance by the ROSS308 compared to the other breeds (figure 11) confirmed this.

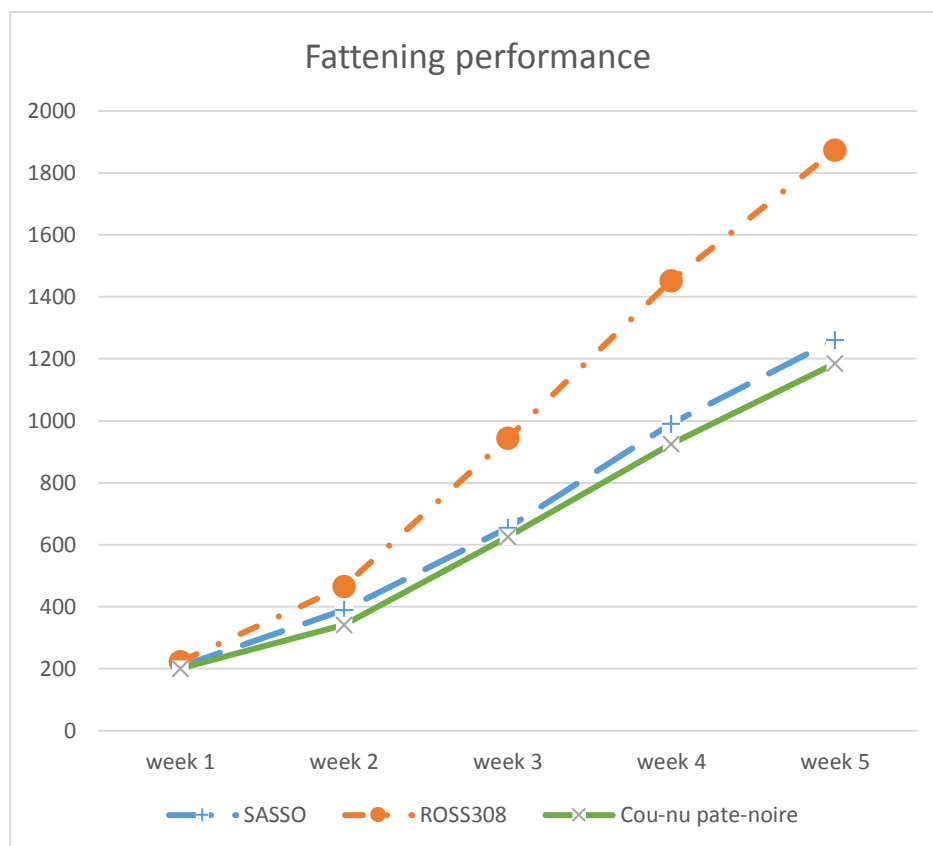


Figure 11: Graphic of the fattening performance of the breeds ROSS308, SASSO and Cou-nu pate-noire

At principle, two broiler breeds with an age of three weeks were ordered from Geisser-Trupro AG. Sadly, their transporter did not delivered at home but more north to another farmer and the chicks price was more as agreed. Additionally, the broilers were visibly not of the same age (min. weight 136 g and max. weight 316 g). This poor communication created further challenges related to feed, which was not suitable for the young chicks, and to the housing, as the broilers were notably stressed from the cold during the night.

All the feeds and the chopped straw for bedding were delivered by FELA. The feed used for the first three weeks was an UFA 513 complete meal for broilers. After the third week, the broilers received UFA 506 complete 3mm pellets mixed with flocked maize and milled barley. The water and the feed were available





*Figure 12: Enzo Ortelli during a weekly weighting with the new poultry weight scale from Arion Fasoli SA*

ab-libitum and 2 cl apple vinegar every 5 l of water was added as vermicide. Because of Covid-19, there were some delays with the fencing material, which arrived late and was complete only the 28.05.2020. From the 29.05.2020 on the broilers had daily access to pasture from 07:00 to 20:00. Before releasing them onto pasture daily, they were acclimated to the outdoor environment on 19.05.2020, 26.05.2020 and 28.05.2020. The broilers had access to the outdoor for 3 hours while one person was physically present to discourage fox attacks, seeing that the solar panel for the electrical fencing had not arrived yet. Nevertheless, Enzo Ortelli seeded grass mixes in some of his vineyard surfaces to promote short grass species that did not interfere with the roots and the leaves of the vineyard stumps, the seeding was normally done in October after the grapes harvest. Crop farmers in Switzerland seeded wheat, barley and other grains in the same time of the year. Enzo Ortelli had the idea to introduce wheat seeds into the grass mixes he used usually so that these plants would be eaten by the poultry in spring, as a source of highly absorbable sugars.

The 10.06.2020 Lucio Ortelli slaughtered eight ROSS308 broilers in his house yard. These broilers were cooked by Lucio Ortelli the 11.06.2020 and served to 9 randomly selected people plus 2 representatives of the meat industry, Emanuele Scotti of the Salumificio del Castello and Nadine Beierlein of Bell AG. The guests had to taste the meat to judge its quality and they had to indicate their willingness to buy the product and for which price. The results of the questionnaire are presented in appendix 14 and the questionnaire itself is shown in appendix 13. It is interesting to mention that the average willingness to pay a whole carcass ready to cook was 18.42 chf/kg. The guests mentioned their willingness to buy the vineyard poultry mostly in 1.2 kg carcasses (7 of 11 guests), in parts (breasts, legs and wings) and as gift package with other products (both 4 of 11 guests). 700g and 2.5kg carcasses seemed to be of less interest for the consumers.

The further broilers were taken to the certified slaughterer Claudio Guerra in Cadenazzo on Monday 22.06.2020 at 07.20. Mr. Guerra and his staff slaughtered the broilers in their slaughtering plant; they prepared six broilers in pieces while the others were prepared in carcasses. On Tuesday 23.06.2020, the driver of Salumificio del Castello stopped at the slaughterhouse and he collected the prepared meat to bring it in Castel San Pietro for the storage in the industrial freezers.

### Costs of the project

Most of the material bought for the project and for the value chain simulation was purchased in Switzerland. Some installations were purchased in Italy from the company Arion-Fasoli SA using the exchange rate of 03.06.2020 at 11:20 AM (1 € = 1.08 chf).

*Table 6: Inputs and prices for the realization of the trailer used as broiler barn.*

Item	Price (chf)	Deliverer	Appendix
Basis trailer	50	Enzo Ortelli	-
Roads for trailer	80	Enzo Ortelli	-
Paint for basis trailer and wooden parts	150	Rezzonico SA	-
Construction material	2510.7	Rezzonico SA	Appendix 2
Installations from Italy	393.93	Arion-Fasoli SA	Appendix 3
Transport	161.89	Arion-Fasoli SA	Appendix 3
Customs clearance	250	Franzosini SA	-
Installations from Switzerland	352.65	Hauptner AG	Appendix 4

Table 6 shows inputs needed to construct the broiler trailer, with a total cost of the material of 3949.17 chf. The construction needed 60 hours of work, Enzo Ortelli and his brother Lucio Ortelli worked for free, but if the 60 hours of construction were calculated with the minimum agricultural salary of 25 chf/hour, the cost of the barn would increase up to  $3949.17+60 \times 25 = 5449,17$  chf.

*Table 7: Inputs and prices for the realization of the fences of the pastures and of the vineyards.*

Item	Price (chf)	Deliverer	Appendix
8 wooden poles	92	Rezzonico SA	Appendix 2
Solar panel and battery for electrical fencing	635	Hauptner AG	Appendix 4
Fencing	417	Rovagro AG	Appendix 5

In table 7, the inputs and the prices for the realization of a 150 m poultry specialized fencing are listed. The total cost of the fencing was 1144 chf. Enzo Ortelli, besides the wine activity, owns a company specialized in fencing called Enzortelli Sagl, which was why he wanted to create a professional electrical fencing with wooden poles and base-fixation to guarantee that foxes could not walk under the fencing to build the fencing, Enzo needed 4 hours and worked with specialized machines. His tariff for the machines was 40 chf/hour and if we considered the minimum agricultural salary of 25 chf/hour, the cost of the fencing would increase to  $1144+4 \times 40+25 \times 40=2304$  chf.

*Table 8: Feed and broiler prices*

Item	Price (chf)	Deliverer	Appendix
Feed	406	FELA	Appendix 6
Bedding	210	FELA	Appendix 6
Broilers	210	Geisser-Trupro AG	Appendix 7
Transport broilers	30	Geisser-Trupro AG	Appendix 7

The prices for feed, bedding and the 62 purchased broilers are given in table 8. The broilers were sold with a discount because Geisser-Trupro AG did not delivered the right breeds and the animals were younger than expected. Too much feed was purchased because older animals were expected. The young two weeks old animals did not appreciate the 3 mm pellet feed and consequently new feed in form of meal was purchased. Additionally, Enzo Ortelli wanted to try other feeds, like whole corn and flocked maize, because of his future goal of feeding the broilers with indigenous feed coming uniquely from Canton Ticino. Additionally, Enzo Ortelli purchased more chopped straw than needed because he wanted to have enough reserve to be potentially able to bed 15 kg of chopped straw once a week. When the broilers were inside 24 h/day, it was

good to change the bedding completely. When the broilers had 12h/day pasture access, the bedding was dry, and it needed only a 3 kg weekly refill. The total cost for feed, bedding and 62 broilers was 856 chf.

Consequently, the construction costs where in total  $3949.17+1144=5093.17$  chf and the whole value chain simulation costed  $3949.17+1144+856=5949.17$  chf without considering the working hours.

### **Economic evaluation**

The profitability of the simulated production system was evaluated with the adapted calculation sheet of Peter Spring, poultry specialist at the agricultural faculty of the University of Applied Sciences for Agricultural, Forestry and Food Sciences BFH-HAFL of Zollikofen, who enabled his students to use it during his module “Geflügel produktion und Futtermittelkunde BLAn114” (appendix 8).

In the evaluation, the depreciation of the buildings and the installations was 5 years. The target weight was considered 2.2 kg and the obtained carcasses were estimated to be 70% of the LW so 1.54 kg. The slaughter costs were estimated to be 7 chf per head and the extra direct costs like water and electricity estimated to be 150 chf. No expenditures were considered for the working hours related to the broiler production.

The adapted model indicated, that the 62 broilers need to be sold for 25 chf/kg SW to cover all the production costs, with every 1.54 kg carcass sold for 38.54 chf. This price was high for poultry meat, but not too high to be asked for extensive broilers that pastured under vineyard. It was assumed that consumers buying Swiss wine for 16 to 24 chf per 0.75 litre wine bottle had also the purchase power to pay 38.54 chf for innovative poultry meat.

For income, it was not considered how much money was saved thanks to the pasturing under the vineyards; more research should be done about this topic. According to Di Filippo (2020) and Rosati et al. (2015), poultry decreased fertilization, weed control and phytosanitary treatments costs to one third of initial expenses. The costs for fertilization, weed control and phytosanitary treatments in Ortelli Vini SA were presented in the following chapter:

Ortelli Vini SA and Enzortelli Sagl sold vineyard services for 80 chf/hour (40 chf/machine hour + 40 chf/hour work force). Firstly, the workload for the fertilizers spreading in vineyards was 3 hours per ha per year and the cost of fertilizers was on average 175 chf per ha per year, giving an actual cost of  $80*3+175=415$  chf/ha/year fertilization costs. Secondly, the workload for the phytosanitary treatments in vineyards was 35 hours per ha per year and the cost of chemicals was on average 1600 chf/ha/year, giving an actual cost of  $80*35+1600=4400$  chf/ha/year phytosanitary treatments. Finally, the workload for the weeding practices in vineyards was 7 hours/ha/year and the cost of weeding chemicals was on average 150 chf per ha and year giving an actual cost of  $80*7+150=710$  chf/ha/year weeding practices. If weeding was done mechanically and not chemically, the Government of Ticino payed 600 chf/ha direct payment.

The total cost for fertilizing, weed control and phytosanitary treatments was consequently on average  $415+4400+710=5525$  chf/ha/year. If, according to Di Filippo (2020), one third of fertilizing, weed control and phytosanitary treatments costs can be decreased thanks to the pasturing of poultry under the vineyards, Ortelli Vini SA could save maximum  $5525/3= 1841.67$  chf/ha/year. This value was not considered further because it had to be researched in greater detail for Ortelli Vini SA.

## 4. Recommended production system

The recommended production system must, as primary goal, not negatively influence the workload of the wine producer because his priority must remain the wine business. Therefore, practices that lower administrative and practical workload are preferred in this production system. The following information can be adapted with the agronomic broiler excel tool developed for this project (appendix 12)

First, it is advised to buy a pre-constructed broiler trailer from a specialized company like ROWA and Hühnermobil. The ROWA mobile barn Flotter Hahn 100 costs 18,822.45 chf with delivery (appendix 9), ready for production and it can hold 214 broilers while still abiding by organic regulations. It is advised to keep an organic flock (smaller than conventional flocks) to increase the available space for the animals and to decrease the risk of disease. It is also advised to buy the electric option to automatize the light program and the pasture opening, so that the wine producer do not have to lose time on it daily (4,216.54 chf). Additionally, 7 fences (139x6=973 chf) from Rovagro AG are needed and the solar panel with the battery (635 chf) from Hauptner AG to power the fencing. Consequently, the building costs are 18,822.45 chf and the installation costs are  $4,216.54+973+635= 5824.54$  chf.

Seeing that the first experiment with Geisser-Trupro AG was not satisfactory, to avoid any time losses related to chick delivery, it is advised to work with intermediaries in the region such as Crivelli (2020), who have the ability to correct the errors of Geisser-Trupro AG, even if they cost 2-3 chf more per head. In other words, it is advised to work with intermediaries that are equipped to raise chicks for a short/mid period, in order to deliver 300 g 21-day-old chicks, which are ready to enter in the vineyards on day 1 of the production cycle. In the case of Mendrisiotta, Crivelli (2020) is an intermediary based in Bioggio, a village between Mendrisio and Lugano. In case of problems, Crivelli (2020) is only 20 minutes far away from Ortelli Vini SA, unlike Geisser-Trupro, which is 2 hours 55 minutes far away from Mendrisio. To guarantee a fast production batch, it is advised to work with intensive breeds like ROSS308, so that the feed conversion ratio is lower than extensive breeds (less feed input) and so that the wine producer has the animals on farm for a shorter time (fewer working hours). The ideal batch duration is three weeks (the broilers will be 6 weeks old).

To feed the broilers, it is recommended to work with the cooperative FELA, which can deliver the desired amount of feeds. To feed 214 broilers and considering that their extensive feed conversion index is 2.7, it is recommended to plan for 1000 kg of feed. The first 100 kg should be four 25 kg bags of UFA 513 complete meal for broilers, to guarantee a feed intake from young age. Once these are finished, it is possible to provide 900 kg UFA 506 complete 3mm pellets *ab libitum* until the last five days of production. Seeing that these feeds contain coccidiostatic, a preventive chemical measure against protozoal coccidiosis in the digestive tract of poultry, two bags of UFA broiler feed without coccidiostatic should be fed to avoid residues in the meat. FELA can deliver the bedding material too. As bedding material, spelt skins are good options because of their low dust content and it should be removed only once, after the broiler slaughtering.

It is advised to plan for four batches of broiler per year. The first batch should be introduced at the beginning of September so that the broilers can graze the vineyards that are harvested first. The last batch should be slaughtered before mid-April when the phytosanitary treatments of the wine trees begin and there is the risk of contamination and respiratory issues for the broilers.

The minimum advised pasture surface is 1m<sup>2</sup> pasture per kg LW. During the winter and the beginning of the spring, it is possible to give more space by changing the pasture only every two weeks. The broilers will have small amounts of weeds available and will eat the young grass sprouts without being selective. This would guarantee a reduced grass growth during spring. When the grass begins to grow intensively in March and April, it is advised to fence smaller areas than 1m<sup>2</sup> per kg LW. With too much space available, broilers would be too selective and the undesired weeds would grow without competition. In smaller areas, broilers are less selective and eliminate all the undesired weeds as feed or through trampling. In this case, it is required to move the fences once a week or even every four days. According to Spring (2020) and Ritz and Merka (2019), free-range broilers defecate 1.4 kg manure, but only 4% is ejected in the pastures. Consequently, the 214 broilers will eject totally 243.96 kg of manure with 65% dry matter, giving in total 158.57 kg of manure (Agridea, 2012). In the recommended production system, they will produce an estimated average of 105.72 kg of manure, because 1/3 of it will be ejected in their first 3 weeks of life on other farms. Only the 4% (4.23 kg) is ejected directly in the vineyards. The rest is mixed with the bedding

and can be applied wherever the vine producer needs it. Considering this, the poultry are consequently ejecting  $3.4\% * 105.72 = 3.6$  kg N,  $2\% * 105.75 = 2.1$  kg P and  $2.8\% * 105.75 = 2.8$  kg P, of which only 144 g N, 84 g P and 112 g K reach the soil directly. The 3.6 kg produced N is enough to fertilize 1,200m<sup>2</sup> of vineyard.

The average time need to manage the broilers is 30 minutes per day (Werro, 2020). In this time, the following practices are possible:

- 15 minutes daily check
- once a week feed and water refill
- 15 minutes evening checks the first week of production (to be sure that all broilers got inside)
- disinfecting and bedding before every batch arrival
- manure removal after every batch
- transport of the broilers from the farm to the slaughterer
- Fencing and barn displacement to new pastures

The profitability of this system is shown in appendix 11, where it is possible to see that with such a production system. With an assumed fattening performance of 60 g per day and a feed conversion value of 2.7, the wine producer has to keep the broilers for a maximum 31 days on his vineyards and consequently he will need 16 hours of work. If this work is valued at 25 chf/hour and four batches of 214 broilers are raised every year the vine producer can sell the whole broilers at a price of 17.5 chf/kg to cover his production costs, asking a price per 1.5 kg carcass of 26.95 chf. This price is competitive for the Swiss free-range broiler market, mostly because it comes from a production system that is perceived as sustainable by consumers. Additionally, the people that can afford Swiss wine can also afford a vineyard pastured broiler for 27 chf. It is advised to raise the broilers in vineyards near the winery, to improve the wine image and to impress the wine buyers, which are potential broiler meat consumers.

## 5. Conclusions

The research question on which this paper is based was the following: how can broilers increase the environmental, social and economic sustainability of conventional wine producers in Ticino?

### **Environmental Sustainability of the project**

From an environmental point of view, the introduction of broilers into Ticino vineyards is an opportunity to decrease herbicides use because of the weeding control service provided by the broilers, and secondly, to decrease the use of artificial fertilizers thanks to poultry excreta. Finally, broilers can guarantee a certain level of pest control, leading to a decrease of pesticide use. Decreasing the spreading of herbicides, fertilizers and pesticides means that machines are also used less, indirectly decreasing the need for diesel and labour. Reducing the machine time on the vineyards soils also decreases the risk of soil compaction, helping it stay porous and be more efficient in water and nutrient storage, while encouraging biodiversity. This rich biodiversity, mostly the micro-fauna in the soil, can be controlled and consumed by poultry.

### **Social Sustainability of the project**

According to what has been discussed, decreasing use of machinery decreases labour, leading to the same output with fewer working hours. This give the opportunity to work with less stress and to pay the workers more for the same performance. The systems also provides a socially acceptable salary for the producer (25 chf/h) and a socially acceptable level of animal welfare.

Additionally, human edible food losses are taken up by the broilers. With such a production system, the grapes that cannot be used for wine and the pressed grapes can be fed to broilers, thus making them available to humans as poultry meat. The social concern of land-use designated to livestock is solved too, as the broilers are not occupying land that could be used for human food production. In this system, in fact, broilers graze on the same surface as human edible food and at the same time.

Concerning the missions of agriculture in the Swiss Confederation, this production system contributes to the provision of the population with foodstuff because more food is produced per unit of land. Additionally, this project can generate additional monetary income for wine producers guaranteeing their upkeep in the countryside and their decentralized settlement in the Canton.

### **Economic sustainability of the project**

From an economic point of view, this production system requires a low amount of additional labour. Additionally, the labour force can be payed decently because of the high price and the high demand for free-range broilers. In addition, decreasing the use of herbicides, fertilizers, pesticides, diesel and working-hours is a remarkable saving opportunity. Besides that, the broilers pasturing under the wine trees improves the public image of the wine and can be used as marketing tool to sell more wine or to sell wine for a higher price.

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one\_del\_pascolo\_in\_allevamenti\_avicunicoli\_free\_range/links/5616193708aed47facf01cf6/Manuale-di-progettazione-del-pascolo-in-allevamenti-avicunicoli-free-range.pdf?origin=publication\_detail [Accessed on 15.05.2020]

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## 7. Appendices

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## **Appendix 1: Questions for interview with Emma Di Filippo and Aurelian Stalder.**

### **Domande per Agricoltori Internship**

#### Azienda

- Quali betriebszweige?
- Label?
- Quanti ettari?

#### Pollame:

- Che tipo di pollame?
- Quanti capi?
- Quanti all'ettaro?
- Razza?
- Come garantite nachzucht? Selbstgemacht oder einkauf?
- Se einkauf, da chi si rifornisce?
- Cosa vende del Pollame? (uova, poletti, pita, in pezzi, carcasse intere,...)
- A che età del pollame macella?
- A che peso vivo?
- Con che peso morto si può contare?
- Quali criteri dettano la macellazione? Il peso, o il periodo dell'anno, o...
- Viene tenuto tutto l'anno o in periodi precisi?

Qual è lo scopo aziendale per la tenuta dei volatili (\$, immagine, meno lavoro,...)

Quali sono le Sue priorità relative al pollame? (businnes, animal welfare, Kundenfreude, ...)

#### Pascolo:

- Quando apre al mattino?
- Quando chiude la sera?
- Anche in inverno?
- Sempre la stessa superficie?
- Sotto che tipo di coltura?
- Non ha paura che i polli mangino foglie o frutta degli alberi/ceppi?
- m<sup>2</sup> di pascolo pianificati per i volatili?
- Posso fare foto?
- Ha problemi con predatori?
- Se sì quali?
- Se sì come li previene/combatte?
- Seminate colture erbacee apposite per i volatili?
- Se sì quali?

#### Stalla

- È mobile o fissa?
- Comperata così o home made?
- Se si sa, quanto è costata?
- Esiste un piano?
- Posso fare foto?

### Foraggio

- Basa il suo foraggio solo sul pascolo?
- Se no, che foraggio da?
- Foraggia anche avanzi di produzione (acini spremuti, verdure eliminate, frutta non vendibile, ...)?

### Feci

- Come gestisce feci dei volatili?
- Per caso fa dei calcoli?
- Se si posso averne accesso?

### Arbeitsbelastung

- Quante ore di lavoro le prende il pollame al giorno/al mese? Pensa che fertilizza meno?
- Pensa che usa meno prodotti fitosanitari?
- Pensa che deve usare meno le macchine per il controllo delle erbe?
- Pensa che tenere volatili nel frutteto/vigna risulti in meno ore di lavoro nella vigna?

### Catena di valore aggiunto/ Wertschöpfungskette

- Chi fornisce i volatili?
- Chi li alleva? (voi direttamente, operaio, contoterzista,...)
- Necessita spesso di cure veterinarie?
- Da chi?
- Chi li macella?
- Chi lavora le carcasse?
- Chi li impachetta?
- Chi si occupa della vendita?
- Chi si occupa del marketing?
- Vengono usati metodi di marketing particolari? (social network, website, newsletter, ...)

### Rentabilità

- Ritiene il sistema rentabile?
- Riesce a risparmiare su pesticidi, erbicidi e fertilizzanti?
- A che prezzo vende i suoi output? (Carne, uova, animali vivi)
- Pensa che il mercato dei suoi prodotti è saturo?
- Ha già pensato di ingrandire l'allevamento di pollame?

### In generale cosa sono i pro?

### E i contro?

### **Foto!**

## Appendix 2: Invoices Rezzonico SA

**REZZONICO**  
SERVIZI E MATERIALI PER L'EDILIZIA

Pagina  
1 / 2

**KOPIE**

CONTANTI  
ORTELLI ENZO SERVIZI SAGL  
CORTEGLIA

Fabio Rezzonico & Co  
Via Penate 9  
6850 Mendrisio

xxxxxxxxxxxxxxxx Cliente xxx

Transazione  
V PAY contactless  
4878 8000 XXXX XXX5 408

28.04.2020 16:43:10  
Trn-Id: 10106978  
AID: A0000000032020  
Contatore Trx: 4095  
Codice Autorizzaz: 103756

Totale EFT CHF: 2'914.00

Arrivederci e Grazie  
091/640.37.40  
info@rezz.ch

La ringraziamo per avere scelto i nostri prodotti e servizi e Le inviamo la seguente fattura:


Descrizione	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Basato sulla Consegna 150496 del 28.04.2020.					
Ns.Art:101639 Gr: G-015.22					
1 ONDULATO TRANSLUCIDO VERDE H.300	30.000	M2	14.00 /M2	35.00	273.00
Lung: 3.000		1.00			
Ns.Art:101630 Gr: G-015.21					
2 LASTRE LAMIERA COLORATA 3.00 X 0.90	6.000	PZ	74.25 /PZ	25.00	334.13
Lung: 3.000		1.00			
Ns.Art:102295 Gr: G-018.0					
3 LISTELLI ABETE 40/50 ML 5	60.000	ML	1.35 /ML	35.00	52.65
Lung: 5.000		12.00 PZ			
Ns.Art:101169 Gr: G-012.23					
4 RETE TEKTA K335 MM 8 (15x15)	1611.000	KG	2.00 /KG	40.00	1'933.20
kg: 53.70 Lung: 5.000 Larg: 2.000		30.00 PZ			
Ns.Art:111431 Gr: G-020.03					
5 IMPREGNANTE ACQUA QUERCIA LT.4	2.000	PZ	42.00 /PZ	5.00	79.80
Ns.Art:107858 Gr: G-020.0					
6 SPRAY MAURER ML.400 VERDE MUSCHIO R.6005	1.000	PZ	5.72 /PZ	20.00	4.58
Ns.Art:100819 Gr: G-008.25					
7 VITI TORX ZINC. 5/ 60	200.000	PZ	5.70 /100	30.00	7.98
Ns.Art:102639 Gr: G-023.0					
8 SPRAY SBLOCCANTE WD40 ML.500	2.000	PZ	14.60 /PZ	30.00	20.44

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MATERIALI DA COSTRUZIONE - CARPENTERIA - COPERTURA TETTI - RIVESTIMENTI FACCIATE - SOFFITTI - CAMINI - STUFE - CANNE FUMARIE - BARBECUE  
SCALE - PAVIMENTI IN LEGNO E SOPRAELEVATI - MOQUETTE - PVC - PISCINE - VASCHE BENESSERE - PERGOTENDE - VELE OMBREGGIANTI

**FABIO REZZONICO+CO** Via Penate 9 - CH 6850 Mendrisio - P.O. Box 1755 - Tel. +41(0)91 640 37 40 - Fax +41(0)91 640 37 49  
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Data	Pagina
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Contanti

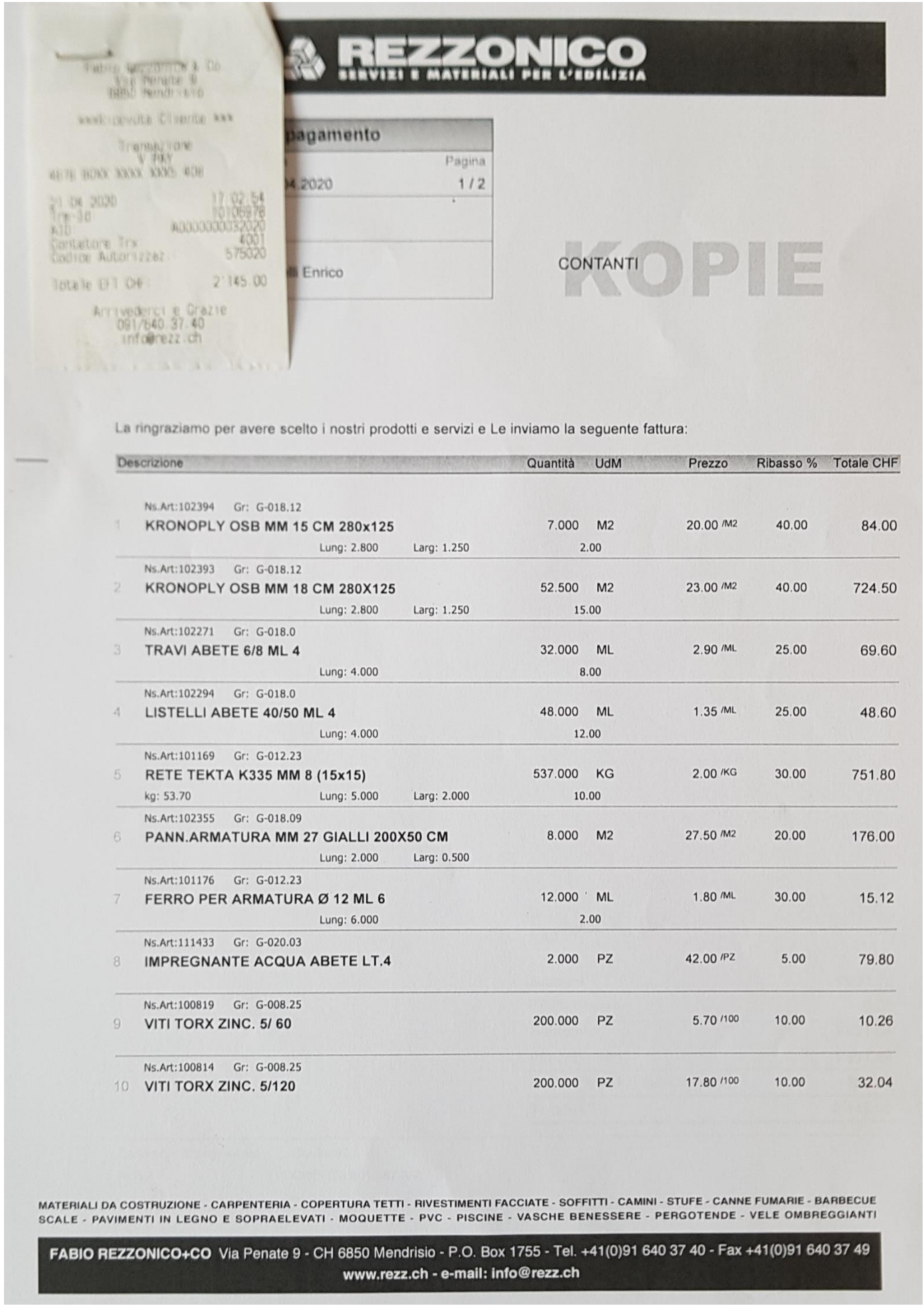
re scelto i nostri prodotti e servizi e Le inviamo la seguente fattura:

	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Basato sulla Consegna 151198 del 08.05.2020.					
	Ns.Art:101169 Gr: G-012.23				
1	RETE TEKTA K335 MM 8 (15x15)	698.100 KG	1.10 /KG		767.91
	kg: 53.70 Lung: 5.000 Larg: 2.000	13.00 PZ			
	Ns.Art:102272 Gr: G-018.0				
2	TRAVI ABETE 6/8 ML 5	60.000 ML	2.90 /ML	30.00	121.80
	Lung: 5.000	12.00 PZ			
	Ns.Art:106210 Gr: G-030				
3	VALVOLA A SFERA 42034 - 3/4" F X 3/4" f - PP	1.000 PZ	22.80 /PZ	45.00	12.54
	Ns.Art:102001 Gr: G-030				
4	TEE FEMMINA 7742 32 X 3/4" F X 32"	1.000 PZ	10.00 /PZ	45.00	5.50
	Ns.Art:106244 Gr: G-030				
5	RACCORDO MASCHIO 7542 - 32X3/4" M	1.000 PZ	5.00 /PZ	45.00	2.75
	Ns.Art:106250 Gr: G-030				
6	RACCORDO FEMMINA 7642 - 32X3/4" F	1.000 PZ	5.50 /PZ	45.00	3.03
	Ns.Art:100813 Gr: G-008.25				
7	VITI TORX ZINC. 6/ 60	200.000 PZ	8.10 /100	20.00	12.96

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Fabio Rezzonico & Co.  
Via Penate 9  
6850 Mendrisio

Transazione  
V PAY  
4078 80XX XXXX XXX 408

21.04.2020 17:02:54  
Trx-ID: 10105878  
AID: 40000000032020  
Contatore Trx: 4001  
Codice Autorizzaz.: 575020

Totale DTI CHF: 2'145.00

Arrivederci e Grazie  
091/640 37 40  
info@rezz.ch

Pagamento	
21.04.2020	Pagina 1 / 2
Enrico	

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La ringraziamo per avere scelto i nostri prodotti e servizi e Le inviamo la seguente fattura:

Descrizione	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Ns.Art:102394 Gr: G-018.12 <b>1 KRONOPLY OSB MM 15 CM 280x125</b> Lung: 2.800 Larg: 1.250	7.000	M2	20.00 /M2	40.00	84.00
Ns.Art:102393 Gr: G-018.12 <b>2 KRONOPLY OSB MM 18 CM 280x125</b> Lung: 2.800 Larg: 1.250	52.500	M2	23.00 /M2	40.00	724.50
Ns.Art:102271 Gr: G-018.0 <b>3 TRAVI ABETE 6/8 ML 4</b> Lung: 4.000	32.000	ML	2.90 /ML	25.00	69.60
Ns.Art:102294 Gr: G-018.0 <b>4 LISTELLI ABETE 40/50 ML 4</b> Lung: 4.000	48.000	ML	1.35 /ML	25.00	48.60
Ns.Art:101169 Gr: G-012.23 <b>5 RETE TEKTA K335 MM 8 (15x15)</b> kg: 53.70 Lung: 5.000 Larg: 2.000	537.000	KG	2.00 /KG	30.00	751.80
Ns.Art:102355 Gr: G-018.09 <b>6 PANN.ARMATURA MM 27 GIALLI 200X50 CM</b> Lung: 2.000 Larg: 0.500	8.000	M2	27.50 /M2	20.00	176.00
Ns.Art:101176 Gr: G-012.23 <b>7 FERRO PER ARMATURA Ø 12 ML 6</b> Lung: 6.000	12.000	ML	1.80 /ML	30.00	15.12
Ns.Art:111433 Gr: G-020.03 <b>8 IMPREGNANTE ACQUA ABETE LT.4</b>	2.000	PZ	42.00 /PZ	5.00	79.80
Ns.Art:100819 Gr: G-008.25 <b>9 VITI TORX ZINC. 5/ 60</b>	200.000	PZ	5.70 /100	10.00	10.26
Ns.Art:100814 Gr: G-008.25 <b>10 VITI TORX ZINC. 5/120</b>	200.000	PZ	17.80 /100	10.00	32.04

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Nr. documento	Data	Pagina
1097624	19.05.2020	1 / 1
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Persona da contattare		
Pereira Horacio / Borrelli Enrico		
pereira@rezz.ch		

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Descrizione	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Basato sulla Consegna 151929 del 19.05.2020.					
Ns.Art:103102 Gr: G-023.0					
1 CASSA MALTA PLASTICA LT.150 80X63X38	2.000	PZ	44.20 /PZ	35.00	57.46
Ns.Art:102294 Gr: G-018.0					
2 LISTELLI ABETE 40/50 ML 4	48.000	ML	1.35 /ML	35.00	42.12
Lung: 4.000					
12.00 PZ					
Ns.Art:100854 Gr: G-008.25					
3 VITI TORX RAPID ZINC. 6/140 HBS	100.000	PZ	36.10 /100	40.00	21.66
Ns.Art:100813 Gr: G-008.25					
4 VITI TORX ZINC. 6/ 60	200.000	PZ	8.10 /100	40.00	9.72

Subtotale	130.96
0.74 % Ribasso	-0.97
Subtotale	129.99
Importo netto	<b>129.99</b>
IVA 7.7% (A10) sul 129.99	10.01
<b>Totale CHF</b>	<b>140.00</b>

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MATERIALI DA COSTRUZIONE - CARPENTERIA - COPERTURA TETTI - RIVESTIMENTI FACCIATE - SOFFITTI - CAMINI - STUFE - CANNE FUMARIE - BARBECUE  
 SCALE - PAVIMENTI IN LEGNO E SOPRAELEVATI - MOQUETTE - PVC - PISCINE - VASCHE BENESSERE - PERGOTENDE - VELE OMBREGGIANTI

**FABIO REZZONICO+CO** Via Penate 9 - CH 6850 Mendrisio - P.O. Box 1755 - Tel. +41(0)91 640 37 40 - Fax +41(0)91 640 37 49  
 www.rezz.ch - e-mail: info@rezz.ch





FATTURA		
Nr. documento	Data	Pagina
1097086	11.05.2020	1 / 1
Nr. cliente		
D00001		
Persona da contattare		
Goncalves Daniela / Borrelli Enrico		
goncalves@rezz.ch		

CONTANTI

La ringraziamo per avere scelto i nostri prodotti e servizi e Le inviamo la seguente fattura:

Descrizione	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Basato sulla Consegna 151285 del 11.05.2020.					
Ns.Art:102294 Gr: G-018.0					
1 LISTELLI ABETE 40/50 ML 4 Lung: 4.000	12.000	ML 3.00 PZ	1.35 /ML	25.00	12.15
Ns.Art:102355 Gr: G-018.09					
2 PANN.ARMATURA MM 27 GIALLI 200X50 CM Lung: 2.000 Larg: 0.500	1.000	M2	27.50 /M2	20.00	22.00
Ns.Art:101630 Gr: G-015.21					
3 LASTRE LAMIERA COLORATA 3.00 X 0.90	3.000	PZ 1.00	74.25 /PZ	10.00	200.48
Ns.Art:107610 Gr: G-017.45					
4 RETE ZINCATA RABITZ 16/0,7/1000 MM 10 ML Lung: 10.000 Larg: 1.000	1.000	PZ	54.00 /PZ	15.00	45.90
Ns.Art:102812 Gr: G-023.0					
5 MENSOLA EASY S.ACCIAIO ZINC. Lung: 0.400	16.000	PZ	5.40 /PZ	30.00	60.48

Subtotale	341.01
0.07 % Ribasso	-0.25
Subtotale	340.76
Importo netto	340.76
IVA 7.7% (A10) sul 340.76	26.24
<b>Totale CHF</b>	<b>367.00</b>

Condizioni di pagamento: Contanti (c)  
N. IVA : CHE-103.891.282 IVA

UBS SA, Chiasso IBAN CH91 0023 6236 8414 6206 A Swift/BIC UBSWCHZH80A  
Conto Corrente Postale IBAN CH19 0900 0000 6900 2307 8 CCP n. 69-2307-8

MATERIALI DA COSTRUZIONE - CARPENTERIA - COPERTURA TETTI - RIVESTIMENTI FACCIATE - SOFFITTI - CAMINI - STUFE - CANNE FUMARIE - BARBECUE  
SCALE - PAVIMENTI, IN LEGNO E SOPRAELEVATI - MOQUETTE - PVC - PISCINE - VASCHE BENESSERE - PERGOTENDE - VELE OMBREGGIANTI

**FABIO REZZONICO+CO** Via Penate 9 - CH 6850 Mendrisio - P.O. Box 1755 - Tel. +41(0)91 640 37 40 - Fax +41(0)91 640 37 49  
www.rezz.ch - e-mail: info@rezz.ch



**REZZONICO**  
SERVIZI E MATERIALI PER L'EDILIZIA

Fabio Rezzonico S.p.A.  
Via Penate 9  
6850 Mendrisio  
www.rezzonico.ch

Trasmissione  
Visa Credit  
4702 2000 4444 0000

30.04.2020 16:27:46  
Trn ID: 02108978  
A10: A0000000001010  
Contabile Trx: 4158  
Codice Autorizzaz: 109117

Totale D.T. OF: 644.00

Arrivati e Grazie  
091/640 37 40  
info@rezz.ch

Data	Pagina
30.04.2020	1 / 1

**KOPIE**  
CONTANTI  
ORTELLI ENZO  
079.633.69.08

La ringraziamo per avere scelto i nostri prodotti e servizi e Le inviamo la seguente fattura:

Descrizione	Quantità	UdM	Prezzo	Ribasso %	Totale CHF
Basato sull'Ordine 1005926 del 30.04.2020.					
Ns.Art:000026 Gr:					
1 FEERO ARMATURA Ø20 LUNGHEZZA 1.50 M	135.000	ML	3.20 /ML		432.00
Ns.Art:000044 Gr: G-099.0					
2 SUPPL.TO PER TAGLIO SU MISURA	1.000	PZ	80.00 /PZ		80.00
Ns.Art:102823 Gr: G-023.0					
MENSOLA ACCIAIO VERN.BIANCA	14.000	PZ	9.00 /PZ	30.00	88.20
Lung: 0.400					

Subtotale	600.20
0.37 % Ribasso	-2.24
Subtotale	597.96
Importo netto	597.96
IVA 7.7% (A10) sul 597.95	46.04
<b>Totale CHF</b>	<b>644.00</b>

Condizioni di pagamento: Contanti (c)  
N. IVA : CHE-103.891.282 IVA

UBS SA, Chiasso IBAN CH91 0023 6236 8414 6206 A Swift/BIC UBSWCHZH80A  
Conto Corrente Postale IBAN CH19 0900 0000 6900 2307 8 CCP n. 69-2307-8

MATERIALI DA COSTRUZIONE - CARPENTERIA - COPERTURA TETTI - RIVESTIMENTI FACCIATE - SOFFITTI - CAMINI - STUFE - CANNE FUMARIE - BARBECUE  
SCALE - PAVIMENTI IN LEGNO E SOPRAELEVATI - MOQUETTE - PVC - PISCINE - VASCHE BENESSERE - PERGOTENDE - VELE OMBREGGIANTI

**FABIO REZZONICO+CO** Via Penate 9 - CH 6850 Mendrisio - P.O. Box 1755 - Tel. +41(0)91 640 37 40 - Fax +41(0)91 640 37 49  
www.rezz.ch - e-mail: info@rezz.ch



## Appendix 3: Invoice Arion-Fasoli SA



### ARION FASOLI s.r.l.

Via Manzoni, 3/5 - 46042 Castel Goffredo (MN)  
 Tel. 0365 654152 Fax 0365 554798  
 e-mail: info@arionfasoli.com Internet: www.arionfasoli.com  
 C.F. 02915530170 P.Iva 01513570208  
 MAGAZZINO VIA NAZIONALE 69  
 25080 RAFFA DI PUEGNAGO

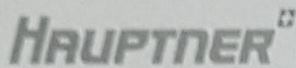
Fattura nr. **163/20** del **25/05/2020**

Destinatario	Destinazione
ENZO ORTELLI SERVIZI SAGL VIA DELLA SELVA, 5 6873 CORTEGLIA SWITZERLAND	ENZO ORTELLI SERVIZI SAGL VIA DELLA SELVA, 5 6873 CORTEGLIA SWITZERLAND

Codice	Descrizione	Quantità	Prezzo	Sconto	Importo	Iva
	Rif. Doc. di trasporto 204 del 25/05/2020:					
A-14	MANGIATOIA IN PLASTICA TAY 10/12 KG.	5 pz	€ 12,0000		€ 60,00	N8A
A-42	COPERCHIO TAY	5 pz				
A-35	GRIGLIA ANTI SPRECO TAY	5 pz				
A-141	ABBEVERATOIO A SERBATOIO 30LT IN LAMIERA ZINCATA	4 pz	€ 20,0000		€ 80,00	N8A
COM-W10	BILANCIA PORTATILE KG. 10	1 pz	€ 28,0000		€ 28,00	N8A
A-17	GABBIA TRASPORTO POLLI MODELLO B 95,5X57X32,5h (Int. 28h) - PORTA SCORREVOLE SUPERIORE	12 pz	€ 12,0000		€ 144,00	N8A
CM-ND10F	NIDO SEMIAUTO 10F RACC. ANT. CART	3 pz	€ 250,0000		€ 750,00	N8A
A-19	CASSETTA TRASPORTO UOVA IN PLASTICA OVOBOX 180	2 pz	€ 15,0000		€ 30,00	N8A
A-220	VASSOIO PORTAUOVA COCO72 ARANCIO	12 pz	€ 1,0000		€ 12,00	N8A
A-32	RIFLETTORE ALLUM. C/PROT. CPL	2 pz	€ 25,0000		€ 50,00	N8A
A-32IN	LAMPADINA INFRAROSSI 150W	2 pz				
	FORMALITA' DOGANALI EXPORT ITA/IMPORT CH	2 nr	€ 35,0000		€ 70,00	N8A
	MERCE DI ORIGINE PREFERENZIALE CEE/ITALIA L'ESPORTATORE DELLE MERCI CONTEMPLATE NEL PRESENTE DOCUMENTO DICHIARA CHE SALVO INDICAZIONE CONTRARIA LE MERCI SONO DI ORIGINE PREFERENZIALE CE					
	1 BANCALE 90X135X160h PESO NETTO: 190/KG PESO LORDO: 200/KG					

Iva	Imponibile	Imposta	Totale
N8A: Art. 8 lettera A DPR 633/72	€ 1.374,00	€ 0,00	Tot. imponibile € 0,00
			Tot. Iva € 0,00
			Tot. importi non imp. Iva € 1.224,00
			Spese di trasporto € 150,00
<b>Pagamento</b>	<b>Scadenze</b>		<b>Tot. documento € 1.374,00</b>
Bonifico anticipato UNICREDIT BANCA SPA IBAN IT41 R020 0855 1810 0010 0927 817 BIC UNCRITM1160	25/05/2020 € 1.374,00		

# Appendix 4: Invoices Hauptner AG



SwissCommerce AG - Riedwiesenstrasse 11-13 - 8305 Dietlikon  
 Tel. 044 805 99 11 - support@hauptner.ch - www.hauptner.ch  
 UID: CHE-107.851.229 TVA

**FACTURE** N°: S-707801 / N° doc: 3356501

N° de client: S-917753

27.05.2020



Enzo ortelli servizi sagl  
 Enzo Ortelli  
 Alla Selva, 5  
 6873 Corteglia  
 Schweiz

**Adresse de livraison**  
 Enzo ortelli servizi sagl  
 Enzo Ortelli  
 Alla Selva, 5  
 6873 Corteglia  
 Schweiz

livraison: DPD Economy

Article	QTÉ	Description	Prix CHF	Montant CHF	
1	A82443701	1 Kit Mobil Power A4500 - coffret en alu incl., Hauptner, Blau, Schwarz, Multi, One Size	635.00	635.00	A
2	A82746601	2 Portier électronique AES, AXT, Grün, One Size	299.00	598.00	A
3		1 Frais de livraison	6.90	6.90	A
4		1 Supplément pour moyen de paiement	1.95	1.95	A

**à payer: CHF 1241.85**

A: Total TVA 7.70% incluse = CHF 1241.85, TVA = CHF 88.79

Payable dans les 30 jours.

**Veillez uniquement utiliser le bulletin de versement ci-joint.**

▼▼▼▼ Vor der Einzahlung abzutrennen/A détacher avant le versement/Da staccare prima del versamento ▼▼▼▼

<b>Empfangsschein / Récépissé / Ricevuta</b>		<b>Einzahlung Giro</b>		<b>Versement Virement</b>		<b>Versamento Girata</b>	
Einzahlung für / Versement pour / Versamento per <b>Credit Suisse (Schweiz) AG</b> 8070 Zürich		Einzahlung für / Versement pour / Versamento per <b>Credit Suisse (Schweiz) AG</b> 8070 Zürich		Keine Mitteilungen anbringen Pas de communications Non aggiungete comunicazioni			
Zugunsten von / En faveur de / A favore di <b>SwissCommerce AG</b> Riedwiesenstrasse 11-13 8305 Dietlikon		Zugunsten von / En faveur de / A favore di <b>SwissCommerce AG</b> Riedwiesenstrasse 11-13 8305 Dietlikon		Referenz-Nr./N° de référence/N° di riferimento <b>97 64580 00000 00000 00335 65017</b>			
Konto / Compte / Conto CHF <b>01-2654-0</b>		Konto / Compte / Conto CHF <b>01-2654-0</b>		Einbezahlt von / Versé par / Versato da <b>Enzo ortelli servizi sagl</b> Enzo Ortelli Alla Selva, 5 6873 Corteglia Schweiz			
1241 . 85		1241 . 85					
97 64580 00000 00000 00335 65017		609					
Enzo ortelli servizi sagl Enzo Ortelli Alla Selva, 5 6873 Corteglia Schweiz		Die Annahmestelle L'office de dépôt L'ufficio d'accettazione					
						0100001241854>976458000000000000000033565017+ 010026540>	

Vielen Dank für Ihre Bestellung bei HAUPTNER.

**Übersicht Ihrer bestellten Artikel:**

Artikel	Pos.	Art-Nr.	Menge	Preis	Summe
 Grünfüttertrog 50 cm	1	A80997401	2	29,90 CHF	59,80 CHF
 Pickstein Geflügel 10 kg	2	A80822001	2	14,90 CHF	29,80 CHF

**Ihre Produkte gehen an folgende Lieferadresse:**

Migros-Supermarkt - Mendrisio  
 Via L. Lavizzari 2, Piazza alla Valle  
 6850 Mendrisio

\*Bei Abholung: Sie werden informiert, sobald Ihr Paket abholbereit ist.

**Ihre Rechnungsadresse:**

Enzo Ortelli servizi Sagl  
 Geflügel  
 Lorenzo Tognola  
 Via alla Selva  
 5  
 6873 Corteglia



## Appendix 5: Invoice Rovagro AG



FACTURE N° 2204278

/ 079 633 69 08 /

Route de Bettens 19  
 1377 Oulens-sous-Echallens  
 Tél. 021 886 37 37  
 Fax 021 882 19 02  
 info@rovagro.ch  
 www.rovagro.ch  
 N° TVA CHE 460.068.050

Signore  
 Ortelli Enzo  
 Via Alla Selva 5  
 6873 Corteglia

Client N° : **43885**  
 Expédition: TFC-Transporteur Franco CTL  
 Commercial: Agnes Niederhauser  
 N / Référence: CMD-Online Shop 14428 / QFFSIQGSU  
 Bulletin de livraison 1 n°4204449 du 07.05.2020  
 Bulletin de livraison 2 n°63193736 du 14.05.2020  
 V / Référence: Paiement par facture  
 Date: 22.05.2020

Quantité	Description	N° art.	Prix	TVA	%	Montant
3 pce(s)	Filet volaille	4.0711	139.00	7.70%		417.00
6 pce(s)	Filet de clôture moutons MaxiNet, électrifiable	4.0740	139.00	7.70%		834.00

**INFORMATION IMPORTANTE !**

**La facture concernant votre commande vous parviendra par mail uniquement. Merci de vérifier votre boîte mail régulièrement !**

77.85 kg TVA incluse 7.70% / CHF 1'251.00: CHF 89.44 **Montant total net 1'251.00**

Paiement à 10 jours net  
 Crédit Suisse 1401 Yverdon-les-Bains - Compte 1107121-71 (Clearing 4835)  
 N° IBAN: CH15 0483 5110 7121 7100 0 - SWIFT: CRESCHZ80A  
 Nous vous remercions pour votre commande !

## Appendix 6: Invoice FELA



FELA TICINO SA Via Stazione 10, CH-6593 Cadenazzo • Tel. + 41 91 851 97 80 • Fax + 41 91 851 97 89  
www.felaticino.ch

Fattura Novazzano no 63597

No cliente 17166  
Data 18.05.2020  
No IVA / no IDI CHE- 115.388.995 IVA  
Ref.: sfe

Signor  
Ortelli Enzo  
Alla Selva 5  
6851 Corteglia

Cadenazzo, 18.05.2020

Pagina 1

Art.	Descrizione articolo	Qta	UM	P. Netto	Importo	IVA
Bollettino Novazzano B91443 - 12.05.2020						
12556	UFA 637 POLLI INGRASSO CON COCCID. 25 KG	175	KG	1.1760	205.80	2.50%
12549	UFA 513 PULCINI COMPLETO CON COCCID. 25 KG	25	KG	1.0340	25.85	2.50%
12556	UFA 637 POLLI INGRASSO CON COCCID. 25 KG	25	KG	0.5880	14.70	2.50%
10245	PAGLIA SMINUZZATA (FRUMENTO) 4-5 CM AGRI-STROH 20 KG -FINO ESAUR. STOCK- SH	15	PZ	14.0000	210.00	2.50%
<b>Totale Bollettino Novazzano B91443 - 12.05.2020</b>					<b>456.34</b>	
Bollettino Novazzano B91588 - 14.05.2020						
12549	UFA 513 PULCINI COMPLETO CON COCCID. 25 KG	75	KG	1.0340	77.55	2.50%
12539	UFA 506 OVAIOLE GRANI MISTI 25 KG	50	KG	0.9470	47.35	2.50%
1716	FELA 1344.00 ORZO MACINATO 25 KG MF	25	KG	0.7500	18.75	2.50%
1885	FELA 1233.00 MAIS ROTTO TICINO 25 KG MF	25	KG	0.6800	17.00	2.50%
<b>Totale Bollettino Novazzano B91588 - 14.05.2020</b>					<b>160.63</b>	
					616.97	
				IVA 2,5% su	616.97	15.43
<b>Totale CHF</b>					<b>632.40</b>	

Con la presente fattura dichiariamo che la nostra ditta ottempera i requisiti espressi all'art. 39 RLCPub.





# Appendix 7: Invoice Geisser-Trupro AG

# TRUPRO AG

St. Gallenstrasse 6  
9402 Mörschwil Telefon 071 866 17 52

Kunden-Nr.: 378  
Beleg-Datum: 13.05.20  
Unser Zeichen: mk

Herr  
Ortelli Enzo  
Via alla Selva 3-5  
6873 Corteglia

**Rechnung Nr: 15015**

Mörschwil, 13.05.20

Bezeichnung	Einh.	Menge	Preis	Rabatt	MwSt	Total Fr.
● unsere Lieferung vom 12.05.2020						
Mast- Eintagsküken, Sasso braun, 2-wöchig	Stück	30.00	3.50		0	105.00
Mast- Eintagsküken, Rebbo weiss 2 wöchig	Stück	30.00	3.50		0	105.00
Transportzuschlag	Stück	1.00	30.00		0	30.00

0.0% MwSt. 240.00 0.00

**Total netto** 30 Tage netto **Fr. 240.00**

JUNGHENNEN. MASTTRUTEN. MASTKÜKEN. EINTAGSKÜKEN. BRUTEIER  
 Email: [info@geisser-trupro.ch](mailto:info@geisser-trupro.ch) [www.geisser-trupro.ch](http://www.geisser-trupro.ch)

## Appendix 8: Model calculation for the profitability of the value chain simulation.

### Modellrechnung Mast-Poulets

Anfangsbestand	62	Leerzeit (Tage)	14
Abgänge	0,00%	Umtriebe pro Jahr	1,00
Endbestand	62	Gebäudewert (Fr.)	5'093
Gewicht Eintritt (g)	215	Einrichtungswert (Fr.)	
Lebendgewicht Eintritt pro Umtrieb (kg)	13	Amortisation Gebäude (Jahre)	5
Ø-Lebendgewicht (g)	2'200	Amort. Einrichtungen (Jahre)	5
Lebendgewicht pro Umtrieb (kg)	136	Zinssatz	2,00%
Schlachtausbeute	0,7	kg Futter je kg Lebendgewicht (FVI)	2,7
Schlachtgewicht (g)	1540	Futter total (kg)	332
Preis pro kg Schlachtgewicht	25,00	Total Arbeit pro Umtrieb (h)	23,63
Preis pro poulet	38,50		
Mastdauer (Tage)	47,26		

	Menge	Preis (Fr.)	Fr. pro Umtrieb	Fr. pro Jahr
<b>Leistungen</b>				
Poulets 1. Qualität	100,0% 136	17,50	2'387	
Poulets 2. Qualität	0,0%	0,00		
Poulets 3. Qualität	0,0%	0,00		
Direktzahlungen (BTS)	0,2 GVE	0.-/Jahr	0	
<i>Total Leistungen inkl. Direktzahlungen (1)</i>			2'387	2'387
<b>Direktkosten</b>				
Küken (0% gratis)	62	3,000	186	
Futter	332	1,301	432	
Diverse Direktkosten pro m2 Stall *)	10 m2	15,00	150	
Fremde Hilfskräfte (Verladen)	0 h	30,00 Fr./h		
Schlachtung (Poulets)	62,0	7,00 Fr./Poulet	434	
<i>Total Direktkosten (2)</i>			1'202	1'202
<b>Strukturkosten</b>				
Gebäude	(Wert) 5'093	(fixe Annuität:) 21,22%	(Reparatur, Unterhalt, Versicher. :) 1,1%	1'137
Einrichtungen		21,22%	2,2%	
<i>Zwischentotal Strukturkosten (3)</i>				1'137
Arbeitskosten (4)	24 h	0,00 Fr./h		
Risiko (1%) **) und Gewinn (1%) (5)	2% der Produktionskosten		47	47

	Fr. je Tierplatz & Jahr bzw. je h	Fr. je kg Lebendgewicht	Fr. je kg Schlachtgewicht	Fr. pro Umtrieb	Fr. pro Jahr
<b>Deckungsbeitrag (1 - 2)</b>	19,11 je TP	8,69	12,41	1'185	1'185
<b>Arbeitseinkommen (1 - 2 - 3)</b>	2,04 je h	0,35	0,50	48	48
<b>Produktionskosten (2 + 3 + 4 + 5)</b>	38,48 je TP	17,49	24,99	2'386	2'386
<b>Nettoeinkommen (1 - 2 - 3 - 4 - 5)</b>	0,02 je TP	0,01	0,01	1	1
<i>Produktionskostenanteile in % (Differenz zu 100 % = diverse Direktkosten)</i>	<b>Tierkosten</b>	<b>Futterkosten</b>	<b>Gebäude/Einr.</b>	<b>Arbeitskosten</b>	<b>Diverses</b>
	8,0%	18,5%	48,6%	0,0%	25,0%

\*) Zusammensetzung der diversen Direktkosten pro Umtrieb:

Heizkosten, Strom, Wasser	fr. 20
Gesundheitsdienst (Desinfektion)	fr. 30
Diverses	fr. 100
<i>Total diverse Direktkosten je Umtrieb</i>	<i>fr.</i> <i>150</i>
- je m2 Stallfläche	<i>fr.</i> <i>15,00</i>
- je Anfangstier:	<i>fr.</i> <i>2,42</i>

\*\*) Annahme: ein Teil des Produktionsrisikos wird durch eine Risikokasse abgedeckt

## Appendix 9: Quotation for the mobile barn FlotterHahn 100



Wachtelmichel GmbH

Angebots-Nr. AN-1118  
 Datum 16.04.2020  
 Ihre Kundennummer 1348  
 Ihr Ansprechpartner Christian Michel

Wachtelmichel GmbH - Önlkenweg 16 - 8602 Wangen b.  
 Dübendorf

Lorenzo Tognola  
 Tessin  
 Schweiz

### Offerte AN-1118

Gerne unterbreiten wir Ihnen folgendes Angebot.

Pos.	Beschreibung	Menge	Einzelpreis	Gesamtpreis
1.	<b>Rowa Flotter Hahn 100</b> -ohne Außenscharrraum -mit Hühnertreppenhaus -mit Wandeinbauventilator	1.00 Stk	CHF 17'476.74	CHF 17'476.74

Je nach Schlachtgewicht können folgende Tierzahlen in dem Fahrzeug gehalten werden:

traditionelle Haltung von Ranger-Masthähnchen  
 Lebendgewicht von 2,5 kg = ca. 214 Tiere  
 Lebendgewicht von 3,5 kg = ca. 150 Tiere  
 ökologische Haltung von Ranger-Masthähnchen  
 Lebendgewicht von 2,5 kg = ca. 164 Tiere  
 Lebendgewicht von 3,5 kg = ca. 120 Tiere  
 Fahrzeugfarbe: chromoxidgrün RAL6020

#### DAS FAHRZEUG VERFÜGT ÜBER

- Fahrzeugmaße (ca. 6,00 m x 2,40 m) ohne Deichsel
- große Kotklappe zur leichten Entmistung
- großes Sommerlüftungsgitter
- feuerverzinkte Fahrzeugprofile
- Grünlandbereifung mit verstärkter Achserhöhung
- Deichsel mit DIN-Öse und Stützrad
- allseits aus 40mm ISO-Sandwichplatten
- Eingangstür (2,00 m x 0,80 m) mit Lüftungsgitter und Fenster
- zweistufige Eingangstreppe
- Kippfenster (0,96 m x 0,29 m)

Seite 1 von 4

Wachtelmichel GmbH  
 Önlkenweg 16  
 8602 Wangen b. Dübendorf  
 Schweiz

Tel.: 079 604 00 48  
 E-Mail: wachtelmichel@gmail.com  
 Web: www.wachtelmichel.ch

UID: CHE-435.945.469  
 MWST-Nr.: CHE-435.945.469

Raiffeisenbank Zürich Flughafen  
 Konto: 84-3431-5  
 IBAN: CH29 8147 4000 0021 8282 9



Wachtelmichel GmbH

Pos.	Beschreibung	Menge	Einzelpreis	Gesamtpreis
	<ul style="list-style-type: none"> <li>- Auslaufjalousie (1,00 m x 0,50 m)</li> <li>- verschließbarer Bodenablauf</li> <li>- Edelstahleinfassung im Bodenbereich</li> <li>- Wasseranschluss außen zur Tankbefüllung</li> <li>- Außensteckdose 230 Volt für die Inbetriebnahme</li> <li>- Außensteckdose für den Weidezaun (nicht bei Photovoltaik)</li> <li>- 4 variable Abstellstützen je 1,2 Tonnen</li> <li>- eine statische Berechnung</li> <li>- TÜV Gutachten für die StVO</li> <li>- Immissionsgutachten</li> </ul> <p>STANDARD INNENAUSSTATTUNG</p> <ul style="list-style-type: none"> <li>- Innenversiegelung gegen Milben</li> <li>- 5 Futterautomaten</li> <li>- 280 Liter Frischwassertank</li> <li>- Nippeltränke (mit 21 Nippeln), höhenverstellbar</li> <li>- Masthähnchenreuter (Sitzstangen)</li> <li>- Ventilator mit Steuerung</li> <li>- LED Beleuchtung mit Lichtsimulation</li> <li>- Kratzboden zum Krallenabrieb</li> </ul> <p>Alle ROWA Mobilställe werden zum Wohl der Tiere mit einem 230 Volt LED-Licht betrieben. Der Vorteil ist eine fast (99,5 %) flackerfreie Lichtqualität. Die dadurch gewonnene Ruhe innerhalb der Tierherde wirkt sich positiv auf Aggressionen sowie die Legeleistung aus.</p>			
Opt.	<p><b>Rowa FLH 100 Classic Packet</b></p> <p>6 Solarmodule mit Wechselrichter für den 230 Volt Betrieb</p> <ul style="list-style-type: none"> <li>-LED-Licht für 16 Stunden Dauerlicht am Tag</li> <li>-Ventilator Laufzeit von 15 Min/ Stunde von 04:00 bis 24:00Uhr</li> <li>-Auslaufjalousie</li> </ul>	1.00 Stk	CHF 4'216.54	(CHF 4'216.54)
Opt.	<p><b>Rowa FLH 100 Fussbodenheizung</b></p> <p>optimale Bedingungen für die Haltung von Masthähnchen</p>	1.00 Stk	CHF 3'740.22	(CHF 3'740.22)

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Wachtelmichel GmbH

Pos.	Beschreibung	Menge	Einzelpreis	Gesamtpreis
	Fußbodentemperatur ca. 29 Grad (NICHT für die PHOTOVOLTAIKANLAGE geeignet)			
Opt.	<b>Rowa FLH 100 Heizstrahler mit Steuerung</b> für eine Aufzucht ab der 3. Woche (NICHT für die PHOTOVOLTAIKANLAGE geeignet)	1.00 Stk	CHF 316.48	(CHF 316.48)
Opt.	<b>Rowa FLH 100 Zubehör für Kükenaufzucht</b> - 6 Stück Stülptränke 10 Liter - 6 Stück Futterautomaten 8 kg - 6 Stück Anfutterplatten	1.00 Stk	CHF 165.30	(CHF 165.30)
Opt.	<b>Habicht Abwehr Netz</b> Größe ca. 144 m <sup>2</sup> (12 m x 12 m) Maschenweite 60 mm Farbe: dunkelgrün - 8 Stück Heringe - 8 Stück Teleskop-Aufstell-Stange - 8 Stück Seile	1.00 Stk	CHF 965.32	(CHF 965.32)
Opt.	<b>Geflügelzaun, Geflecht mit Steckpfählen</b> 1,12 m hoch, 50 m lang; stromgeführt (ohne Weidezaungerät)	1.00 Stk	CHF 127.92	(CHF 127.92)
<b>Gesamtbetrag netto</b>				<b>CHF 17'476.74</b>
zzgl. Mehrwertsteuer 7.7%				CHF 1'345.71
<b>Gesamtbetrag brutto (gerundet)</b>				<b>CHF 18'822.45</b>
Summe optionaler Positionen netto				CHF 9'531.78

Lieferzeit momentan ca. 5 Monate ab Auftragserteilung

Aktueller Eurokurs: 1.07.-

Technische und optische Änderungen sind im Rahmen der Produktweiterentwicklung vorbehalten.

Gültigkeit der Preise: bis 8 Wochen nach Erhalt des Angebotes.

Auf das komplette Fahrzeug geben wir die gesetzliche Garantie; darüberhinaus eine freiwillige Gewährleistung von 3 Jahren.

Zahlungsmöglichkeit -1

Wir bitten um 40 % Anzahlung bei Auftragserteilung, 40 % Anzahlung direkt vor der Auslieferung und der

Seite 3 von 4

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## **Appendix 10: Questions for interview with Kuno Werro**

### **Environmental, social and economic sustainability of an alternative laying hen production system**

#### **Questions Kuno Werro**

Goal:

- Compare Laying hens production systems in Europe
- Do a good job to convince Prof. De Boer to do an Internship in Livestock-agroforestry systems.

Umwelt, soziale und wirtschaftliche Nachhaltigkeit von einer alternativen Legehennen Produktionssystem.

#### **Generell**

- 1.1 Betriebszweige?
- 1.2 Nicht-Landwirtschaftliche Betriebszweige?
- 1.3 Ha?
- 1.4 Bio seit wann?
- 1.5 Legehennen seit wann?
- 1.6 Nutztiere Anzahl?
- 1.7 (Sommer Alp?)

## Hühnerhäuser

- 1.8 Wieso haben Sie dieses bestimmte Hühnerhaus gewählt?
- 1.9 Welchen positiven Punkten hat dieses System?
- 1.10 Welchen negativen Punkten hat dieses System?
- 1.11 Tun Sie selber die Junghennen aufziehen?
- 1.12 Haben Sie irgendwie spezielle Versicherungen im Bezug zur Eierproduktion?
- 1.13 Sind sie froh über das System generell?
- 1.14 Wie sieht es aus mit Krankheiten wie z.B. Salmonellen?  
Wie kämpfen Sie dagegen? Wo lassen Sie den Test machen und wie viel kost es?
- 1.15 Gibt es spezielle Regelungen in Bezug zu der Nutzung vom Anhänger?
- 1.16 Brauchten Sie eine spezielle Bewilligung?
- 1.17 Was würden Sie anderst machen mit/in dieses System?

## Umwelt Nachhaltigkeit

- 1.18 Halten sie sich an die Bio Richtlinien oder versuchen Sie noch mehr nachhaltig zu sein?
- 1.19 Mit welche Energie funktionieren die Einrichtungen im Anhänger?
- 1.20 Haben sie Probleme mit Herdenschutz/Beutetiere? Wenn ja, was machen Sie dagegen?
- 1.21 Tun Sie die Hühner in der Nacht einschliessen?
- 1.22 Sind manche Prozesse des Hauses automatisiert? (z.B. Auslauf Eröffnung am morgen)
- 1.23 Wie oft ändern Sie die Parzelle an den Hühnern?
- 1.24 Wie tun Sie die weiden managen und wie verschieben Sie der Anhänger?
- 1.25 Wird die Fütterung vom Alter der Weiden Beeinflusst?
- 1.26 Wie füttern Sie das Geflügel?
- 1.27 Wie tun Sie di Parzellen zäunen?
- 1.28 Wie machen Sie die Säuberung des Stalles nach jedem Umtrieb?
- 1.29 Wie oft windet das Ausmisten statt?
- 1.30 Boden: wird es beschädigt durch die Hühner?
- 1.31 Wie tun Sie das Dünger managen?
- 1.32 Tut die Menge Mist die Produktion limitieren? (Düngungsnormen/Swiss-Bilanz)
- 1.33 Beschäftigt Ihnen der Thema Futter-Nahrung Kompetition?
- 1.34 Haben Sie schon gedacht die Hühner mit den Ernteresten des Betriebes zu füttern?
- 1.35 Beschäftigt Ihnen der Thema Co2-äquivalenten Emissionen, Energie-konsum und Landkonsum?
- 1.36 Haben Sie Oft der Veterinär nötig?
- 1.37 Arbeiten Sie mit eine Legehennen-spezialisierte Beratungsstelle?

## Wirtschaftliche Nachhaltigkeit

- 1.38 Sind Sie froh von die wirtschaftliche Leistung des Systems?
- 1.39 Wie viele Eier können sie damit produzieren?
- 1.40 Durch welche Kanäle tun Sie vermarkten? Welchen Kanal haben Sie lieber?
- 1.41 Mit welchen Preis können Sie die Eier verkaufen?
- 1.42 Kennen Sie Ihren Produktionspreis?
- 1.43 Wie viel mussten Sie für den Stall ausgeben und mit welche Investitionen haben Sie rechnen müssen?
- 1.44 Ausser Bio/Bts/Raus kriegen Sie andere Beiträge?
- 1.45 Haben Sie neue Investitionen für die Zukunft geplant?

## Soziale Nachhaltigkeit

- 1.46 Wie viel Leute eingestellt?
- 1.47 Sind das genügend für Sie? Hätten Sie mehr/weniger zu Verfügung?
- 1.48 Wie viele Arbeiten mit den Hühnern? Haben diese Leute eine spezielle Ausbildung in Bezug zu Eierproduktion?
- 1.49 Wie viel Stunden pro Tag brauchen Sie durchschnittlich für die Eierproduktion?
- 1.50 Was sind die Tagesarbeiten in Bezug zu die Eierproduktion?
- 1.51 Welchen Arbeiten nehmen mehr Zeit? Welche weniger?
- 1.52 Tun sie Spezielle Tierwohlmassnahmen anwenden?
- 1.53 Wie lange behalten Sie Hühner?
- 1.54 Was machen Sie mit Alte Hühner?
- 1.55 Welchen Einfluss hat dieses System auf die Bevölkerung?
- 1.56 Haben Sie positive/negative Feedback von Konsumenten?
- 1.57 Wird jemand der Familie übernehmen?

## Appendix 11: Model calculation for the profitability of the recommended production system

### Modellrechnung Malmast-Poulets

Anfangsbestand	214	Leerzeit (Tage)	14
Abgänge	3,00%	Umtriebe pro Jahr	4,00
Endbestand	208	Gebäudewert (Fr.)	18'822
Gewicht Eintritt (g)	300	Einrichtungswert (Fr.)	5'825
Lebendgewicht Eintritt pro Umtrieb (kg)	62	Amortisation Gebäude (Jahre)	10
Ø-Lebendgewicht (g)	2'200	Amort. Einrichtungen (Jahre)	5
Lebendgewicht pro Umtrieb (kg)	457	Zinssatz	2,00%
Schlachtausbeute	0,7	kg Futter je kg Lebendgewicht (FVI)	2,7
Schlachtgewicht (g)	1540	Futter total (kg)	4'260
Preis pro kg Schlachtgewicht	17,50		
Preis pro poulet Mastdauer (Tage)	26,95 31,67	Total Arbeit pro Umtrieb (h)	15,83
	<b>Menge</b>	<b>Preis (Fr.)</b>	<b>Fr. pro Umtrieb</b>
<b>Leistungen</b>			
Poulets 1. Qualität	100,0% 457	12,25	5'594
Poulets 2. Qualität	0,0%	0,00	
Poulets 3. Qualität	0,0%	0,00	
Direktzahlungen (BTS)	0,8 GVE	0.-/Jahr	0
<i>Total Leistungen inkl. Direktzahlungen (1)</i>			5'594
			22'377
<b>Direktkosten</b>			
Küken (0% gratis)	214	5,000	1'070
Futter	4'260	1,170	1'246
Diverse Direktkosten pro m2 Stall *)	15 m2	36,36	400
Fremde Hilfskräfte (Verladen)	0 h	30,00 Fr./h	
Schlachtung (Poulets)	207,6	7,00 Fr./Poulet	1'453
<i>Total Direktkosten (2)</i>			4'169
			16'676
<b>Strukturkosten</b>			
	(Wert:)	(fixe Annuität:)	(Reparatur, Unter-halt, Versicher.:)
Gebäude	18'822	11,13%	1,1%
Einrichtungen	5'825	21,22%	2,2%
<i>Zwischentotal Strukturkosten (3)</i>			3'666
Arbeitskosten (4)	16 h	25,00 Fr./h	396
Risiko (1%) **) und Gewinn (1%) (5)	2% der Produktionskosten		110
			439

	Fr. je Tierplatz & Jahr bzw. je h	Fr. je kg Lebendgewicht	Fr. je kg Schlachtgewicht	Fr. pro Umtrieb	Fr. pro Jahr
<b>Deckungsbeitrag (1 - 2)</b>	26,64 je TP	3,12	4,46	1'425	5'701
<b>Arbeitseinkommen (1 - 2 - 3)</b>	32,13 je h	1,11	1,59	509	2'035
<b>Produktionskosten (2 + 3 + 4 + 5)</b>	104,50 je TP	12,24	17,49	5'591	22'364
<b>Nettoeinkommen (1 - 2 - 3 - 4 - 5)</b>	0,06 je TP	0,01	0,01	3	13
<i>Produktionskostenanteile in % (Differenz zu 100 % = diverse Direktkosten)</i>	<b>Tierkosten</b>	<b>Futterkosten</b>	<b>Gebäude/Eintr.</b>	<b>Arbeitskosten</b>	<b>Diverses</b>
	19,5%	22,7%	16,7%	7,2%	33,8%

## \*) Zusammensetzung der diversen

*Direktkosten pro Umtrieb:*

Heizkosten, Strom,	fr.
Wasser	100
Gesundheitsdienst (Desinfektion)	fr. 100
	fr.
Diverses	200
<i>Total diverse Direktkosten</i>	<i>fr.</i>
<i>je Umtrieb</i>	<i>400</i>
	<i>fr.</i>
- je m2 Stallfläche	36,36
	<i>fr.</i>
- je Anfangstier:	1,87

\*\*) Annahme: ein Teil des Produktionsrisikos wird durch eine Risikokasse abgedeckt



## Appendix 12: Agronomic broiler excel tool

### Sheet 1: Processo di produzione

Nome	Unità	Quantità
Polli	capi	214
Perdite	%	3
Polli macellati	capi	207,58
Durata standard Startphase	gg	12
Durata standard Entwicklungsphase	gg	12
Durata standard Endphase	gg	18
Età entrata in stalla	gg	21
Età macellazione	gg	42
Durata allevamento tot	gg	21
Durata Startphase	gg	0
Durata Entwicklungsphase	gg	3
Durata Endphase	gg	18

### Sheet 2: Ingrasso giornaliero e pesi

Nome	Unità	Quantità
Ingrasso giornaliero medio	kg	0,06
Peso arrivo in stalla	kg	0,8
Obiettivo peso vivo	kg	2,2
Peso morto	%	70
Peso morto	kg	1,54
Giorni ingrasso	gg	23,33
Controllo	gg	21,00

## Sheet 3: Foraggio e acqua

Nome	Unità	Quantità
Indice di trasformazione Foraggio	Indice	2,7
Foraggio medio al giorno	kg/pollo	0,13
Foraggio necessario standard	kg	5,46
Foraggio tot	kg/pollo	3,61
<b>Foraggio necessario tot</b>	<b>kg</b>	<b>772,97</b>
Consumo Startphase	Kg/pollo	0,3
Consumo Startphase tot	Kg	0
Sacco	kg	25
Costo al sacco	chf	25
Costo tot	chf	0,00
Consumo Entwicklungsphase	Kg/pollo	0,5
Consumo Entwicklungsphase tot	Kg	110,4
Sacco	kg	25
Costo al sacco	chf	25
Costo tot	chf	110,42
Consumo Mastphase	Kg/pollo	3,1
Consumo Mastphase tot	Kg	662,5
Sacco	kg	25
Costo al sacco	chf	25
Costo tot	chf	662,54
<b>COSTO FORAGGIO TOT</b>	<b>chf</b>	<b>772,97</b>
Consumo Acqua	l/kg foraggio	2,4
Consumoo acqua	l/pollo	8,67
Consumo acqua tot	l	1855,12
Standard consumo acqua per pulire	m3/128m2	1,5
	m3/m2	0,01
	l/m2	11,72
Acqua per pulire stalla Ortelli	l	267,58
Consumo acqua tot	l	2122,71

## Sheet 4: Feci e nutrienti

Parcella 642						
Nome	Unità	Quantità				
Quantità letame 1 pollo	Kg	1,14				
Quantità letame prevista	Kg	243,96				
Sostanza secca	%	65				
Sostanza secca	Kg	158,574				
Superficie pascolata	m2	965				
		N	P	K	Mg	Ca
Fabbisogno vigna	kg/ha/anno	30	20	78	25	.
Fabbisogno vigna su superficie pascolata	kg	2,90	1,93	7,53	2,41	-
Contenuti letame pollame ingrasso	%	3,4	2	2,8	0,56	0,38
Nutrienti espulsi tot	Kg	5,39	3,17	4,44	0,89	0,60
Nutrienti espulsi in periodo ingrasso	Kg	2,70	1,59	2,22	0,44	0,30
- = deficit + = surplus	Kg	-0,20	-0,34	-5,31	-1,97	-
Numero polli massimo accettabile	capi	72,46	82,13	228,78	366,6 3	-

Parcella 1600						
Nome	Unità	Quantità				
Quantità letame 1 pollo	Kg	1,14				
Quantità letame prevista	Kg	243,96				
Sostanza secca	%	65				
Sostanza secca	Kg	158,574				
Superficie pascolata	m2	4005,87				
		N	P	K	Mg	Ca
Fabbisogno vigna	kg/ha/anno	30	20	78	25	.
Fabbisogno vigna su superficie pascolata	kg	12,02	8,01	31,25	10,01	-
Contenuti letame pollame ingrasso	%	3,4	2	2,8	0,56	0,38
Nutrienti espulsi tot	Kg	5,39	3,17	4,44	0,89	0,60
Nutrienti espulsi in periodo ingrasso	Kg	2,70	1,59	2,22	0,44	0,30
- = deficit + = surplus	Kg	-9,32	-6,43	-29,03	-9,57	-
Numero polli massimo accettabile	capi	300,81	340,92	949,69	1521,94	-

Totale Parcella 642 + Parcella 1600						
Nome	Unità	Quantità				
		N	P	K	Mg	Ca
Fabbisogno vigna	kg/ha/anno	30	20	78	25	.
Fabbisogno vigna su superficie pascolata	kg	14,91	9,94	38,77	12,43	#iVALOR!
Contenuti letame pollame ingrasso	%	3,4	2	2,8	0,56	0,38
Nutrienti espulsi tot	Kg	5,39	3,17	4,44	0,89	0,60
Nutrienti espulsi in periodo ingrasso	Kg	2,70	1,59	2,22	0,44	0,30
- = deficit + = surplus	Kg	-12,22	-8,36	-36,55	-11,98	#iVALOR!
Numero polli massimo accettabile	capi	<b>373,27</b>	423,04	1178,47	1888,57	#iVALOR!

## Sheet 5: Misure stalle

Nome	Unità	Quantità
Densità polli massima	kg/m2	20
Area stalla minima	m2	22,8338
Area stalla 1 disponibile	m2	23
Area stalla 2 disponibile	m2	0
Area stalla 3 disponibile	m2	0
Area stalla 4 disponibile	m2	0
Area stalla tot	m2	23
Area pascolo minimo	m2/kg	1
Area pascolo minimo	m2	470,8
642 Pascolo diponibile	m2	965
1600 Pascolo disponibile	m2	4005,87
Area minima Zona a Clima Esterno (ZCE)	% pollaio	20
Tot area ZCE	m2	4,57
Tot area tetto ZCE	m2	4,57
Foraggiamento meccanico alla mangiatoia o al nastro	cm/pollo	2
	cm tot	428
	cm/m2 pollaio	30
	cm tot	685,014
Canale della mangiatoia circolare automatica	cm/pollo	1,5
	cm tot	321
	cm/m2 pollaio	22,5
	cm tot	513,7605
Abbeveratoi a tettarella	unità/pollo	0,067
	unità tot	14,338
	unità/m2 pollaio	1
	unità tot	22,8338
Canale di un abbeveratoio laterale	cm/pollo	1
	cm tot	214
	cm/m2 pollaio	15
	cm tot	342,507
Canale di un abbeveratoio circolare	cm/pollo	1
	cm tot	214
	cm/m2 pollaio	15
	cm tot	342,507
Abbeveratoi a coppa con acqua a libera	unità/pollo	0,033
	unità tot	7,062
	unità/m2 pollaio	0,5
	unità tot	11,4169
Sitzstangen	cm/kg	11
	cm tot	2354
	cm dal suolo	30
	cm tra Sitzstangen	25
	cm da parete	15

## Sheet 6: ISTALLAZIONI

Nome	Unità	Quantità	CHF/pezzo	Fornitore
Pickstein SOFT!	pezzi	0	14,9	Hauptner.ch
Grünfüttertrog	pezzi	0	29,9	Hauptner.ch
Futterautomat mit Standfüßen 50liter	pezzi	0	12	Arion Fasoli Italia
Alu-Schieber	pezzi	0	54,9	Hauptner.ch
Automatische Hühnertür	pezzi	0	169,9	Hauptner.ch
Infrarot-Wärmestrahlergerät	pezzi	0	29,9	Hauptner.ch
Bilancia	pezzi	0	35	Arion Fasoli Italia
Casse per trasporto	pezzi	0	32	Arion Fasoli Italia
Hängetränke 8 Nippeln	pezzi	0	0	Hauptner.ch
Alu tränke	pezzi	0	25	Arion Fasoli Italia
50m recinto polli	pezzi	7	139	Rowagro.ch
Kit pannello + batteria	pezzi	1	635	Hauptner.ch
<b>Tot</b>			<b>1608</b>	

## Appendix 13: Questionnaire for the consumers appreciation

Enzo Ortelli, Lucio Ortelli, Lorenzo Tognola

11.06.2020



# Questionario degustazione Galett Trii Pin

## Introduzione:

Il Galett Trii Pin è pensato come una soluzione ambientalmente, socialmente ed economicamente sostenibile per viticoltori del Mendrisiotto nel quale i polletti pascolano sotto i ceppi di vigna.

I 7 Galett Trii Pin di questa sera sono stati cucinati allo spiedo e senza grande condimento per permettere un'analisi più precisa della carne.

Grazie mille per partecipare a questa degustazione, essenziale per le decisioni future riguardanti la concretizzazione del sistema di produzione. E buon appetito!!!

Enzo Ortelli  
Lucio Ortelli  
Lorenzo Tognola

## 1. Qualità della carne

1.1. Come valuti la durezza della carne?

(0 = carne molto morbida, 10 = carne molto dura)

0---1---2---3---4---5---6---7---8---9---10

1.2. Pensi che la carne sia asciutta?

(0 = per niente asciutta, 10 = molto asciutta)

0---1---2---3---4---5---6---7---8---9---10

1.3. Pensi che la carne sia acquosa?

(0 = per niente acquosa, 10 = molto acquosa)

0---1---2---3---4---5---6---7---8---9---10

1.4. Pensi che la carne sia grassa?

(0 = per niente grassa, 10 = molto grassa)

0---1---2---3---4---5---6---7---8---9---10

1.5. Pensi che la carne sia oliosa?

(0 = per niente oliosa, 10 = molto oliosa)

0---1---2---3---4---5---6---7---8---9---10



Enzo Ortelli, Lucio Ortelli, Lorenzo Tognola

11.06.2020



## 2. Qualità ottiche

2.1. Cosa pensi del colore della carne?

(0 = non mi piace per niente, 10 = mi piace molto)

0---1---2---3---4---5---6---7---8---9---10

2.2. Cosa pensi della forma die polli?

(0 = non mi piace per niente, 10 = mi piace molto)

0---1---2---3---4---5---6---7---8---9---10

## 3. Gusto e profumo

3.1. Cosa pensi del profumo della carne?

(0 = non mi piace per niente, 10 = mi piace molto)

0---1---2---3---4---5---6---7---8---9---10

3.2. Cosa pensi della succosità della carne?

(0 = per niente succosa, 10 = molto succosa)

0---1---2---3---4---5---6---7---8---9---10

3.3. Cosa pensi dell'aroma della carne

(0 = per niente aromatica, 10 = molto aromatica)

0---1---2---3---4---5---6---7---8---9---10

3.4. Nella vostra porzione ci sono parti difficili da masticare?

Sì

No

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## 4. Potenziale di mercato

4.1. Sapendo come viene prodotto il Galett Trii Pin, saresti pronto ad acquistare questo tipo di carne di pollo?

- Sì  
 No

4.2. Se sì, come vorresti acquistare il Galett Trii Pin?

(è possibile mettere più di una crocetta)

- Galletto intero di max 700 grammi  
 Polletto intero di 1.2 kg  
 Cappone intero da 2.5 kg  
 Pacchetto regalo/natalizio con pollo e ingredienti per cottura al forno  
 In parti (petto, alette, cosce) per cottura al forno o al grill  
 Altro

Se "Altro", in che forma vorresti acquistare il Galett Trii Pin? .....

4.3. Consigliaresti il Galett Trii Pin ad amici, colleghi o conoscenti?

- Sì  
 No

4.4. Sapendo che alla Migros:

- |                               |                |
|-------------------------------|----------------|
| - Polletto 1.2kg non marinato | = 09.50 chf/kg |
| - Polletto 1.2kg marinato     | = 10.20 chf/kg |
| - Galletto 700g               | = 13.30 chf/kg |
| - PollettoBIO 1.2kg           | = 18 chf/kg    |

Quanto saresti disposto a pagare un Galett Trii Pin? ..... chf/kg

## 5. Dati Personali

Nome:.....

Anno di nascita:.....

Ridare per favore il questionario a Lorenzo Tognola,

GRAZIE per aver partecipato e se ci sono ulteriori commenti o feedback per favore fateceli sapere.

Enzo Ortelli  
 Lucio Ortelli  
 Lorenzo Tognola

## Appendix 14: Dataset of the consumers questionnaire

	Anno di nascita	Come valuti la durezza della carne?	Pensi che la carne sia asciutta?	Pensi che la carne sia acquosa?	Pensi che la carne sia grassa?	Pensi che la carne sia oliosa?	Cosa pensi del colore della carne?	Cosa pensi della forma delle polli?	Cosa pensi del profumo della carne?	Cosa pensi della succosità della carne?	Cosa pensi dell'aroma della carne?	Nella vostra porzione ci sono parti difficili da masticare?	Saresti pronto ad acquistare questo tipo di carne di pollo?	Se sì, come vorresti acquistare il Galett Trii Pin?	Consigliereesti il Galett Trii Pin ad amici, colleghi o conoscenti?	Sapendo che alla Migros:
1	1994	3	1	1	7	2	8	10	10	8	6	si	si	1,2 2,5 regalo	si	.
2	1992	3	3	6	4	4	8	9	9	10	9	no	si	1,2	si	22
3	1994	3	1	3	4	2	7	6	8	7	5	no	si	in parti	si	15
4	1997	0	0	1	2	4	10	10	7	10	8	no	si	1,2 regalo	si	19,5
5	1995	2	1	7	5	5	10	8	8	8	5	no	si	2,5 100 XD	si	19,5
6	2000	2	0	6	3	2	10	9	9	9	7	si	si	700g 1,2 in parti	si	18
7	1993	7	6	2	4	0	10	10	8	8	9	no	si	1,2 regalo	si	20
8	1995	6	3	8	6	5	10	10	3	9	8	no	si	regalo	si	10,2
9	1993	6	1	6	2	3	8	10	7	9	8	no	si	in parti	si	20
10	1993	6	8	7	3	4	10	10	8	6	7	no	si	1,2	si	15
11	1964	2	0	4	0	0	8	8	10	.	10	no	si	1,2 in parti	si	25
	Average	3,64	2,18	4,64	3,64	2,82	9,00	9,09	7,91	8,40	7,45					18,42