Proposal for an Araçá-Boi Fruit Mead Factory in the Amazon Region

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Abstract

The present work is intended to present a proposal for the construction of a factory, which will produce handcrafted mead with exotic fruit from the Amazon region, Araçá-Boi. It will be shown in a very relevant way the importance in the valorization of the fruit, little used in the local cuisine, its nutrients and the commercialization of the drink in the region. The work will enable the recognition of this drink from ancient times, much appreciated in the Nordic culture, made with the fermentation in honey base, which gave rise to an alcoholic beverage, still so little explored in Brazil.

Keywords: Mead Factory; Araçá-boi; Artisanal Production;

1. Introduction

Due to the great competition of the Brazilian beverage market, among them beer and wine, one of the most sold in all trade, thus opening new trends in the new drinks market, despite the great domination of the first places of the most consumed beverages in the country. remember other types of drinks that are consumed, such as rum, rum, whiskey and etc. Sales of these types of beverages are growing increasingly, considering wholesale and retail thus reaching high sales.

Mead is not prominent in the beverage market, with an alcohol content of 4 to 14% ºGL, its main base is the ingredient honey, obtained from fermentation and diluted with drinking water. This basic process may vary depending on the addition of ingredients for better variation of the beverage, cereals and / or fruits, thus varying in color and flavors. The chemical composition of mead should comply with the limits of total acidity, fixed acidity, volatile acidity and dry extract [1].

Objective is to design a factory of Handcrafted Mead in the Amazon region, using a regional fruit the araçá-

boi, which has a bit of acidity and very nutritious. It aims to expand the beverage market for future ventures, thus bringing this market product little explored in Brazil, through market research of alcoholic beverages, and the production process and investments needed to prepare the project.

2. Theoretical revision

2.1 Flowchart

Flowcharts are ways of representing, through graphic symbols, the sequence of steps of a work to facilitate its analysis. A flowchart is a visual resource used by production managers to analyze production systems, seeking to identify opportunities to improve process efficiency [2]. The Flowchart makes it easy to view tasks in graphical forms to show information in clear and objective ways that the procedure can be understood in just a few small steps.

2.2 Gantt Chart

The Gantt chart is a simple tool that uses horizontal bars to show which tasks can be performed simultaneously throughout the execution of the job. Activities are listed vertically, dates horizontally and duration are represented in the form of the length of the bars [2]. Understanding the graph shows the progress of the process, so that each activity must follow to reach each stage of the process, as it is widely applied by companies that seek to understand the best production process, one of the most used fermentation by engineers.

2.3 Factory Design and Layout

The purpose of the factory and layout design and to develop the concepts of integrating techniques and decisions, to approach new methodologies, having to provide an integrated view of services and logistics procedures. Based on dimensions and facets, the layout types of all procedures and equipment locations can be studied to facilitate understanding of the process and impact on performance and behavior results [3].

2.4 Google Sketch Up

A tool for practicing dimension studies, for floor plan projections and even volumetric objects, being a system that facilitates the spatial vision of a project, and easy to manipulate the tools, with excellent graphic performances. According to NETO, GOMES AND SOUZA (2010), an interactive computer system should allow the user's work to be facilitated by the availability of tools and resources on the monitor, which can be represented in text or icon representations.

2.5 Consumer Market

A drink of undefined origin, plus the highlight of its substance made up of honey, water and yeast, has been gaining more attention in series and films of Viking and Nordic cultures, as one of the first drinks that has a history of being very popular by ancient peoples, well-known as Mead, due to its honey-based fermentation.

Archaeological data reveals that the drink consisted of wild grapes, honey and rice, the so-called wine-mead-sake, which is the oldest record of any alcohol-containing drink. Later, mead was produced in ancient Egypt, Greece, the Roman Empire, and medieval Europe. [5]

The drink has a very sweet taste, being dry, frothy and liqueur, being very easy to make, but having a very long fermentation time, to reach the required alcohol content. According to RIBEIRO JUNIOR (2015), in addition to ethanol, other important substances for the characterization of the fermented are produced, such as aromatic compounds, according to the origin of the honey, that is, the floral species where the bees collected nectar.

Current macroeconomic scenario continues to challenge Brazilians' consumption patterns and continues to compromise disposable income in most households [7]. Due to the great trend in alcoholic beverages, the diversity among beverages such as beer and wine gaining prominence in the international and national trade markets, their new versions of fruit, seeds and etc. compositions. Mead was no exception, having several recipes in its composition in order to reach new market trends, being very popular today.

Mead already attracts looks for future endeavors, as it is not a very traditional drink in the market, but being popular among young Nerd culture lovers, lovers of alcoholic and curious, assign a new substance in the drink, further grow the curiosity of try, and give a historical value of new recipes for producing this drink.

3. Methodology

Approach to factory design research was done through reading articles and books related to the production process, as well as honey and Mead, having research through e-mails with Mead producers and beekeepers, on ways for preparation. the equipment and methods needed to begin small-scale artisanal production.

4. Study Application: Mead Production Process

4.1 Raw Material:

4.1.1 Honey

Honey is a natural product used since the dawn of mankind in traditional medicine, having gained popularity among the Egyptians, Arabs, Greeks and other civilizations [8]. Honey is considered a viscous, aromatic and sweet fluid made from flower nectar and secretions of live parts of certain plants or excretions of plant-sucking insects, in which honey bees collect, transform, combine and mature in beehives [9]. Being a sweet made by the nectar of flowers contains its physical and chemical characteristics, a food that should be consumed every day complete and nutritious has several benefits full of vitamins and minerals, depending on its shape, honey can vary from its color, taste, consistency and time to crystallize.

4.1.2 Araçá - Boi

The guava tree is an exotic and delicious fruit and little known in the regions of Brazil, in which fruit tree of the Western Amazon cultivated in small scale in some countries like Peru, Bolivia, Ecuador, Colombia and some North and South regions in the interior of Brazil [10]. The pulp is juicy and very acidic, so it is not suitable for natural consumption, being used for the preparation of juices, ice cream and jellies for the production of nectar, being very useful in mixing with low acidity fruit pulp [11]. With guinea-ox is no

different, has a very good nutritional value, bringing improvements in the body, being rich in nutrients, bringing health benefits. Because it is little known, its traditional recipes are the preparation of sweets and desserts, and very few in drinks.

4.1.3 Yeast

The definition of yeast is important for the industrial sector, and is well known in the area of beverage production, for fermentation of alcoholic beverages, as they help in the production of alcohol.

4.1.4 Nutrients and Energizer

They are types of nutrients that keep fermentation active by providing nitrogen for rigorous fermentation, and energizer provides vitamins. Thus acting quickly in the production of sugar breakage for alcohol transformation. Since honey has little nitrogen, nutrients and energizer help to reduce fermentation time, thus avoiding the development of contaminating microorganism.

4.2 Equipment

Figure 01: Equipment for Craft Production
Source: BREJABOX ’

• Kit Combo Equipment for home beverage production (10 Liters).
- Digital Scale, Disc Grinder, 15 lt mashing pan with ½ extraction valve, Grain bag filter, 15 lt boiling pan with ½ extraction valve, Thermometer, Density meter, 250 ml beaker, Fermenters 12 liters with Airlock (2 units) and extraction tap, Bottle Stopper, 1 liter Glass Bottles (2 units), Auto Siphon (1 units), Silicone Tube (1 units).

4.3 Production Methods

4.3.1 Determine the level of sweetness

Mead being a beverage known as extremely sweet, its most traditional production being dry, taking into consideration the level of sweetness cannot vary according to personal preference. Measurement at the present level of sweetness is done by scaling the densimeter, in which we determine the level of its specific gravity, relative to determining the degrees of sweetness.

• Dry: 0.998 - 1.010, Semi-dry: 1.011 - 1.020, Mild: 1.021 - 1.030, Dessert: 1.031 and above.

4.3.2 Density Reading

The densimeter is very familiar among artisan beverage producers, as it has a purpose to measure the density difference between pure water and sugar water dissolved in it. The hydrometer makes this reading floating in the liquid. To make the measurement, a plastic or glass tube is required to take samples and test to analyze the density of the liquid present, thus determining the reading. In the case of Mead, every time a density test sample is taken, it has a chance to introduce the most viable possibility of infection and to make the samples at the beginning and end of the fermentation cycle.

4.3.3 Sanitation

All materials need to be extremely hygienic, and worked with great care, as with not very clean materials, they can vary measurements and introduce possible probabilities of infection. The environment where Mead production is done needs to be very clean and places where materials will be exposed.

All material should be thoroughly washed and sanitized with clean cloths, immediately during production and good if gloves and apron are used for handling the densimeter and other equipment, so as not to contaminate external media, wash your hands with soap following the instructions. cleaning procedures on the palms and nails.

4.3.4 Definition of Specific Gravity and Alcohol Content

It is the relationship between the densities of water and honey, in which the ratio between the masses of water and honey is determined by reference to the same volume, thus assigning a fixed value, the specific density (SG) of the mixture, in this case the Mead. Specific density of mead made by the ratio of Initial Gravity (GI) by subtraction of Final Gravity (GF).

Equation 01 - Determine Specified Density of Mead.

$$SG = GI-GF$$

To determine the Alcohol Content (TA) of a drink, and to know the relationship between alcohol and sugar density, since the standard measure of how much alcohol is contained in a given volume. Mead typically being measured more specifically by specific gravity and can be calculated by the constant of 131.25 between the ratio of alcohol and sugar densities to multiply by specific gravity and thus obtain as a percentage of the alcohol content present in the fermentation of the beverage.

Equation 02 - Determine the Alcohol Content.

$$AT = (GI-GF) \times 131.25$$

4.3.4 Process description

In general, the production of Mead, having a very low complexity and considering its relevant investments to produce with quality, faces its difficulties in its production, since the fermentation time is very long until it is ready for consumption. For small-scale production it will take a lot of preparation to serve markets in commercial areas of small and large enterprises in the city of Manaus.

The production process of Mead is very distinct, because it has a remarkable feature in its production flow, because it is discontinued in different stages, because due to its time can vary the times of honey fermentation and must preparation. There are a number of operations to perform the production segment,

so if there are possibilities to do joint operations or continue, the steps follow as follows Figure (Table 01).

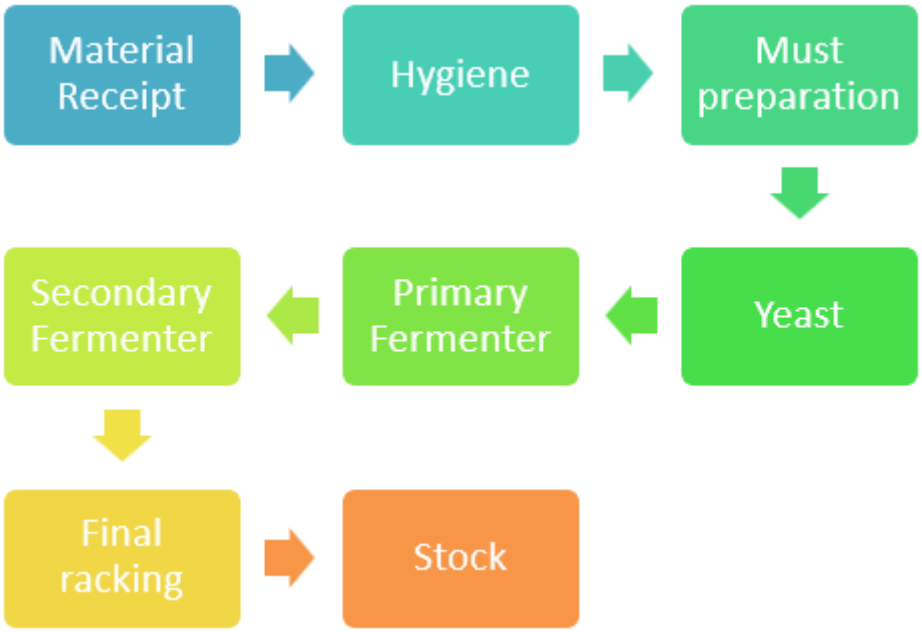

Figure 02: Flowchart of the Mead Production Process
Source: Author

4.5 Production Process

The process for the production of Mead must have the minimum essential care, since a fineness to produce, due to being a craft drink, presents its risks of preparation. Sanitation of all equipment is necessary for preparation as a probability of is subject to risks of contamination.

4.5.1 Receipt of Material

The process of receiving the material, is established by the division of the products that will be used in the consumption of the production from the preparation of the must and the quantity of ingredients to prepare the yeast. The remaining materials are stored in refrigerated places.

4.5.2 Essential Care - Hygiene

i. Keep your hands clean and disinfect them with gel alcohol
ii. Wash equipment and materials that will come in contact with the mead.
iii. Store appropriate place the juice of the guava tree
iv. Follow the procedure carefully, to let the fermentation process act naturally.

4.5.3 Must Preparation

v. Prepare equipment and materials will be used:
1. 15 liter pan
2. Sanitized Cloth
3. 12 Liter Fermenter Bucket
4. Big Elastic

5. Thermometer
6. Densimeter

In this stage the must must be prepared, since the initial mixture of the production process, we must first establish how much water, juice of the guava and honey we will use, in this case we will use 3 liters of water, 1 liter of guava juice and 1 kg of honey. Soon we will use only 1 liter of water in the first steps to boil in the preparation of the must.

First place 1 liter of water in the pan over low heat until it begins to boil, and then when water starts to show signs of steam, turn off the heat, and then add 1 kg of honey during it and also add 1 liter of the juice of guava and 2 liters of water bringing more volume, and with it mix until it dissolves the honey, thus becoming the must that is homogeneous compound.

Then proceed to let the wort cool until it reaches a room temperature, use the thermometer and then immediately take a wort sample and read Initial Gravity (GI), and note the density readings of the substance, and then put the wort already cooled in the fermenter bucket, sealing with the clean cloth and securing it with a rubber band to await the preparation of the yeast.

4.5.4 Yeast Preparation

saw. Prepare equipment and materials will be used:

1. Digital scale
2. Thermometer

The preparation of yeast and the process of the ability to break down sugar into alcohol, making transformation of the prepared must to perform the fermentation faster for consumption. This step takes a lot of use of the digital scale to determine the amount needed to prepare yeast, for this reaction to react in the mixture, and to be able to achieve what we are aiming for.

vii. Quantity prepared:

1. 50 g of hot water
2. 2.5 g of fermenter (Nutrients)
3. 2.0 g of ICV-D47

First we must mix the amount of hot water with fermenter, so mix until it dissolves, and allow to cool to a temperature of 40ºC with the aid of the thermometer, or can wait approximately 10 minutes. Then add the amount of ICV-D47 and mix until completely dissolved in water, and wait about 20 to 15 minutes for the yeast reaction to be ready.

4.5.5 Primary Fermenter

The process in which yeast will be mixed with the must, being one of the steps, but prolonged and that requires more attention over time. By adding yeast to the fermentation to begin the fermentation, we close the lid-fermenter bucket with Airlock, monitoring the mash fermentation for about 72 hours. During the time, stirring is done manually with a closed bucket for about 10 minutes during the days so that fermentation reacts with oxygen.

4.5.6 Secondary Fermenter

This step consists of transferring the Mead to the glass bottle with the substances Sodium Metabisulfite and Potassium Sorbate, causing chemical agents to kill the living microorganisms, thus ending the sugar breakdown. Prior to performing the procedure, a Final Gravity (GF) sampling was taken, thus performing the formula to determine the sweetness level of the Mead.

The Beverage Racking Process can be performed with auto siphon and silicone tube, or use fermenter bucket tap if so, transfer Mead to glass bottle and leave sealed with Airlock silicone cap. The Mead being in the glass bottle with chemical agents is followed up for 24 hours after transferring the Mead until it is lighter in color.

4.5.7 Final Racking

Where the Mead is transferred to a specific bottle, in the case of a 1 liter bottle, in which it will be a final container, where it will be left to age for 1 week so that it is ready for consumption, resting for a while until that is sufficient to lighten the drink.

4.5.8 Stock

Storage Step Mead, in a place out of contact with the sun, preferably in places with room temperature under shade, and can store in refrigerators or freezer at very low temperatures, so that does not change the taste.

4.6 Production Volume

Table 01: Mead Processing Control.

Service Control Planning: Mead Processing		
services	unity	Time
Must Preparation	5 Kg/L	20 to 25 minutes
Yeast Preparation	54 g	35 to 40 minutes
Primary Fermenter	5 Kg/L	42 to 72 hours
Secondary Fermenter	5 Kg/L	24 hours
Final Traffic	5 Kg/L	1 week or more

Source: Author

According to Table 01 the production of Mead in the preparation of 5 liters, the primary fermentation takes around 1 hour and 5 minutes, if we apply the production in liters per day we can prepare in a 6 hour shift

with 5 fermenter buckets, we will have approximately 30 liters in the first stages of the production process (Table 02). The services, but need to be aware are fermentation from primary to secondary, requires great attention and monitoring, because its total duration can take 3 to 4 days until the final traffic, where we let the Mead grow old over time. Production Rate: The preparation of 5 Liters of Mead takes around 1 week and 4 days (Table 02).

Table 02: 30 Liters Rate per day

30 Liter Production Level (Per Day)						Weekly Total
Weeks	Monday	Tuesday	Wednesday	Thursday	Friday	
1º	30	30	30	30	30	150
2º	30	30	30	30	30	150
3º	30	30	30	30	30	150
4º	30	30	30	30	30	150
						600

Source: Author

The factory production will operate with 10 fermenter buckets, with production level of which every 1 hour and 5 minutes, will produce 10 liters of must preparation, which will ferment in the buckets, in case of 2 buckets per hour. To monitor the production processing control, we aim at the tasks per step, following the Gantt chart, how long the service will be performed.

Table 03: Production Control

Gantt Chart - Production Control											
Step	Time in days										
	1	2	3	4	5	6	7	8	9	10	11
Must Preparation	X										
Yeast Preparation	X										
Primary Fermenter	X	X	X								
Secondary Fermenter			X	X							
Final Process				X	X	X	X	X	X	X	X
Stock											X

Source: Author

4.7 Industrial Costs

Elaboration for the necessary costs to manufacture the Handcrafted Mead with araçá-boi fruit, and how much we can produce a unit of 1 liter or 700 ml, however the factory needs to have a good investment in order to be able to produce better performance. Spreadsheet of the costs that will be spent to produce a 700 ml unit Table 04, in which it is more commercially prepared, in which we will see how much each raw material and input cost will come out.

Table 04: Cost Worksheet of a unit.

Cost sheet		
Descriptive		**Unitary value**
Sale value	Market Value (from 50,00 to 150,00 reais)	R$ 100,00
Feedstock	Honey (1kg)	R$ 25,00
Feedstock	Mangrove Juice (1 Liter)	R$ 5,00
Feedstock	Yeast (5g)	R$ 22,00
Feedstock	Nutrients and Energizer (20g)	R$ 10,00
Packing	700 ml bottle	R$ 3,00
Total cost		R$ 65,00
Total profit		R$ 35,00

Source: Author

The profit obtained is very relevant and has an added value, being a very flexible but not cheap production level, a good start for a small-scale venture, where we can get approximately a monthly profit of 21,000.00 R $, with a production of 3 weeks per month. With this the project budget worksheet for its elaboration and value investment that will need for the project Table 05.

Table 05: Budget Worksheet.

Project Budget			
Description of costs	Category	Pk	Total
Shed Rent	Input	1	R$ 4.000,00
Layout Preparation	Input	1	R$ 4.000,00
Company Documentation	Input	-	R$ 1.500,00
Honey	Consumption	450 (kg)	R$ 11.250,00
Squawk Juice	Consumption	450 (L)	R$ 2.250,00

Yeast 5g	Consumption	225 (Packages)	R$ 4.950,00
Nutrients and Energizer 20g	Consumption	180 (Packages)	R$ 1.800,00
700 ml bottle	Consumption	600	R$ 1.800,00
Homemade Production KIT	Consumption	4	R$ 3.200,00
Office material	Input	-	R$ 13.000,00
Total			R$ 47.750,00

Source: Author

4.8 Location

The location chosen to design the factory was Avenida Govenador José, 830 Aleixo Manaus Amazonas Zip Code 69055-010, where they have warehouses for sale, with the total area dimensioning 300 m², due to the location is located among other areas of industrial factories, has great Route routes access the main avenues, making it located in large commercial areas, making it easy to find customers, and reducing transportation costs.

4.9 Layout

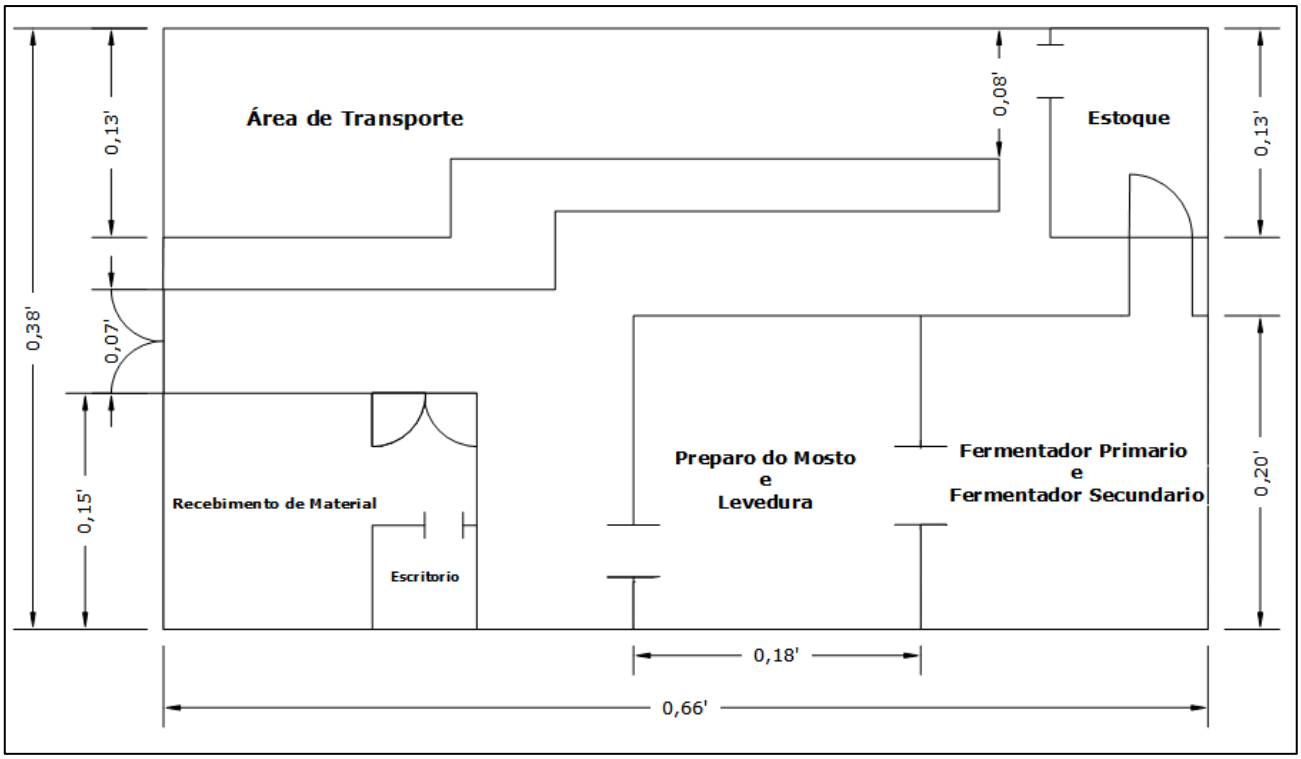

Figure 03: Layout Process

Source: Author

In the Layout model, the receipt of the material is near the entrance, where the office is located, where it

will download the purchase materials received, shortly after that the material is stored, and another part goes to the must preparation room. and yeast, which follows the next step through the primary and secondary fermentation room, right after preparation and sending it to the stock in which it expects production unloading and ready for customer demand.

5. Results and Speeches

The factory project proved to have a good profit, but with very significant investment to prepare for production, however the processing of Mead has its complexity due to the long fermentation time, since in itself, the production volume must be prepared for demand. , being applied a pull production system. One of its difficulties, and in production, in controlling demand for the amount of Mead prepared for planned delivery, among some fermentations can vary the time it is ready for consumption.

Being a promising venture to expand, but the market for alcoholic beverages in Brazil, as a few producers of Mead, who work in the area. Due to the project being applied in the Amazon, to large producers of honey and guava in the region, having local suppliers reduces the cost, and may even improve the price of the costs of purchasing large quantities wholesale. Thus generating economy in the region and more jobs in order to add cultural value of Honey and Amazon fruits.

6. Final Considerations

Being a very relevant production process, it can still generate new business opportunities with other fruits and even seeds, for being a very old drink and cheering for the young culture that seek new trends and curiosities, to try a new alcoholic beverage for the region. With the implementation of the pull production system, you can work the processing control of Mead and prepare new demands for new flavors.

This factory was designed to be a model for entrepreneurs interested in creating an alcoholic beverage market in the region, as it has a responsive sequencing concept focused on specific fruit and honey production, and may vary between stages. And determine which operations can improve and minimize set up time.

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