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China, Factor 1: Plant

## **Investigation and research on apple planting in mountainous areas of central Hebei Province**

--Take Jingxing mining area Tianhuyu Farmers Professional Cooperatives as an example

### **Abstract:**

Apples' manufacturing position around the world is of vital importance. They not only are widely planted in the north part of China, but also has been one of the fruit trees which are the most widely planted and the most productive in the world. Currently, the apple yields are still growing rapidly, and there are more new varieties of apples emerging gradually in the world. Apples have a mild and fruity flavor. They not only contain rich carbohydrates, organic acid, protein and pectin, but also are rich in mineral, such as calcium, phosphorus, potassium, zinc and iron. As is well known, all the fruits are rich in vitamins and dietary fiber. Besides, apples also contain malic acid, tartaric acid and carotene. The nutritional value of apples is the most closest to perfection of all kinds of vegetables and fruits. Some research shows that patients with cardiovascular disease and high blood pressure can obtain benefits from eating apples frequently. Zinc in apples is of beneficial to improve people's memory. Therefore, apples are regarded as the "Wisdom Fruit". What's more, as the saying goes, "One apple a day keeps the doctor away", consumers are attracted to apples more.

In this passage, I will introduce the apple industry development and achievements in tianhuyu valley, the location and human conditions of apple planting , some problems are faced and also the solutions.

### **Key words:**

Apple planting, Integration of production, study and research, bagging technology, ecology agriculture -----

### **1. The apple industry development in Tianhuyu Valley**

Tianhuyu, jingxing mining area is located in the western mountainous area of Shijiazhuang city, Hebei province. The planting area is about 600 acres. Since 1986, Tianhuyu Farmers' Cooperative has been established in cooperation with Hebei Agricultural University. Today, there are still 30 acres of special land for variety research, and the new varieties used at present are called "tianhong no.1" and "tianhong no.2". The apple orchard is surrounded by mountains on three sides, with an altitude of 600-800 meters. Its soil is high quality loamy brown soil with high content of organic matter and trace elements and suitable accumulation of nutrients. The area is irrigated with groundwater, which is sufficient and has a satisfactory quality. It is conducive to the growth of apple trees.

Under the support of the teacher in school, I learned to the local head: at present, the valley farmers production cooperatives put stress to keeping up with the trend of ecological agriculture sightseeing agriculture development to the extreme. With several more downstream enterprise cooperation, the apples sold throughout the country, even exported to Australia, New Zealand, Canada and other countries, are popular among customers. Its new concept of focusing on quality rather than profit has also won the

support of consumers.

## 2. The natural location conditions of apple planting in tianhuyu valley

### 2.1 Propriate temperature

The temperature of the region is one of the most important factors influencing the growth of apple, looks like the interannual variability of temperature will affect the fruit trees , the geographical distribution of its diurnal variation may affect the physiological metabolism of sugar accumulation, which will cause serious influence to the fruit. Apple trees have a wide range of temperature adaptation and can be grew in areas with an average temperature of 5.3-15.3 degrees Celsius. But if the maximum temperature exceeds 25 degrees Celsius, the quality of apples may be adversely affected. Hebei province is located in the northern latitude 37-38 ° area, annual average temperature in 8-19 degrees celsius, so it can provide the suitable temperature.

### 2.2 Rich water resources

Water is an indispensable condition for the growth of all living things. For apples, too much or lack of water will exert a negative effect on the fruit. Tianyu valley is well drilled locally and irrigated with groundwater, which is less polluted, with sufficient water and good water quality. The rainfall in Hebei province is mainly concentrated in summer, with an average annual precipitation of 526mm, which can probably meet the growth requirements of apple trees.

### 2.3 Plenty of sunshine

Light is the energy of photosynthesis, through which all green plants exchange energy with the sun. Apple is a light-loving species, so fruit yield, fruit size, glycolic acid content are all related to light. Hebei has an annual light hours of about 3000, with plenty of sunshine in summer.

### 2.4 Fertile soil and rational use of fertilizers

Fertile soil is one of the important conditions for the growth and development of apple trees. Apple trees are fond of thick, loose and fertile soil, and the content of soil organic matter should be high. This area is loamy brown soil, which is suitable for apples. At present, there are two kinds of fertilizers, organic fertilizers and inorganic fertilizers. Organic fertilizers contain a variety of microorganisms and nutrient elements, and the decomposition of microorganisms can maintain soil vitality. Meanwhile, the recycling application of wastes is realized, but most of them are long-lasting fertilizers. At the same time, inorganic fertilizer effect is quick, durative short. But if they are used in large quantity, they can cause fruit tree poison instead. Additional, long-term use inorganic fertilizer is also detrimental to the soil. Tianyu valley mainly use organic fertilizer supplemented by inorganic fertilizer to give full play to the advantages of various fertilizers and protect the soil as much as possible.

Sheet of nutrient contents of various organic fertilizers

category	water	Organic matter	nitrogen	phosphorus <sub>205</sub>	potassium <sub>20</sub>
Chicken and duck manure	50-56	25.5-26	1.0-1.63	1.4-1.54	0.62-1.85
Pig manure	64.6-77	25-31	0.58-1.0	0.19-0.28	0.4-0.67

and horse and cow dung					
Human excrement and urine		5-10	7	0.2-0.4	0.2-0.3
Soybean cake			5.8	1.32	2.13
Peanut cake			3.4	1.17	1.34
Sesame cake			6.3	3.0	1.3

### 2.5 Excellent topography

Topography is an indirect environmental factor that affects the growth and development of apples very much. It dramatically affects the growth, yield and quality of apples by changing the distribution of light, temperature, water and heat on the ground. Jingxing mining area is a lowland hilly area. So it is very suitable for apple growth.

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## 3. The human location conditions of apple planting in tianhuyu valley

### 3.1 Fine breed

The Fuji apple is from Japan, with its big color fresh, thin skin and thick flesh, juicy and sweet, fragrant and delicious, late ripe and durable storage characteristics has been welcomed by the production and consumers. Launched by Ma Baokun, Hebei agricultural university professor, households have been set up in a "production-teaching-research combination" base, "three-excellent" cultivation mode, with 30 acres in high quality varieties breeding, produced the higher sugar content, better quality "tianhong no.1" "tianhong no.2". Most of them are dwarf apple trees. They have good quality, are resistant to storage, and also create high yield. Most significantly, they are easy to manage and save a host of labor.

Testing items	Unit	measurements	Testing results	Qualified or not
Soluble solids	-----	≥13.0%	13.75%	Well qualified
hardness	N/cm <sup>2</sup>	≥78.4	80.36	Well qualified
Vitamin C	mg/100g	-----	6.32	great
Weight of per apple	g	-----	274.6	great
Apple chromaticity	-----	-----	Red 90%	great

### 3.2 Excellent pest and disease control technology

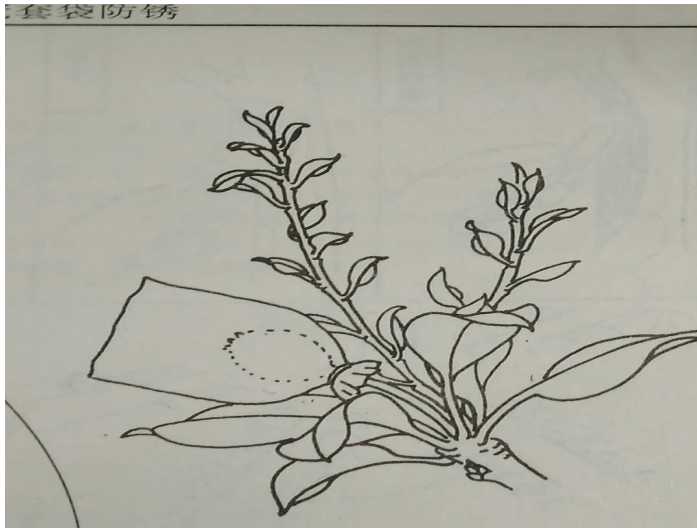
At present, there are three basic pest and disease control methods in China: chemical control, biological control and physical control. Tianhuyu area uses mainly physical control, supplemented by chemical biological control. The physical control is mainly black light lamp and sticky insect plate. The black light takes advantage from the insects' phototaxis, launch a uv lighting at night, insects in the retina absorb the light. Their optic nerve is stimulated, and nervous system command organs to light source. Then we use

chemical or electrical methods to kill pests. Sticky insect boards take advantage to insect repellent to certain chemical odors and certain colors. It is beneficial to no pollution to the environment, little damage to the tree body and no long-term follow-up effect. Biological control is the use of pest natural enemies to eliminate pests. The operation is simple, but the effect is slow. Chemical control such as pesticides, they have less demand for artificial, wider range, quick effect, less investment. They are appropriate management of sudden, explosive pest. Chemical control is the conventional pesticide spraying, but for soil, the tree body harm is bigger. In recent years, we begin to reduce dosage, and use them in an appropriate time.

category	National testing measurements	Produce testing results	Qualified or not
Methamidophos mg/kg	$\leq 0.05$	0.01	yes
Biphenyl chrysanthemum ester mg/kg	$\leq 0.5$	0.0006	yes
Triadimefon mg/kg	$\leq 1$	0.001	yes
Hexachloro-cyclohexane soproicide mg/kg	$\leq 0.05$	0.0005	yes
Dimethyl dichloro vinyl phosphoate mg/kg	$\leq 0.02$	0.01	yes

### 3.3 Bagging technology

With the continuous development of modern fruit industry, bagging technology in fruit planting has been very common. Apple bagging could improve the quality of apple, to a certain extent, realizing green production, effective prevention and control of insect pests and reduce the damage due to natural weather conditions on the apple, the fruit appearance quality, color and luster is better. Early bagging generally used plastic products, due to its low cost. In recent years, due to the importance of reducing white pollution, most bags are made of paper. This way of building good quality requires a lot of human labors. Although there are now machine bagging, the cost is not the average orchard can be transferred, and the quality and flexibility of the machine bagging also need to be considered. The downside is that the bag also blocks some of the sun's rays, affecting photosynthesis, and reducing the amount of vitamin C and protein that makes the flavor lighter.



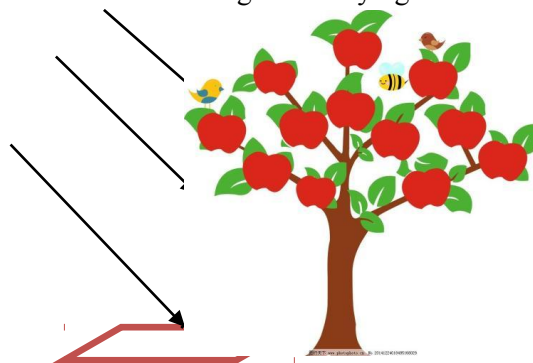
### 3.4 yangyinpo

In mountainous areas, yangpo has long sunshine and strong light, which is conducive to fruit coloring, high hardness, strong flavor and storage, while yinpo fruit is just the opposite.

Therefore, tianyu valley adopts the method of laying a backlight plate on the Yin slope to reflect the sunlight of the Yin slope, which can solve the problem of fruit quality difference of the Yang Yin slope.

In addition, the orchard workers take action, let the tree leaves only a trunk and three large lateral branches, so that the fruit can prolapse vertically, also can accept the sun no dead Angle, ensures the photosynthesis of the fruit, and enhance the quality of the fruit. This method is currently called "drooping fruit method".

The following figure shows the schematic diagram of laying the reflector:



### 3.5 special policy

As the mining area is an important industrial area, the government pays more attention to the development of basic agriculture. Starting in 1986, up to now, the government still helps to protect the woods and fields and arrange research internship from Hebei Agriculture University in order to accelerate the combination of science and practice, create more economic benefits for the land, bring the residents considerable income and better life. Using the unique natural conditions to cultivate superior technology, tianhuyu area actively develop green agriculture, ecological agriculture, adhere to the quality, the progress they made can't depart from the support of the government.

## 4. The achievements in development of apple planting in tianhuyu valley

Tianhuyu village in shijiazhuang mining area, 226 households, 843 people, 1019 mu of arable land, 1700 mu of woodland. "Use technology to develop the mountainous area" strategy is insisted, implementing a scientific outlook on development, with the development of ecological agriculture as the main line, to develop the high quality fruit industry as the breakthrough point, taking economic construction as the center, vigorously implement the mountainous area economic and technological development. They undertake more than 20 scientific research projects, and the introduction of innovation of 15 mountain fruit of scientific research project acceptance through the expert, won the second and third prizes at the provincial or ministerial level, respectively, in 2008 tianhuyu valley of rural tourism in Hebei province was identified as pilot, is identified as pilot demonstration village of science and technology. Since 2012, tianhuyu valley actively implement mountain ecological agriculture sightseeing projects, completed during the first half of the entrance portal environment construction and modern agriculture sightseeing park road hardening and field road paving stone steps.

They use the latest scientific and technological achievements "three-excellent integration of high quality apple production technology" and "apple standardized cultivation" techniques for cultivation, of which 600 acres modern agricultural sightseeing garden. Woods and field employees have college degree in 4 people, obtain the agronomist qualification 2 people, 34 people by learning training green certificates issued by the forestry bureau of Hebei province, strong technical force, the orchard management techniques in the industry in the province and the state. "Hao Yuan" brand red Fuji apple technology content high, with beautiful fruit shape, colour and lustre is gorgeous, sweet and delicious advantages favored by consumers, in 1999 won the silver medal of "99 Kunming world expo", was awarded as "China famous" in 2000, in 2001 won the award for the Shijiazhuang high quality famous brand, in 2003, 2005 and 2003, awarded the title of quality products in Hebei province, in 2004 was awarded as the first seminar of agricultural products quality in Shijiazhuang fruit, in the 11th China's agricultural products trade fair in 2007 won the title of "king of fruit", the "Beijing Olympic Games recommend fruit campaign" won the first prize, In 2008, it won the national green food quality certification; in 2003, 2006 and 2009, it won the title of Hebei famous brand products for three consecutive times; in 2012, it won the organic food quality certification. Hao Yuan woods and fields in Shijiazhuang city in 2005 was named the fruit industry leading enterprises, in 2009 by the ministry of agriculture as standard orchards, in 2010 was named the national popular science demonstration bases, popular science demonstration bases in Hebei province, Shijiazhuang scientific quality-oriented education bases.

Tianhuyu has modern agriculture sightseeing park, products are divided into "Hao Yuan" red Fuji apple, no bitter sweet persimmon, red fruits, peach, and apricot, cedar, and many other varieties, and humanities landscape, natural landscape more than 20, is a collection of ecological harvesting and sightseeing tourism, a high-tech demonstration garden. With a total investment of 1.5 million yuan, we have gradually improved the infrastructure in the tourism park and created a good environment for tourists to spend their leisure and vacation time and travel and harvest.

In the second half we will strengthen ecological environment construction, and maintain the natural landscape features. To maintain ecological environment, we will build tianhuyu valley into a set of ecological tourism, sightseeing picking, modern agriculture as one of the ecological tourism resort, rural economic development in the mountain areas to create a new bright spot.

## 5. The current problems and my point of view about the solutions to the problems

### 5.1 Pollution of apple's appearance in an industrial environment

Mining areas, as the name implies, are rich in coal resources, which has attracted many steel enterprises to build factories here. Although plantations are located in the prevailing wind direction, some industrial pollution gas emissions affect the quality of the fruit. Although bagging technology has been adopted, it is necessary to pick the bag in the last and most important dozens of days, which results in decreased glossiness of the fruit. The surface of fruit is very dusty, which affects the bright luster of fruit and reduces the sales volume to a certain extent obviously.

In this regard, I think orchard protection forest can be built to reduce the harm of industrial pollution. According to the research, orchard shelter forest can stop wind destroying the apples, reduce the mechanical damage of fruit, and also to a certain extent, solve the atmospheric pollution and dust particles are caused by industrial damage to apple dramatically. It also has other benefits, such as regulating climate, reducing evaporation of soil water, and maintaining soil and water on slopes.

### 5.2 low profits attributed to low output

Due to the smaller plots, also pay more attention to production, with the passage of time, the fruit trees also in aging, so in recent years apple production in 1000 jin per acre to 2000 jin per acre, and labor input is large. So earnings have been not very optimistic.

In this regard, I think orchard intercropping can be promoted to plant some other cash crops in the empty window period before the apple matures. It can change a part of aging fruit trees, planting hawthorn trees and so on.

A more appropriate approach would, of course, be to develop tourism agriculture. Tourism agriculture originated in the recent Chinese society. People working in cities are increasingly lonely and sad because of the rapid development. The noise of the city noise, industrial machines roaring sound, mobile computers and other high-tech products of information explosion, since the advent of the era of media, the all let those born in the last century and eighties people feel confused and from nothing. Therefore, they yearn to return to their childhood in the countryside, to seek the beautiful things they have not seen for many years. Picking gardens and economies emerged. People take children who have never seen orchards, with a heart to remember the past, to the fields, to experience rural life with children, and to cultivate the quality of their love of work. In work, their spiritual world will become richer.

As the consumption hot spot becomes more and more prominent, the tourism agriculture develops from the simple picking to the integrated system of eating, drinking, and playing. People can not only experience the sense of harvest, but also experience other rural characteristics. According to the person in charge of tianhuyu valley, they found a hot spring several hundred meters underground. In the near future, maybe you can enjoy a hot spring after picking



fruit. However, there is no perfect way, and tourism agriculture also has some disadvantages.

First of all, some tourists are not ethical enough, they will throw rubbish everywhere. This is not just added to the orchard workers labor. Things like plastic garbage, which are hard to handle, affect soil organic matter content, and obvious effect on fruit quality. In addition, some people will climb trees or break some of the branches in order to pick the fruit on the top of the tree, for apples there taste better. Obviously, this behavior can have an immeasurable effect on the fruit trees. To solve these problems, it is necessary not only to strengthen the inspection of workers in the garden, but also to strengthen the ideological and moral construction of the whole society and promote the improvement of citizens' own quality. The head of the cooperative has told us that he will vigorously develop the integration of infrastructure, accommodation, picking, and sightseeing.

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