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Study on Growth Pattern of Capsicum in Greenhouse

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Abstract: ***Polyhouse is a specialized structure that provides a controlled climate condition for the growth of different plants and other crops. It is a major innovation supported by state governments by providing subsidies for establishing the structure. Polyhouse farming requires less water, fertilizer, and pesticides, and provides a higher yield compared to traditional farming methods. The use of polyhouses is not limited to growing flowers, vegetables, and fruits, but also for developing new techniques for agriculture. The material which is used in this construction is bamboo which is very cheaper comparing to other construction material and easily available, and the strength of bamboo is excellent, it also provides a protected environment for crops from adverse climatic conditions like heavy rainfall. For this protective structure government is also providing subsidy up to 50% for the construction of Greenhouse & Shade net House. Apart from this, 20% additional subsidy is given to small, marginal, scheduled caste & scheduled tribe farmers i.e., 80% subsidy is payable to them. For small and marginal farmers this is a best option for growing different fruits and vegetables is different season. In this experiment we have taken capsicum as our crop, Capsicum is an important commercial vegetable crop known as sweet pepper, bell pepper, or Shimla Mirch. These plants grew throughout the world.Cultivation of crops is mainly climate dependent in normal conditions. Capsicum is a rich source of vitamin A, vitamin C, and mineral calcium (13.4 mg), magnesium (14.9 mg) of phosphorus (28.3 mg), of potassium (263.7 mg) per 100 grams of fresh capsicum fruit weight. The area of the polyhouse (15ft x 10ft) and the ambient condition (15ft x 10ft). We have taken different parameters like temperature, relative humidity, pH etc. The average temperature in the polyhouse and in ambient condition is 27 °C & 24 °C, the average relative humidity in the polyhouse and in ambient condition is 86.5 % & 71 %, the average pH in the polyhouse and in ambient condition is 7.5 & 7.3. This experiment is conducted in two ways, in the polyhouse and the ambient condition to check the difference between the productivity, quality, quantity of the crop. From the polyhouse we got 375.1 gms of capsicum and from the ambient condition we got 186.9 gms of capsicum. The quality of the capsicum is determined by the appearance of the vegetable , the capsicum from the polyhouse looks very good compared to the ambient condition yield, due to some environmental changes the crop is affected.***

Keywords: Capsicum, poly house, temperature, relative humidity

I. INTRODUCTION

Capsicum is an important commercial vegetable crop known as sweet pepper, bell pepper, or Shimla Mirch. These plants grew throughout the world.Cultivation of crops is mainly climate dependent in normal conditions. Hence, all vegetables have their own season in which they are cultivated. But with the introduction of greenhouse technology (Nelson, 1985), farmers can be able to grow different vegetables during off season to generate profit from it and have a good market value. This crop is a cold season crop, but capsicum is cultivated throughout the year using poly house. Capsicum is a rich source of vitamin A, vitamin C, and mineral calcium (13.4 mg), magnesium (14.9 mg) of phosphorus (28.3 mg), of potassium (263.7 mg) per 100 grams of fresh capsicum fruit weight.As there are many small and marginal farmers in Odisha, hence the suitability of a low cost naturally ventilated greenhouse was evaluated for off-season cultivation of capsicum in Odisha because of its high demand during pre-summer period. Bamboo is introduced as the low-cost material for constructing greenhouses. it has become a popular material choice in architecture and design projects because of its sustainable qualities and hardwearing characteristics as it has a higher compressive strength than concrete or wood and rivals the tensility of steel. The cultivation of capsicum was tried in pre-winter days of the year 2022 with sowing under both open and ambient conditions to evaluate and compare its different growth parameters. Looking into the demand of capsicum during off-season and maintaining suitable temperature inside the green house for the growth of capsicum, experiment was conducted under greenhouse and open field conditions with the following objectives and the parameters are to be taken as temperature, relative humidity, pH there parameters are taken every day after the day of sowing to compare the growth and yield of capsicum both inside greenhouse and in open field condition and to compare the cost, quantity, quality, colour of the capsicum both inside and outside the greenhouse.

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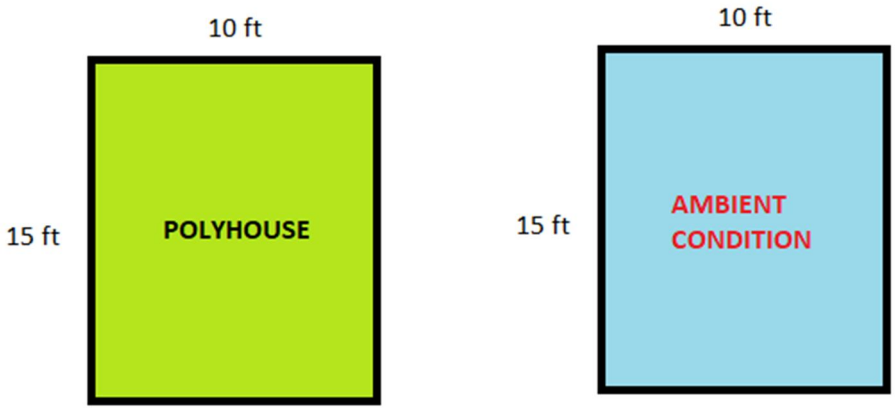
II. METHODOLOGY

A. Location

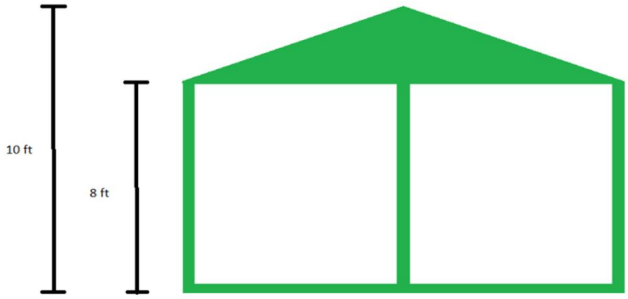
This study was conducted in the campus of Gandhi Institute for Technology (Autonomous) - Ground (20.2227° N, 85.6739° E). This area was selected because it is the nearest place to our site and the soil condition for vegetable growth is good.
For the analysis of data the total vegetables grown were divided into two plots viz., polyhouse (15ft x 10ft) , ambient (15ft x 10ft).

B. Layout

1) Top View



2) Front View



C. Environmental Parameters

1) Temperature: Temperature is a physical quantity that measures the degree of hotness or coldness of an object . It is typically measured using a thermometer. The average temperature 28 to 30°C at daytime , 18 to 20°C at night and more than 35°C fruits will fall down and it affects the setting.


Figure 3.1 temperature meter

2) Relative humidity (Rh): It is the amount of water content present in the soil. This includes the volumetric water content. There are three indicators dry, moist and wet, where red indicates dry soil; green indicates moist soil, and blue indicate wet soil. The moisture content measured by the sensor does not indicate the water intake by the plant as the soil looses water by various means. The average Rh should be 50 to 60 %.


Figure 3.2 Hygrometer

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3) *pH:* This shows an estimate that expresses the acidity or alkalinity of a solution on a logarithmic scale, where 7 indicates neutral. pH influences various plant growth factors, such as nutrient availability, and soil structure. The probe is inserted taking Ph as preference. It will deflect to any reading between 1 – 10, where 1 – 3 indicate acidic soil, 4 – 7 indicates neutral, and 8 – 10 indicate basic soil.

D. Growth Parameters

1) *Plant Height:* Plant height refers to the vertical measurement of a plant from its base to its highest point.



Figure 3.3 seed bed



Figure 3.4 sprouting



Figure 3.5 shifting to polyhouse



Figure 3.6 flowering stage



Figure 3.7 fruiting stage

2) *Root Depth:* Root depth refers to the vertical measurement of the extent of a plant's root system in the soil . It is categorized as shallow, moderate, or deep, depending on the depth of the roots.

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III. RESULT AND DISCUSSION

1) We have put some samples in the polyhouse as well as in the ambient condition to check the productivity in both the environments.
2) The average temperature of polyhouse and ambient condition is 27 °C & 24 °C.
3) The average relative humidity of polyhouse and ambient condition is 86.5% & 71%.
4) The average pH of polyhouse and ambient condition is 7.5 & 7.3.
5) From the polyhouse we got about 375.1 gm of capsicum from the samples.
6) From ambient condition we got about 186.9 gm of capsicum from the samples.
7) Due to some climatic conditions there is some damage in the productivity in both the cases.





Dt:10/11/22	Inside				time: 8 am
		Temp	Rh	pH	
	T1	21.7	62%	7.8	
	T2	21.8	72%	7.8	
	T3	21.7	70%	7.7	
	T4	21.3	65%	7.5	
	T5	22.3	70%	7.4	
		Temp	Rh	pH	time: 2 pm
	T1	28.2	60%	7.8	
	T2	28.3	40%	7.6	
	T3	28.3	44%	7.8	
	T4	29.1	69%	7.9	
	T5	28.3	60%	7.8	
		Temp	Rh	pH	time: 4 pm
	T1	28.3	63%	7.7	
	T2	27.9	39%	7.8	
	T3	27.5	42%	7.9	
	T4	28.1	65%	7.7	
	T5	27.3	62%	7.8	

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Dt:10/11/22	Inside				time: 8 am
		Temp	Rh	pH	
	T1	21.7	62%	7.8	
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	T3	21.7	70%	7.7	
	T4	21.3	65%	7.5	
	T5	22.3	70%	7.4	
		Temp	Rh	pH	time: 2 pm
	T1	28.2	60%	7.8	
	T2	28.3	40%	7.6	
	T3	28.3	44%	7.8	
	T4	29.1	69%	7.9	
	T5	28.3	60%	7.8	
		Temp	Rh	pH	time: 4 pm
	T1	28.3	63%	7.7	
	T2	27.9	39%	7.8	
	T3	27.5	42%	7.9	
	T4	28.1	65%	7.7	
	T5	27.3	62%	7.8	

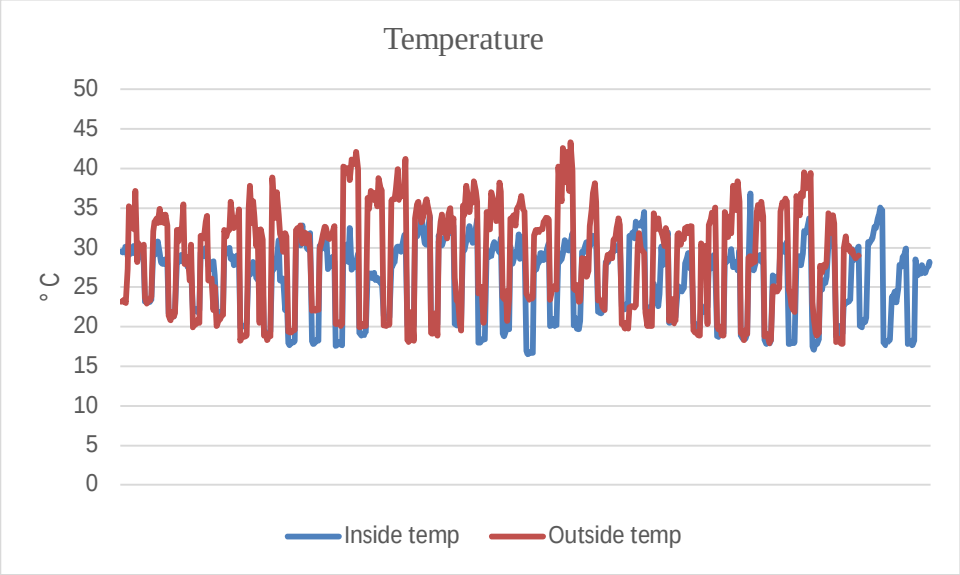
Dt:14/11/22	Inside				time: 8 am
		Temp	Rh	pH	
	T1	19.9	68%	7.7	
	T2	20.1	65%	7.5	
	T3	20.1	65%	7.5	
	T4	19.9	70%	7.5	
	T5	20.5	81%	7.5	
		Temp	Rh	pH	time: 2 pm
	T1	27.8	52%	7.8	
	T2	26.6	41%	7.9	
	T3	27.3	25%	7.9	
	T4	28.2	63%	7.4	
	T5	27.8	59%	7.6	
		Temp	Rh	pH	time: 4 pm
	T1	26.2	89%	7.3	
	T2	25.9	90%	7.4	
	T3	26.3	82%	7.4	
	T4	27.1	80%	7.2	
	T5	26.2	90%	7.3	

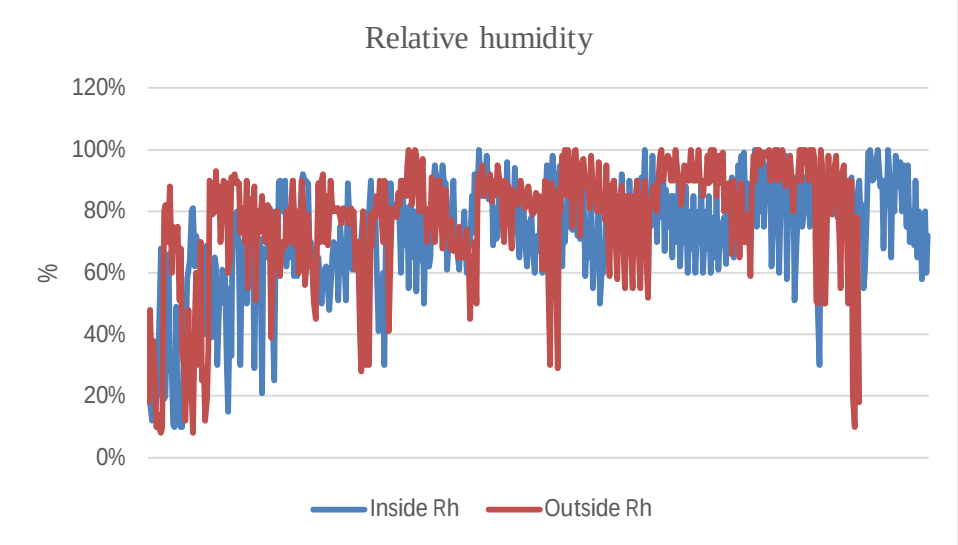
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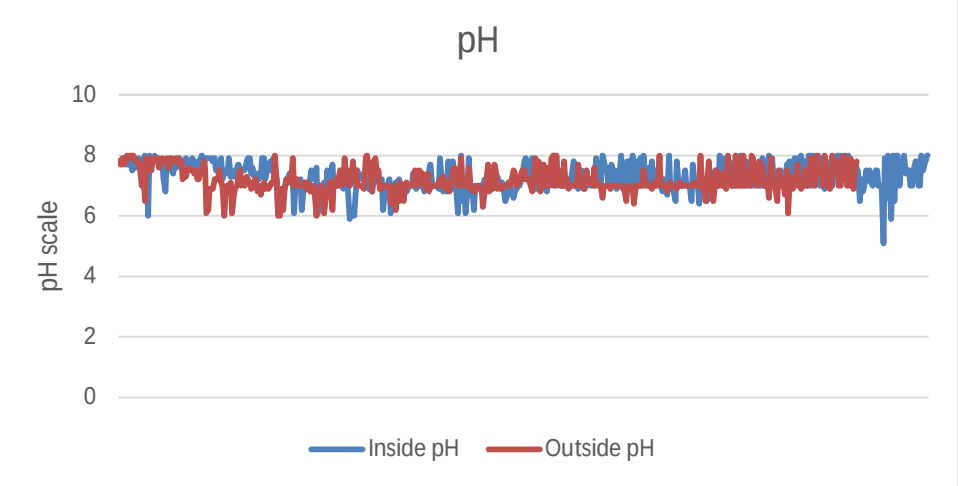
Dt:15/11/22	Inside				time: 8 am
		Temp	Rh	pH	
	T1	19.1	62%	7.9	
	T2	19.3	72%	7.9	
	T3	19.1	65%	7.2	
	T4	18.9	71%	7.5	
	T5	19.5	90%	7.7	
		Temp	Rh	pH	time: 2 pm
	T1	28.7	59%	7.8	
	T2	27.2	65%	7.5	
	T3	28.4	59%	7.9	
	T4	28.7	65%	7.2	
	T5	30.9	80%	7.2	
		Temp	Rh	pH	time: 4 pm
	T1	25.8	90%	6.1	
	T2	25.9	92%	6.2	
	T3	26.1	89%	6.9	
	T4	22.1	90%	6.9	
	T5	25	89%	6.9	

Dt:15/11/22	Inside				time: 8 am
		Temp	Rh	pH	
	T1	19.1	62%	7.9	
	T2	19.3	72%	7.9	
	T3	19.1	65%	7.2	
	T4	18.9	71%	7.5	
	T5	19.5	90%	7.7	
		Temp	Rh	pH	time: 2 pm
	T1	28.7	59%	7.8	
	T2	27.2	65%	7.5	
	T3	28.4	59%	7.9	
	T4	28.7	65%	7.2	
	T5	30.9	80%	7.2	
		Temp	Rh	pH	time: 4 pm
	T1	25.8	90%	6.1	
	T2	25.9	92%	6.2	
	T3	26.1	89%	6.9	
	T4	22.1	90%	6.9	
	T5	25	89%	6.9	

A. Graphs


Temperature
50
45
40
35
30
25
20
15
10
5
0
° C
Inside temp
Outside temp


Relative humidity
120%
100%
80%
60%
40%
20%
0%
%
Inside Rh
Outside Rh


pH
10
8
6
4
2
0
pH scale
Inside pH
Outside pH

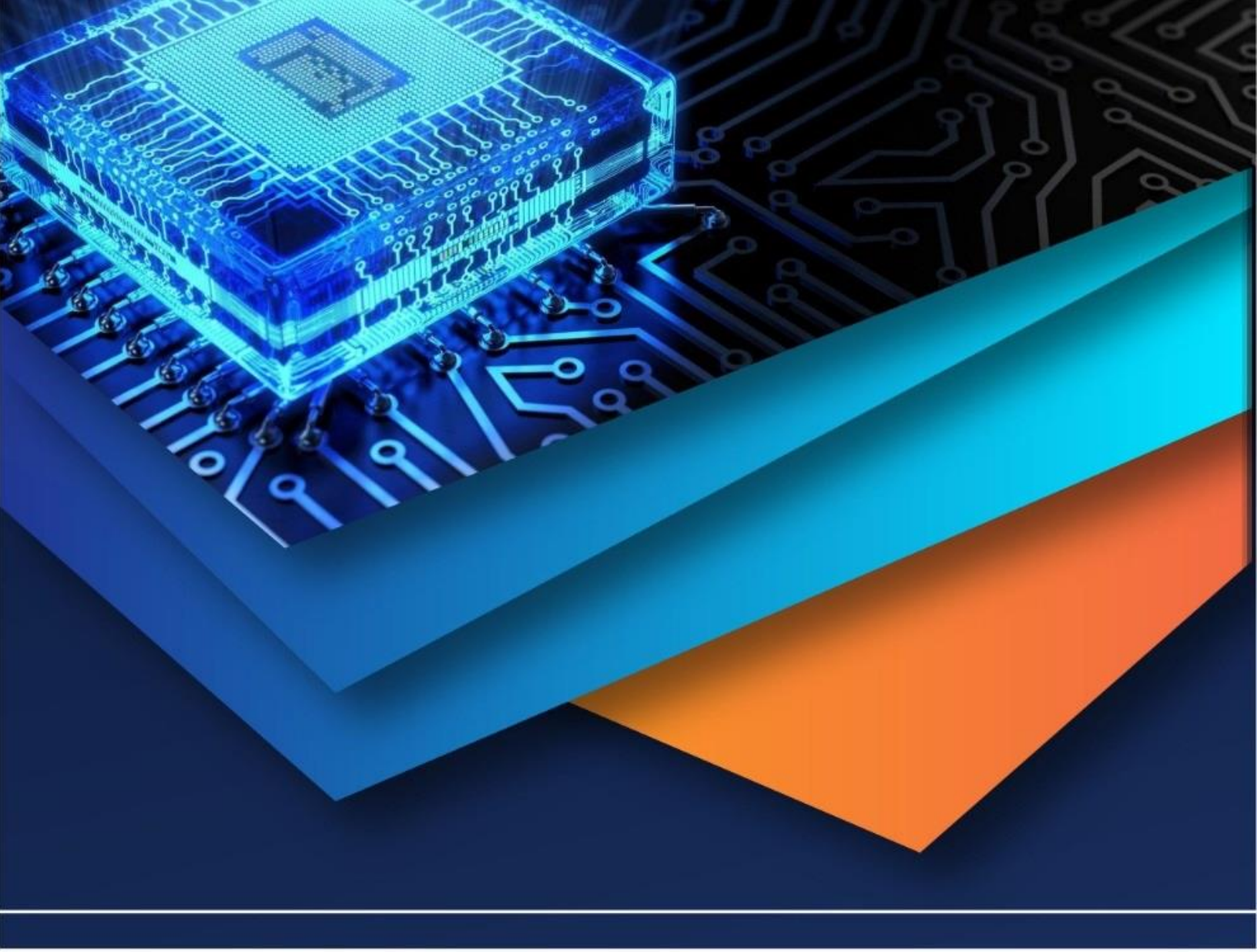
IV. CONCLUSION

1) Polyhouse farming has several advantages, including the ability to grow crops throughout the year, higher yields, protection against weather and pests, and efficient use of space.
2) Proper maintenance of the polyhouse is essential to ensure its longevity and optimal functioning.
3) Increasing crop yields and production.
4) polyhouse farming is profitable.

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