Supplementary material

Questionnaire

1. Gender (select one):

☐ Male

☐ Female

2. Age (write your age in numbers [e.g., 34 years old]):

\_\_\_\_\_\_ years

3. Annual Income (select one):

☐ Below 1 million yen

☐ 1 million to less than 2 million yen

☐ 2 million to less than 3 million yen

☐ 3 million to less than 4 million yen

☐ 4 million to less than 5 million yen

☐ 5 million to less than 6 million yen

☐ 6 million to less than 7 million yen

☐ 7 million to less than 8 million yen

☐ 8 million to less than 9 million yen

☐ 9 million to less than 10 million yen

☐ 10 million to less than 11 million yen

☐ 11 million to less than 12 million yen

☐ 12 million to less than 13 million yen

☐ 13 million to less than 14 million yen

☐ 14 million to less than 15 million yen

☐ 15 million to less than 16 million yen

☐ 16 million to less than 17 million yen

☐ 17 million to less than 18 million yen

☐ 18 million to less than 19 million yen

☐ 19 million to less than 20 million yen

☐ 20 million and above

4. Educational Attainment (select one):

☐ High school or lower

☐ Undergraduate degree or equivalent

☐ Graduate degree

5. Farming Experience (select one):

☐ Below 5 years

☐ 5-9 years

☐ 10-14 years

☐ 15-19 years

☐ 20-24 years

☐ 25-29 years

☐ Above 30 years

6. Land Size (select one):

☐ Below 5 ha

☐ 5-9.99 ha

☐ 10-19.99 ha

☐ 20-29.99 ha

☐ 30-39.99 ha

☐ 40-49.99 ha

☐ 50-59.99 ha

☐ 60-69.99 ha

☐ 70-79.99 ha

☐ 80-89.99 ha

☐ 90-99.99 ha

☐ 100 ha and above

7. Household Workforce (Please specify the number of people involved in your household workforce):

\_\_\_\_\_\_ people (Please enter a number)

8. Work Status:

☐ Part-time

☐ Full-time

9. Do you believe feed rice production is profitable?

☐ 1 - No benefit

☐ 2 - Benefit slightly

☐ 3 - Benefit moderately

☐ 4 - Benefit significantly

10. Does feed rice production ensure you a decent living and secure your family's livelihood?

☐ 1 - No benefit

☐ 2 - Benefit slightly

☐ 3 - Benefit moderately

☐ 4 - Benefit significantly

11. Does feed rice production increase domestic feed and contribute to food security?

☐ 1 - No benefit

☐ 2 - Benefit slightly

☐ 3 - Benefit moderately

☐ 4 - Benefit significantly

12. Does feed rice production provide you with a sense of satisfaction and happiness?

☐ 1 - No benefit

☐ 2 - Benefit slightly

☐ 3 - Benefit moderately

☐ 4 - Benefit significantly

13. Regarding feed rice production, how concerned are you about climate-related disasters such as heavy rain and typhoons?

☐ 1 - No concern

☐ 2 - Concern slightly

☐ 3 - Concern moderately

☐ 4 - Concern significantly

14. Regarding feed rice production, how concerned are you about economic influences?

☐ 1 - No concern

☐ 2 - Concern slightly

☐ 3 - Concern moderately

☐ 4 - Concern significantly

15. Regarding feed rice production, how concerned are you about labor shortage?

☐ 1 - No concern

☐ 2 - Concern slightly

☐ 3 - Concern moderately

☐ 4 - Concern significantly

16. Regarding feed rice production, how concerned are you about extra expenses (e.g., machinery and fertilizers)?

☐ 1 - No concern

☐ 2 - Concern slightly

☐ 3 - Concern moderately

☐ 4 - Concern significantly

About Mental Health (MH)

Instructions: Please indicate how often you have been bothered by the following two problems over the last two weeks using the scale provided.

17. Little interest or pleasure in doing things

☐ 0 - Not at all

☐ 1 - Several days

☐ 2 - More than half the days

☐ 3 - Nearly every day

18. Feeling down, depressed, or hopeless

☐ 0 - Not at all

☐ 1 - Several days

☐ 2 - More than half the days

☐ 3 - Nearly every day

19. How would your behavior change if you were cultivating feed rice on a 10-hectare plot and future feed rice subsidies were reduced by 10% from the current level? Rate from 0 (no change) to 10 (completely stop feed rice production), with each increment representing a 10% change.

☐ 0

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

☐ 8

☐ 9

☐ 10

20. Do you feel responsible for inheriting agriculture?

☐ 0 - No

☐ 1 – Yes

21. Do you identify yourself as a farmer?

☐ 0 - No

☐ 1 – Yes

22. Are you currently producing feed rice?

Please select the option that best describes your current status:

☐ 0 - Yes, I am currently producing feed rice.

☐ 1 - No, I am not currently producing feed rice.

23. Please provide your insights. What key factors could motivate farmers, like yourself, to change their mindset and start growing feed rice?

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Code (This code functions within the context of Jupyter Notebook version 6.4.12. Modifications may be required if utilizing different versions or alternative tools)

import pandas as pd

from sklearn import model\_selection

from sklearn.model\_selection import GridSearchCV

from sklearn import tree

from sklearn.metrics import accuracy\_score, roc\_curve, roc\_auc\_score

from sklearn.utils import resample

import matplotlib.pyplot as plt

import numpy as np

datasetnew = pd.read\_excel("C:/Users/xiang/manuscript.xlsx")

print(datasetnew.isnull().sum(axis=0))

predictors = datasetnew.columns[1:]

y = datasetnew["feedbehaviorP"]

X\_train, X\_test, y\_train, y\_test = model\_selection.train\_test\_split(datasetnew[predictors], y, test\_size=0.25, random\_state=123)

parameters = {

"criterion": ["gini", "entropy"],

"max\_depth": [3, 4, 5, 6, 7, 8],

"min\_samples\_leaf": [2, 3, 9, 10, 11],

"min\_samples\_split": [2, 3, 4, 5, 6, 7]

}

grid\_dtcatag = GridSearchCV(estimator=tree.DecisionTreeClassifier(random\_state=123), param\_grid=parameters, scoring="accuracy", cv=3)

grid\_dtcatag.fit(X\_train, y\_train)

best\_params = grid\_dtcatag.best\_params\_

print(f"Best Parameters: {best\_params}")

CART\_Class = tree.DecisionTreeClassifier(\*\*best\_params)

decision\_tree = CART\_Class.fit(X\_train, y\_train)

pred\_test = CART\_Class.predict(X\_test)

pred\_train = CART\_Class.predict(X\_train)

test\_accuracy = accuracy\_score(y\_test, pred\_test)

print(f"Test Accuracy: {test\_accuracy}")

train\_accuracy = accuracy\_score(y\_train, pred\_train)

print(f"Train Accuracy: {train\_accuracy}")

y\_train\_proba = CART\_Class.predict\_proba(X\_train)[:, 1]

y\_test\_proba = CART\_Class.predict\_proba(X\_test)[:, 1]

auc\_train = roc\_auc\_score(y\_train, y\_train\_proba)

auc\_test = roc\_auc\_score(y\_test, y\_test\_proba)

print(f"Training Dataset AUC Score: {auc\_train:.4f}")

print(f"Test AUC Score: {auc\_test:.4f}")

def bootstrap\_auc(X, y, model, n\_bootstraps=1000, random\_state=123):

np.random.seed(random\_state)

aucs = []

for \_ in range(n\_bootstraps):

# Resample with replacement; remove fixed random\_state to introduce variability

X\_resampled, y\_resampled = resample(X, y)

# Predict probabilities

y\_resampled\_proba = model.predict\_proba(X\_resampled)[:, 1]

# Calculate AUC

auc = roc\_auc\_score(y\_resampled, y\_resampled\_proba)

aucs.append(auc)

return aucs

bootstrapped\_aucs\_train = bootstrap\_auc(X\_train, y\_train, CART\_Class)

lower\_bound\_train = np.percentile(bootstrapped\_aucs\_train, 2.5)

upper\_bound\_train = np.percentile(bootstrapped\_aucs\_train, 97.5)

print(f"95% CI for Training Dataset AUC Score: [{lower\_bound\_train:.4f}, {upper\_bound\_train:.4f}]")

bootstrapped\_aucs\_test = bootstrap\_auc(X\_test, y\_test, CART\_Class)

lower\_bound\_test = np.percentile(bootstrapped\_aucs\_test, 2.5)

upper\_bound\_test = np.percentile(bootstrapped\_aucs\_test, 97.5)

print(f"95% CI for Testing Dataset AUC Score: [{lower\_bound\_test:.4f}, {upper\_bound\_test:.4f}]")

fpr\_test, tpr\_test, thresholds\_test = roc\_curve(y\_test, y\_test\_proba)

plt.figure()

plt.plot(fpr\_test, tpr\_test, color='blue', lw=2, label=f'ROC curve (area = {auc\_test:.2f})')

plt.plot([0, 1], [0, 1], color='grey', lw=2, linestyle='--')

plt.xlim([0.0, 1.0])

plt.ylim([0.0, 1.05])

plt.xlabel('False Positive Rate')

plt.ylabel('True Positive Rate')

plt.title('Receiver Operating Characteristic (ROC) Curve - Testing Data')

plt.legend(loc="lower right")

plt.show()

from sklearn. tree import export\_graphviz

from IPython.display import Image

import pydotplus

from six import StringIO

dot\_data=StringIO()

export\_graphviz(decision\_tree,out\_file=dot\_data, feature\_names=predictors,class\_names=["producing","not producing"],rounded=True,filled=True,special\_characters=True)

graph =pydotplus.graph\_from\_dot\_data(dot\_data.getvalue())

graph.progs = {'dot': u"C:\\Program Files\\graphviz\\bin\\dot.exe"}

Image(graph.create\_png())