Risk Behavior of Farmers Cultivating Traditional Rice Varieties in Erode District, Tamil Nadu

G. Kaviya[1*], A. Vidhyavathi[1], S. Padma Rani[1] and M. Nirmala Devi[2]

[1]*Department of Agricultural Economics, Tamil Nadu Agricultural University (TNAU), Coimbatore (641 003), Tamil Nadu, India.*
[2]*Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University TNAU, Coimbatore (641 003), Tamil Nadu, India.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

This study investigates the risk behavior of traditional rice variety growers in Erode District of Tamil Nadu state, using Moscardi and De Janvry approach and Discriminant analysis technique. A well structured questioner was prepared and purposive random sampling was done in three blocks which covers highest cultivable area under paddy namely Gobichettipalayam, Modakurichi and Bhavani in Erode district. Each traditional rice varieties have some unique characteristics i.e some are pest and disease resistant, drought resistant, resistant to waterlogged condition and have medicinal values. The present study was done to identify the major risks, to quantify the risk attitude and to identify the factors influencing risk attitude of the traditional variety growers in Erode District. In the research it was found that the varieties preferred by farmers were *Thuyamalli, Kichadi samba, Karuppukavuni, Mapillai samba,Arcaud Kichadi Samba, Poongar, Thanga Samba, Sivan Samba* and few other varieties they were cultivating in small areas using organic farming method.The major risk found in cultivating traditional rice varieties were market risk followed by human labour risk, processing risk, input risk, technology risk, institutional risk, natural risk and other risks include transport risk and storage risk. The farmers were grouped into three categories i.e., risk preferrers (63.33 per cent), risk neutral (28.33 per cent) and risk averse (8.33 per cent)

Corresponding author: E-mail: kaviyaganesan15@gmail.com;

based on risk attitude. Once again the farmers in each group was categorized into low, medium, high risk based on nine factors namely, farmers age, major occupation, years of schooling, family size, membership in any of the farmers association, proportion of paddy area to total farm area, proportion of paddy income to total farm income, experience and adequacy of market which were influencing the risk attitude of farmers. In order to conserve the traditional rice varieties from extinction, to restore the soil health, to ensure nutritional security the farmers were willing to take risk.

1. INTRODUCTION

Tamil Nadu has long been renowned as a rice-growing region with a high level of biodiversity. Tamilnadu has around 1200 traditional rice types. Co.Nammalvar and Nel Jayaram, organic agricultural scientists, worked in Tamil Nadu to conserve traditional rice varieties. Farmers in Tamil Nadu have documented 174 traditional rice varieties as a result of this. Some of the rice varieties of Tamil Nadu include, *Kullakkar, Karuppukavuni, Kichadi Samba, Mapillai samba, Thuyamalli, Illupai poo, Kaivara samba, Karunguruvai, Salem senna, Kothamalli samba, Thanga samba, Sivan samba, Tiruchengode samba* etc., Traditional rice varieties are grown in the seasons namely Navarai (December-January), Swarnavari (April-May), Samba (July and August), Kuruvai (June-July), and Thaladi (September and October) [1]. Farmers have deep knowledge of their own rice varieties, their environmental and nutritional requirements and their properties and peculiarities. Indigenous varieties are still conserved for a variety of reasons. Some of them are pest and disease resistant (Eg: *Sigappu Kuruvikar*). They provide fodder and roofing material (Eg: *Kullakar*). They are suited for specific food preparations (Eg: *Kallimadiyan* for Manapparai Murukku). They provide energy and stamina (Eg: *Mappillai Samba*). They are flood and drought resistant (Eg: *Samba Mosanam* and *Vadan Samba*). They have specific medicinal properties (Eg: *Pitchavari* for curing diarrhea). Some varieties are useful for pregnant mothers and lactating mothers (Eg: *Navara* and *Neelan Samba*). Some are suitable for saline soil (Eg: *Kalarpalai*) [2]. The main drawback in the traditional varieties is lesser yield and longer duration when compared to the improved varieties and hybrids. Due to this reason after the introduction of high yielding modern varieties farmers slowly started to adopt those varieties.The modern varieties need more of chemical fertilizers, manures and machine labour for vigorous growth [3]. Inspite of using these resources farmers able to get more yield leading to good returns [4]. But these cultivation practice leads to decreased soil fertility, decreased resistance of pests to chemicals, and decreased production. People were increasingly aware that this method was causing serious pollution of the land, water and air, as well as several diseases that can be traced to chemical cultivation. In recent years, the government is keen to promote sustainable agricultural methods and M.S. Swaminathan (Father of India's Green Revolution) called for the "Ever green revolution" which is a sustainable method [2]. The traditional rice varieties were more suitable for organic farming which was the way to restore the soil fertility which gets detoriated due to the application of chemical fertilizers for non traditional rice varieties.Realizing the health benefits of traditional rice varieties, individuals in urban areas began to consume them, creating market demand that leads to rise in the price of traditional rice varieties than that of modern varieties. Traditional varieties, on the other hand, are produced in small quantities. Rice farmers in and around the town began cultivating traditional types in an attempt to meet local demand.Hence a study has been carried out to analyse the risks involved in cultivating traditional varieties and attitude of the farmers towards taking risk [5]. This study was carried out in Erode district because 27 % of the cultivable area in the District was under paddy [6] and also Gobichettipalayam taluk in Erode district is popularly known as the rice bowl of western Tamil Nadu.The popular traditional varieties in Erode District are *Thuyamalli, Kichadi samba, Karuppu kavuni, Mapillai samba, Arcaurd Kichadi Samba, Poongar, Thanga samba, Sivan Samba* etc.,

2. OBJECTIVE

1. To identify the major risks and to quantify the risk attitudes of sample farmers
2. To identify the factors influencing the risk attitudes of sample farmers

3. METHODOLOGY

In the Erode District, on the basis of highest area under paddy cultivation, top three blocks were chosen for study namely Gobichettipalayam, Modakurichi, and Bhavani. The information was gathered from 60 traditional variety growers ie., 20 farmers from each block. Purposive sampling was used to select farmers.Data were collected from sample farmers using a personal interview method.The tools used for analysis were Garette Ranking,Moscardi and De Janvry Approach and Discriminant analysis. For data analysis SPSS software was used.

3.1 Garrett's Ranking Technique

Garrett's ranking technique was used to determine the key risks in traditional paddy variety cultivation. The ranks awarded to the farmers' limitations were transformed into scores using a percentage for each assigned rank.

Percent position = $100 \times (R_{ij} - 0.5) / N_j$

Where,
R_{ij} = Rank assigned for the ith category by the jth individual
N_j = Number of problems assigned by j^{th} individual

The percent positions estimated were gathered into scores by referring to Garrett's table. As a result, the scores of various respondents were added for each factor, and mean values were estimated. The descending order of the mean values obtained for each of the attributes was used. The attributes with the greatest mean value were deemed the most essential, with the remaining attributes following in that order [7].

Fig. 1. Map Showing the Blocks of Erode District

Blocks Selected for Study
1) **Bhavani**
2) **Gopichettipalayam**
3) **Modakurichi**

3.2 Moscardi and de Janvry Approach

To assess the degree of farmers' risk attitude, the key factors of traditional paddy yield must be identified. From the relationship between input vector (X) and yield (Y) as represented by (1) for the production function, the coefficient of variation (cv) of yield was

$$\theta = \delta_y / \mu_y \qquad (1)$$

Where,

θ = Coefficient of variation of yield
δ_y = Standard deviation of yield
μ_y = Mean yield

If factor cost (P_i) and product price (P_y) were given, then the preference order can be maximized with respect to input levels.The resulting first order conditions was,

$$P_y f_i (\mu_y / X_i) = P_i / (1- {}_\theta K_s) \qquad (2)$$

Where,

P_i = Input cost
X_i = Input vector (most significant input)
P_y = output price
f_i = the elasticity of production of the i-th input
K_s = risk attitude parameter
By solving equation (2), the value of the risk attitude parameter was calculated from observed levels of products and inputs.

$$K_s = 1/{}_\theta [1- ((P_i X_i) / (P_y f_i \mu_y))] \qquad (3)$$

Equation (3) calculates a risk attitude K_s for each farmer based on their knowledge of the production function, the coefficient of variation of yield, product price, and factor cost, as well as observed levels of factor use.Farmers were divided into three groups using the risk attitude parameter K_s, which was distributed evenly [8].

i) Risk preferrer – low risk attitude parameter
ii) Risk neutral – medium risk attitude parameter
iii) Risk averse – high risk attitude parameter

3.3 Discriminant Analysis

A discriminant analysis is performed after the farmers have been divided into several risk aversion categories. On the basis of a set of independent factors, we can categorise individual farmers into two or more mutually exclusive and exhaustive categories using the discriminant analysis technique [9]. The independent socio economic, institutional and farm characteristic variables which can be used as follows:

W_1 = Farmer's Age
W_2 = Major Occupation (only in Farming = 1, others = 2)
W_3 = Years of Schooling (Years)
W_4 = Family size (Number)
W_5 = Membership in any farmers association (Yes = 1, No = 0)
W_6 = Proportion of traditional varieties of paddy cultivated area to total farm area
W_7 = Proportion of traditional varieties of paddy income to total farm income
W_8 = Experience in growing traditional paddy varieties (in years)
W_9 = Adequacy of market (Yes = 1, No = 0)

The grouping variables were the farmer's risk groups. They are classified as follows:

1. Group 1-Risk prefer
2. Group 2-Risk Neutral
3. Group 3-Risk averse

The discriminant function estimates were intended to allocate the traditional varieties of paddy farmers to the same group as the classification variables did (Parameter Ks).Through discriminant analysis and the significant level of each variable included in the function, the factors impacting the farmer's risk attitude were also determined.

4. RESULTS AND DISCUSSION

4.1 Major Risks in Traditional Varieties of Paddy Cultivation

The risks identified other than market risk were human labour risk, processing risk, input risk, natural risk, technology risk, institutional risk and other risks include transportation risk and storage risk. In the present study the market risk was due to the following reasons they are, people who are having awareness about the health benefits of traditional rice varieties only showed interest in buying these varieties and in recent years only the awareness gradually started increasing in urban areas. The price of traditional rice was high which made the low income people to go for non traditional rice.Farmers who were members in any of the farmers associations sell their produce through their association retail outlet. But other farmers started to take risk by trying to sell their produce directly to the consumers which took a long time for them to completely sell all

their produce. There was no separate procurement centre available for traditional rice. The human labour risk was due to more labour required for harvest, labour unavailability, high wage rate. The processing risk happens because there was no separate machineries for hulling traditional rice and it need to be developed. Due to manual hulling there is a chance for broken rice and also it took more time for hulling. Input risk was due to the reason that cost of seeds for traditional rice varieties was higher (average price Rs.50) than non traditional rice varieties (average price Rs.25) and also traditional rice varieties seeds were not supplied through Government seed depots.Many of the varieties were in the verge of extinction. Farmers who were able to produce organic fertilizers and plant protections in their home were to plan according to the time of application in their fields. Technology risk includes the machineries developed for paddy were not efficient for traditional rice varieties. Hence separate machineries need to be developed for traditional rice varieties. Institutional risk was last but before mentioned risk because Government was not providing any subsidies separately for encouraging traditional rice variety growers and in the study the sample farmers were not getting any support from Government side for traditional rice varieties cultivation. Excessive rainfall or drought causes natural risk but traditional rice varieties can withstand during rainfall and also they were resistant to pest and diseases. Some examples include the variety *Samba mosanam* can withstand waterlogged condition, the variety *kullakar* was drought resistant variety and *Kudhiraival samba, Kurangu samba* were resistant to many pest and diseases [2]. The other risks includes transport risk and storage risk. The transport risk occurs during transporting the produce from field to processing area or retail shop for selling. The storage risk occurs because while storing the grains may be prone to storage pest and diseases. Table 1 shows the risk scores assigned to various aspects of traditional paddy varieties cultivation.

4.2 Risk Attitude of the Farmers

Using Moscarde and De Janvry approach the farmers cultivating traditional paddy varieties were categorized into three groups and the results are presented in the table 2. Majority of the farmers fall under the category of risk preferrer (63.33 per cent) followed by risk neutral (28.33 per cent) and risk averse (8.33 per cent). This showed farmers who were willing to take

above said risk only can cultivate traditional varieties.

Discriminant analysis was performed to validate the farmer typology that had already been categorised using the risk attitude parameter K_s. Each farmer's group was divided into three categories: low risk, medium risk, and high risk. Among the risk preferrer group 94.7 % of them were categorized as low risk preferrer.Among the risk neutral 88.2 % of them were categorized as medium risk neutral and in risk averse group 60 % of them were high risk averse. Low risk and high risk in the anticipated group membership referred to those who could move to other risk groups because they were closer to the next risk group, whilst medium risk stayed in the same risk group.

4.3 Factors Influencing the Risk Attitude

The characteristics that influence the risk attitudes of the sample farmers are presented in table 4. In order to found the smallest set of variables that were relevant for discrimination and, as a result, the amount of their relevance in discriminating, a test was conducted on the coefficient of variables for their statistical significance.

The result indicated that age, years of schooling, membership in any farmers association, proportion of paddy cultivated area to total area cultivated and adequacy of market were significant at one percent level. Proportion of paddy income to total farm income was significant at ten percent level. These were the factors which strongly influences the risk attitude of the farmers cultivating traditional varieties of paddy. Major occupation, family size, and experience were not strongly influencing the risk attitude of the paddy farmers.

In risk preferrer group majority of the farmers were in the age of less than or equal to thirty six, their major occupation was farming and their subsidiary occupation was business, they completed a graduation and their family consists of 3 to 5 members, 90 per cent of members in associations like Uyir Organic Group, Kazhani Farmer Producer Company were willing to take risk, proportion of paddy cultivated area to total cultivated area was between 0.34 – 0.67, proportion of paddy income to total farm income was less than 0.34, experience in cultivating traditional varieties was 2 to 4 years, they were not having adequate market facilities for selling

their produce. Remaining farmers came under risk neutral and risk averse group. Table 5. clearly showed that in each category which kind of farmers were ready to take risk and avoid risk.

The benchmark characteristics of risk attitude groups were presented in the table 6. From the below table we infer that the farmers who were young in age is willing to take risk than old age farmers. Highly educated farmers and members in farmers associations like uyir organic group and kazhani farmer producer company had great interest in cultivating traditional varieties because they were aware about the benefits of these varieties and showed interest in conserving those varieties from extinction. In recent years only the farmers started to cultivate the traditional varieties so they have lesser experience. Eventhough there was not much market facilities available for them, the famers indicated that the farm gate price they obtain for traditional rice (average price Rs.80) was higher than non traditional rice (average price Rs.38).

Table 1. Major risks in traditional paddy varieties cultivation

S.no	Risks	Score	Rank
1	Market Risk	76.75	I
2	Human Labour Risk	67.85	II
3	Processing Risk	58.4	III
4	Input Risk	55.8	IV
5	Technological Risk	48.8	V
6	Institutional Risk	38.4	VI
7	Natural risk	33.6	VII
8	Other Risk	20.4	VIII

Table 2. Risk attitude of the farmers cultivating traditional paddy varieties

S.no	Risk Attitude	Risk Attitude Parameter (Ks)	Traditional Variety Growers	
			Nos.	Percentage
1	Risk Preferrer	$0 < Ks < 1$	38	63.33
2	Risk neutral	$1 \leq Ks \leq 2$	17	28.33
3	Risk averse	$2 < Ks < 3$	5	8.33
Total			60	100.00

Table 3. Validation of risk attitude groups through discriminant analysis

S.no	Risk attitude	No.of.Farmers	Predicted Group Membership		
			Low Risk	Medium Risk	High Risk
1	Risk preferrer	38	36 (94.7)	2 (5.3)	0
2	Risk neutral	17	0	15(88.2)	2 (11.8)
3	Risk averse	5	0	2 (40)	3 (60)
4	Total	60	36 (60)	19 (31.67)	5 (8.33)

(Note: Figures in parenthesis indicate percentage to the total)

Table 4. Factors Influencing the Risk Attitude

S.no	Variables	Wilks Lambda	Significance
1	Age (Years)	0.534	0.000***
2	Major Occupation (Farming = 1, Others = 0)	0.938	0.16
3	Years of Schooling	0.575	0.000***
4	Family Size (No.)	0.965	0.364
5	Membership in any farmers association (Yes = 1, No = 0)	0.657	0.000***
6	Proportion of paddy cultivated area to total farm area	0.591	0.000***
7	Proportion of Paddy income to total farm income	0.918	0.087*
8	Experience in growing traditional paddy varieties (in years)	0.935	0.149
9	Adequacy of Market (Yes = 1, No = 0)	0.838	0.006***

(*** indicates one percent significance level, ** indicates five percent significance level, * indicates ten percent significance level)

Table 5. Factors responsible for risk attitude of farmers cultivating traditional paddy varieties

S.no	Factors		Risk Preferrer	Risk neutral	Risk averse	Total
1	Age (Years)	Young (≤ 35)	30 (88.23)	4 (11.76)	0	34 (100)
		Middle (36 to 45)	6 (46.15)	5 (38.46)	2 (15.38)	13 (100)
		Old (≥ 46)	2 (15.38)	8 (61.53)	3 (23.07)	13 (100)
		Total	38 (63.33)	17(28.33)	5 (8.33)	60 (100)
2	Major Occupation	Farming	21 (55.26)	14 (36.84)	3 (7.89)	38 (100)
		Business	17 (77.27)	3 (13.64)	2 (9.09)	22 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
3	Educational Level	Illiterate	1 (100)	0	0	1 (100)
		Primary	0	3 (60)	2 (40)	5 (100)
		Secondary	0	5 (62.5)	3 (37.5)	8 (100)
		Higher Secondary	6 (42.8)	8 (57.1)	0	14 (100)
		Graduate	28 (96.55)	1 (3.44)	0	29 (100)
		Post Graduate	3 (100)	0	0	3 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
4	Family Size (No.)	Small (< 3)	6 (60)	4 (40)	0	10 (100)
		Medium (3 to 5)	26 (63.41)	10 (24.39)	5 (12.19)	41 (100)
		Large (> 5)	6 (66.67)	3 (33.33)	0	9 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
5	Membership in any farmers Association	Yes	28 (90.32)	3 (9.68)	0	31 (100)
		No	10 (34.48)	14 (48.27)	5 (17.24)	29 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
6	Proportion of Paddy Cultivated Area to Total Farm Area	0.00 - 0.33	3 (17.65)	10 (58.82)	4 (23.53)	17 (100)
		0.34 - 0.67	28 (77.78)	7 (19.44)	1 (2.78)	36 (100)
		0.68 - 1.00	7 (100)	0	0	7 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
7	Proportion of Paddy Income to Total Farm Income	0.00 - 0.33	31 (58.49)	17 (32.07)	5 (9.43)	53 (100)
		0.34 - 0.67	7 (100)	0	0	7 (100)
		0.68 - 1.00	0	0	0	0
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
8	Experience (Years)	< 2	4 (57.14)	2 (28.57)	1 (14.29)	7 (100)
		2 - 4 years	30 (61.22)	15 (30.61)	4 (8.61)	49 (100)
		> 4	4 (100)	0	0	4 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)
9	Adequacy of Market	Yes	16 (94.12)	1 (5.88)	0	17 (100)
		No	22 (51.16)	16 (37.21)	5 (11.63)	43 (100)
		Total	38 (63.33)	17 (28.33)	5 (8.33)	60 (100)

(Note: Figures in parenthesis indicate percentage to the total)

Table 6. Benchmark characteristics of risk attitude groups

S.No	Variables	Risk Preferrer	Risk neutral	Risk averse
1	Age (Years)*	33.87	43.18	51.4
2	Major Occupation (Farming = 1, Others = 0)	0.55	0.82	0.6
3	Years of Schooling*	14.61	10.35	8
4	Family Size (No.)	4.47	4	3.8
5	Membership in any farmers association (Yes = 1, No = 0)*	0.74	0.18	0
6	Proportion of paddy cultivated area to total farm area*	0.57	0.32	0.24
7	Proportion of Paddy income to total farm income*	0.26	0.23	0.2
8	Experience in growing traditional paddy varieties (Years)	0.71	2.29	1.8
9	Adequacy of Market*	0.42	0.06	0

*(Note : * refers to statistically significant variables)*

5. CONCLUSION

The above mentioned findings showed that in the cultivation of traditional rice varieties, marketing is the most significant issue because of the reasons 1) there was no procurement centre separately for traditional rice varieties 2) lack of market infrastructure 3) the price of the traditional rice was higher when compared with non traditional rice which made low income group of people to depend on non traditional rice but the farmers will generate good revenue if they able to sell their produce. The other risks include human labour risk, processing risk, input risk, technology risk, institutional risk, natural risk and other risks include transport risk and storage risk. Even though there was lots of risk in traditional varieties cultivation,63.33 per cent of the traditional variety farmers were risk preferrers, 28.33 per cent were risk neutral and 8.33 per cent were risk averse. The significant factors which influence the risk attitude of the traditional variety growers were age, years of schooling, membership in any of the farmers association, proportion of paddy cultivated area to total farm area, proportion of paddy income to total farm income and adequacy of market. Even if, lots of risk involved in cultivation and marketing those traditional variety growers were willing to take risks because they were aware about the benefits of traditional rice and showed interest in conserving those varieties and also they stated that Farm gate price for traditional rice was higher when compared with non traditional rice which made them to take risk. To overcome the risks, 1) machineries like harvester, huller need to be developed separately for traditional paddy varieties 2) Government should involve in encouraging farmers cultivating traditional varieties by supplying traditional variety seeds because the seed cost was higher when compared with non traditional variety seeds, traditional varieties seed farm has to be established more in number, separate procurement centre need to be established in each district because these farmers were facing lots of challenges in marketing, subsidies can be provided for them to cultivate those varieties. These measures can be undertaken to promote traditional paddy variety cultivation since these varieties can respond well to organic farming leading to restoration of soil health which gets detorated due to chemical fertilizers applied for non traditional paddy varieties.

ACKNOWLEDGEMENTS

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Karpagalakshmi S, Brindha K. A Study on Farmers' Production of Traditional Rice Varieties in Thanjavur District of Tamilnadu. International Journal of Future Generation Communication and Networking. 2021;14(1):540-546

2. Balasubramanian AV, Vijayalakshmi K, Parimala K, Subhashini Sridhar, Subramanian K, Manikandan R. Traditional Rice Varieties of Tamil Nadu: A Source Book. The Centre for Indian Knowledge System; 2019

3. Lokanadha Reddy E, Radhakrishna Reddy D. A study on resource use efficiency of input factors with reference to farm size in

paddy cultivation in Nellore District. IOSR Journal of Humanities and Social Science. 2013;17(1):48-55.

4. Bhakthavatsalam KVS, Mundinamani SM. Economics of resource use efficiency in paddy cultivation. Karnataka Journal of Agriculture Sciences. 2015;28(3): 369-372.

5. Piotr Sulewski, Adam Was, Pawel Kobus, Kinga Pogodzinska, Magdalena Szymanska, Tomasz Sosulski. Farmers attitudes towards risk – An empirical study from Poland. Agronomy. 2020;10:1555: DOI:10.3390/agronomy10101555.

6. Erode District Statistical Handbook Department of Economics and Statistics, Erode; 2019-20.

7. Nithin Raj K, Paul Lazarus T, Aswathy Vijayan, Durga AR, Aparna B, Brigit Joseph, Roy Stephen. Constrains in paddy cultivation faced by the farmers in upper kuttanad: A study in Alappuzha District of Kerala. Journal of Pharmacognosy and Phytochemistry. 2020;9(4):370-373.

8. Olarinde1 LO, Manyong VM, Akintola JO. Attitude towards risk among maize farmers in the dry savanna zone of Nigeria : some prospective policies for improving food production. African Journal of Agricultural Research. 2007;2(8):399-408.

9. Ramayah T, Noor Hazlina Ahmad, Hasliza Abdul Halim, Siti Rohaida Mohamed Zaina, May-Chiun Lo. Discriminant analysis: An illustrated example. African Journal of Business Management. 2010;4(9):1654-1667.

_____