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"Geospatial Information for a Smarter Life and Environmental Resilience"

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Evaluating the Current Ecological Adaptability and Future Trends of Agricultural Land Use Systems for Spatial Orientation of Land Use Planning in Quoc Oai District, Hanoi City.

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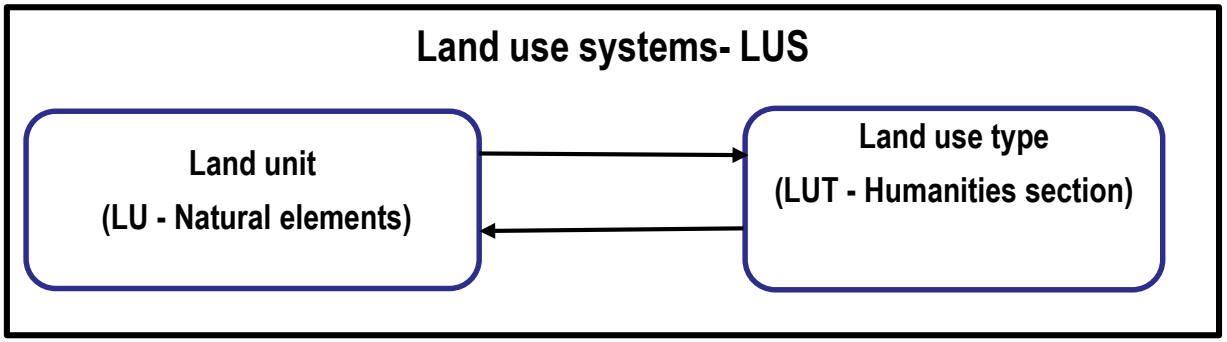
Structure

- Background
- Study area
- Methods
- Results and discussion
- Conclusion

What is the land use systems?

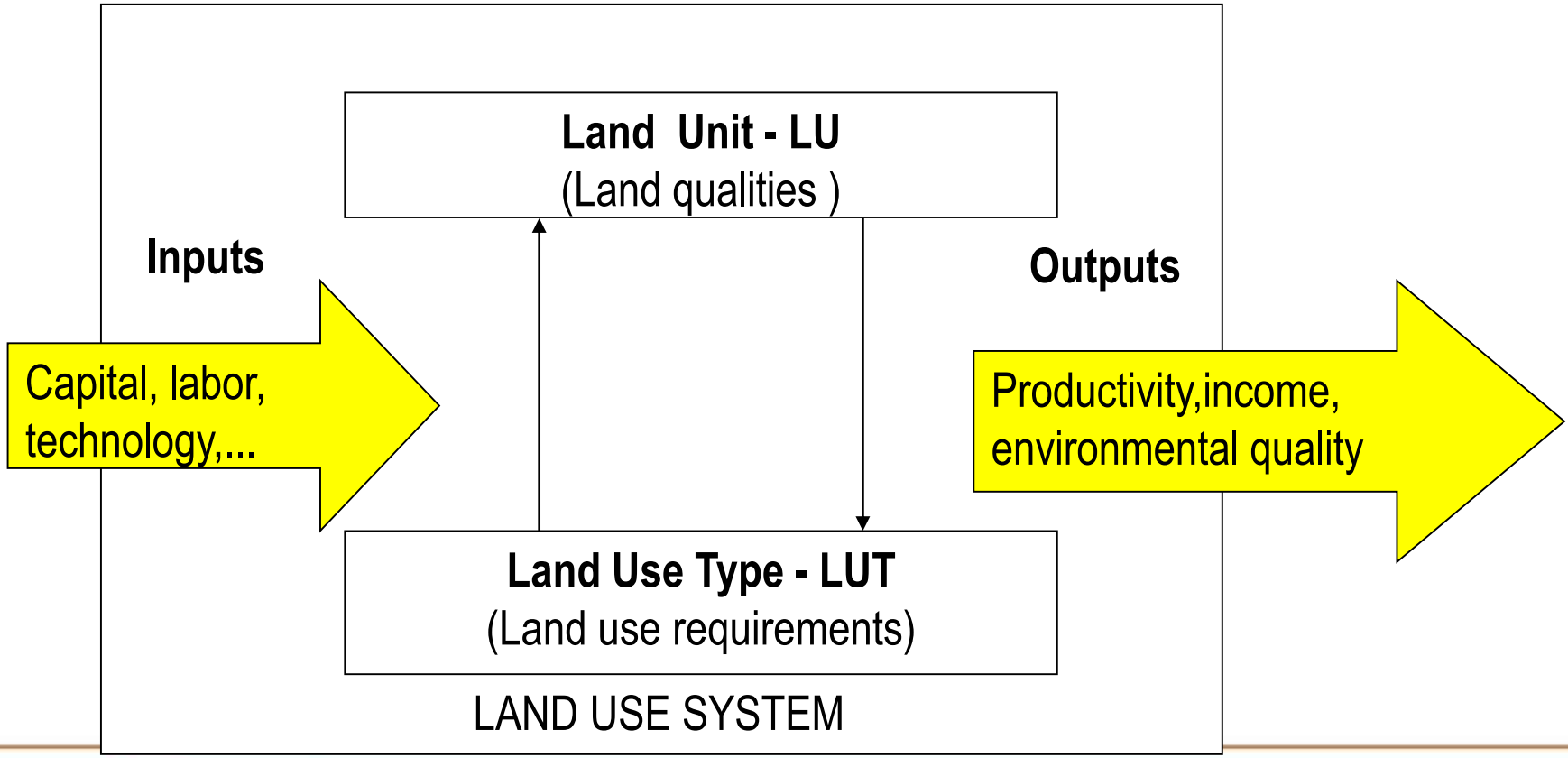
- Land use system (LUS) is a combination of a land use type with a separate land unit that forms two closely interrelated components. These interactions will determine the characteristics of the level and type of investment costs; land improvement; and productivity and yield of land use system (FAO, 1984; Driessen và Konijn (1992), Hermand Huizing (1995) và ITC (1998); Ministry of Agriculture and Rural Development, 2008).



Land units are less changed due to human impact than land use types in a territory. Therefore, the diversity of LUS depends on the diversity of land use types.

Land Unit	Land use type
• LUS of agricultural production • LUS of forestry • LUS of aquaculture	• LUS of rural settlements • LUS of urban settlements	• LUS of industrial zones and clusters • LUS of exploits minerals • LUS of builds materials and ceramics
The LUS group is closely related to natural conditions	The LUS group relates to human settlement	The LUS group related to non-agricultural production

What is the agricultural land use systems?



It is specific in structure

Structural simulation

Firstly: Demonstrates a compact combination of LU and LUT (Beek, 1981; FAO, 1984).

Secondly: Provide an analytical framework to evaluate the effectiveness of variations in the system

Demonstrate the interrelationship between components in LUS at input and output

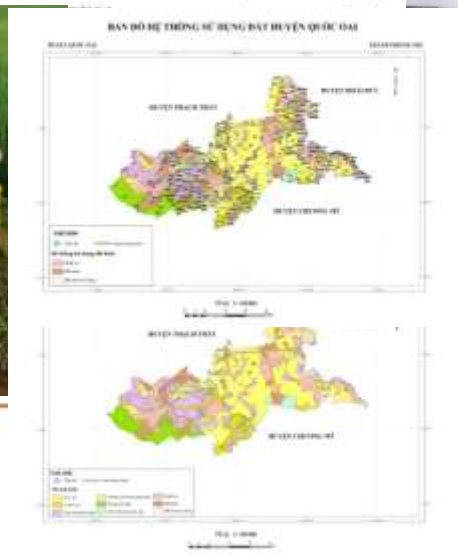
Evaluating ecological adaptability according to land use **system** approach will be more complete and allow for extrapolation in land evaluation.

Study area

The total natural land area of the district is 15112.8 ha, of which agricultural land area is 9637.91 ha. Agriculture in the district aims to develop ecological villages and high-tech agriculture

Methods

- Methods of data collection and analysis
- Method of field survey
- Mapping and GIS methods
- Expert method
- Analytic Hierarchy Process (AHP):

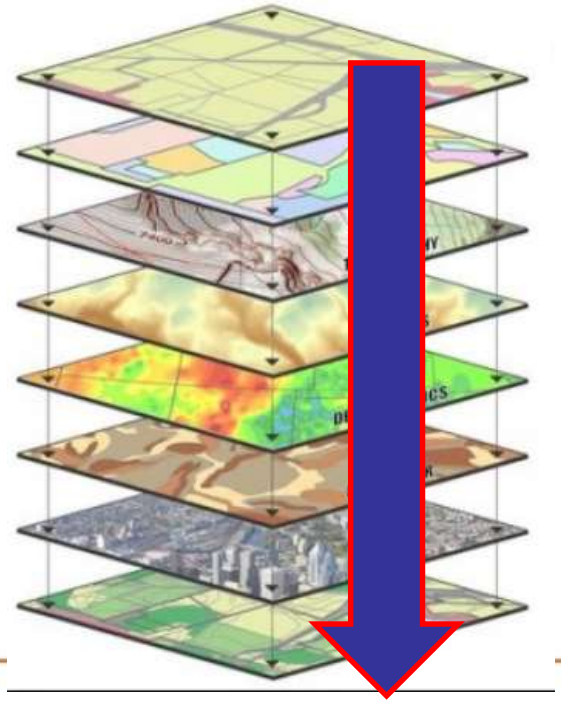


Characteristics of land unit in Quoc Oai district

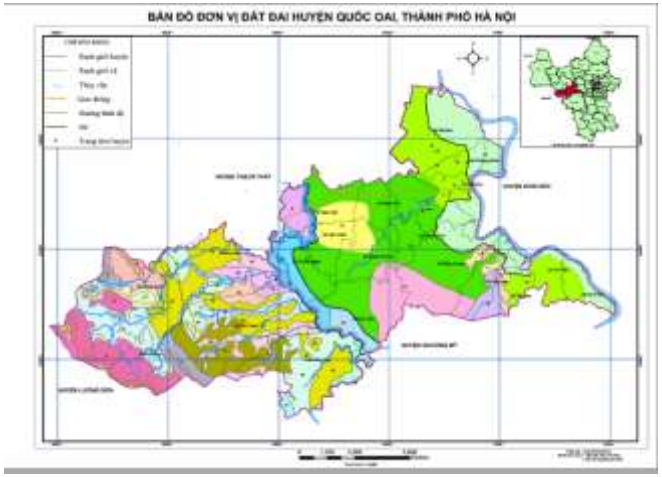
- **8 criteria**

  Drainage regime
  Irrigation regime
  Texture
  Soil depth
  Soil type
  Slope
  Topography
  Bedrocks

Thematic map



Land unit map

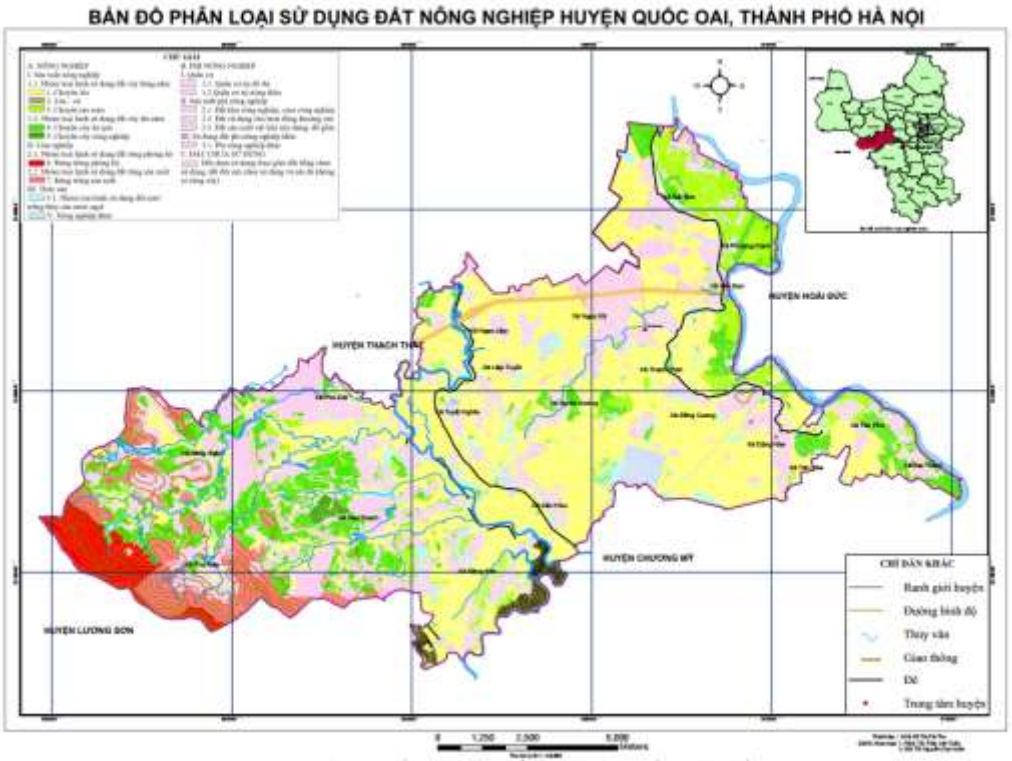


34 land units

Land use type

No	Name of LUT
1	Rice
2	Rice - fish
3	Vegetables
4	Perennial fruit trees
5	Tea tree
6	Production forest
7	Protection forest
8	Freshwater aquaculture
9	Other agriculture

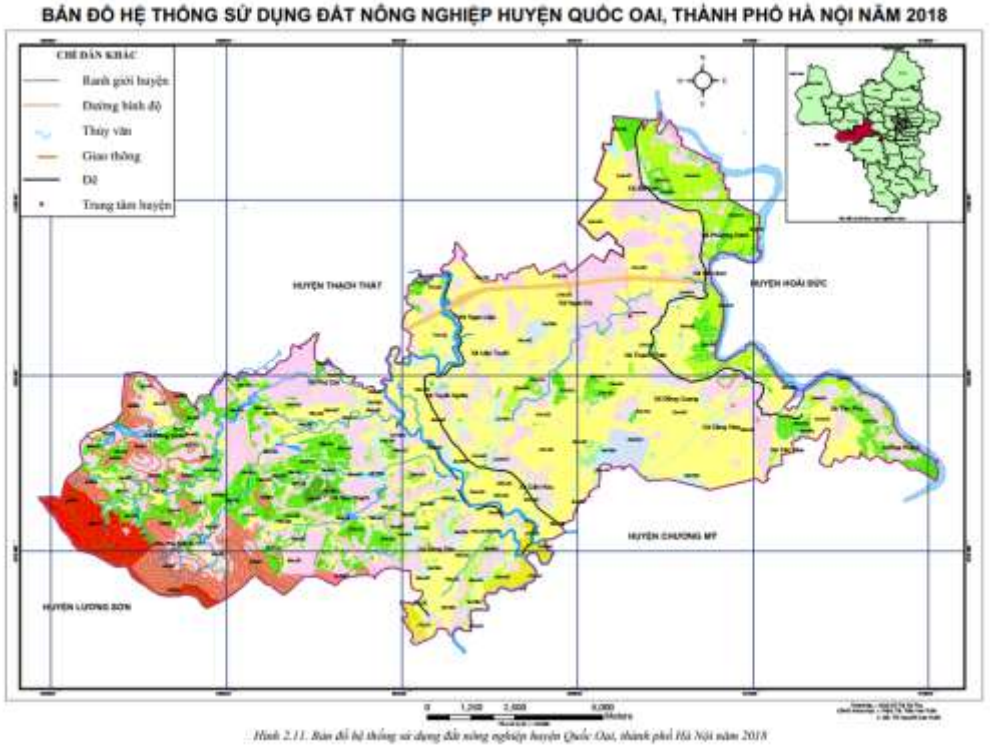
Land use type map



Hình 2.10. Bản đồ phân loại sử dụng đất nông nghiệp huyện Quốc Oai, thành phố Hà Nội

Agricultural land use system

- As a result, there are 46 agricultural land use systems based on a combination of 34 LU and 7 LUT
- LUS is showed by **n - X**, which X is the land use type, n is the land unit (for example: 5-LUC)



Agricultural land use system map

Ecological demand of agricultural land use type

LUS	Criteria	Weight	The appropriate level			
			Highly Suitable (4 points)	Moderately Suitable (3 points)	Marginally Suitable (2 points)	Not Suitable (1 points)
Rice	Soil type	0.13	Pk,Pg	Pb	Pj, Fl	Fk,Fs,J, Fp
	Texture	0.06	e	d	c	
	Topography	0.13	In the dyke	Alluvial ground	Low hill	High hill, mountain
	Soil depth	0.06	1	2	3	
	Irrigation regime	0.23	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.12	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.03	a,am	ap	alb	b,s,v,t
	Slope	0.24	I	II	III	IV, V,VI
Rice-fish	Soil type	0.13	Pj	Pk, Pg	Pb, Fl	Fk, Fs, J, Fp
	Texture	0.06	e	d	c	
	Topography	0.12	In the dyke	Alluvial ground	Low hill	High hill, mountain
	Soil depth	0.06	1	2	3	
	Irrigation regime	0.24	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.12	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.03	a,am	ap	alb	b,s,v,t
	Slope	0.24	I	II	III	IV,V,VI
Vegetables	Soil type	0.10	Pk,Pb	Fl, Fp	Pg	Fk,Pj,J,Fs
	Texture	0.16	c	d	e	
	Topography	0.14	Alluvial ground	In the dyke	Low hill	High hill, mountain
	Soil depth	0.07	1	2	3	
	Irrigation regime	0.14	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.27	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.04	a	ap, am	alb	b,s,v,t
	Slope	0.07	I,II	III	IV	V,VI

Ecological demand of agricultural land use type

LUS	Criteria	Weight	The appropriate level			
			Highly Suitable (4 points)	Moderately Suitable (3 points)	Marginally Suitable (2 points)	Not Suitable (1 points)
Perennial fruit trees	Soil type	0.18	Pk	Fk,Fs,Fp,Pb	Fl	Pg,Pj,J
	Texture	0.06	e	d	c	
	Topography	0.17	In the dyke	Alluvial ground	Low hill	High hill, mountain
	Slope	0.18	II	I	III	IV,V,VI
	Soil depth	0.19	1	2	3	
	Irrigation regime	0.08	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.10	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.04	a,am	ap,s,b	alb	v,t
Tea tree	Soil type	019	Fs, Fk	Fp	Fl	J,Pb,Pk,Pj,Pg
	Texture	0.06	d	c	e	
	Topography	0.16	Low hill	High hill	In the dyke	Alluvial ground, mountain
	Slope	0.21	III	II	I	IV,V,VI
	Soil depth	0.16	1	2	3	
	Irrigation regime	0.09	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.10	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.04	s,b	ap	am	alb,a, v, t
Forests (including production forests and protection forests)	Soil type	0.23	Pbe, Pe,Fs, Fp	Fl	Pg	J, Pj
	Texture	0.07	e	d	c	
	Slope	0.20	IV,V,VI	III	II	I
	Soil depth	0.22	1	2	3	-
	Irrigation regime	0.10	Active irrigation	Semi-active irrigation	Difficult irrigation	No irrigation
	Drainage regime	0.05	Active drainage	Semi-active drainage	Difficult drainage	Self-draining
	Bedrocks	0.05	b,s,t,a	ap,am	alb	v
	Topography	0.08	Mountain, high hill	Low hill	In the dyke	Alluvial ground

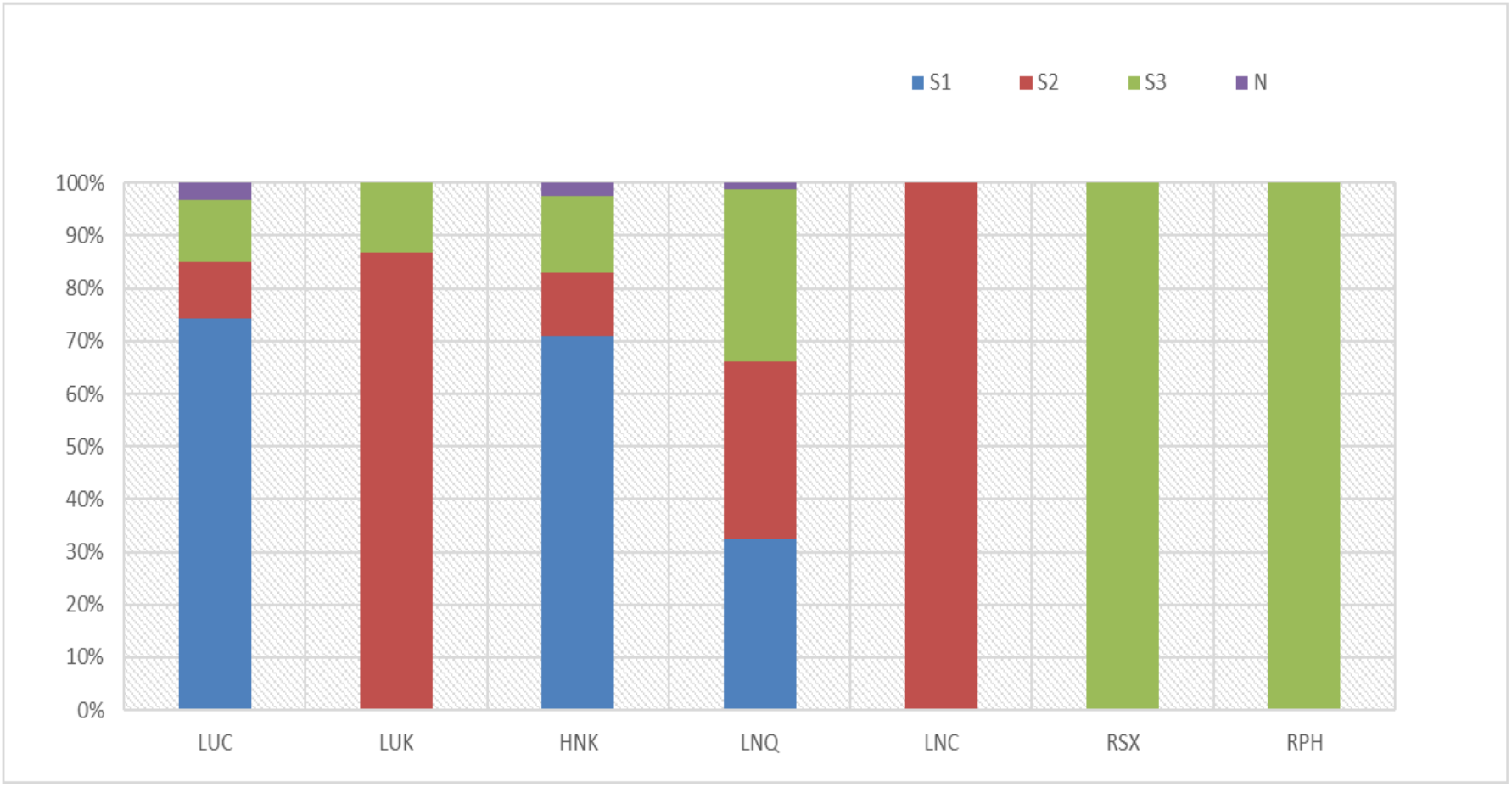
Evaluating the current ecological adaptability of agricultural LUS

Result	Highly Suitable	Moderately Suitable	Marginally Suitable	Not Suitable
Rice				
LUS	22-LUC; 23-LUC; 24-LUC; 25-LUC; 26-LUC; 28-LUC; 29-LUC; 32-LUC; 34-LUC	19-LUC; 20-LUC; 30-LUC; 33-LUC	11-LUC; 16-LUC; 18-LUC	6-LUC; 7-LUC; 9-LUC
Area (ha)	3689.01	528.4	580.8	161.1
Percentage (%)	**74.39**	10.65	11.71	**3.25**
Rice-fish				
LUS	-	27 – LUK	17 – LUK	-
Area ha)	-	217.74	33	-
Percentage (%)	-	86.84	13.16	-
Vegetables				
LUS	32-HNK	22-HNK, 24-HNK	16-HNK	14-HNK
Area (ha)	556.36	94.6	113.6	19.9
Percentage (%)	**70.92**	12.06	14.48	**2.54**

Evaluating the current ecological adaptability of agricultural LUS

Result	Highly Suitable	Moderately Suitable	Marginally Suitable	Not Suitable
Perennial fruit trees				
LUS	24-LNQ; 32-LNQ	15-LNQ; 22-LNQ, 14-LNQ; 16-LNQ	6-LNQ; 9-LNQ, 10-LNQ; 11-LNQ	5-LNQ
Area (ha)	528.1	551.51	530.7	20.7
Percentage(%)	**32.38**	33.81	32.54	**1.27**
Tea tree				
LUS	-	14-LNC	-	-
Area (ha)	-	137.0	-	-
Percentage(%)	-	**100**	-	-
Forests (including production forests and protection forests)				
LUS	-	-	2-RPH, 3-RPH, 3-RSX, 4-RSX, 5-RSX, 6-RSX; 12-RSX, 13-RSX	-
Area (ha)	-	-	1112.3	-
Percentage (%)	-	-	100	-

Evaluating the current ecological adaptability of agricultural LUS



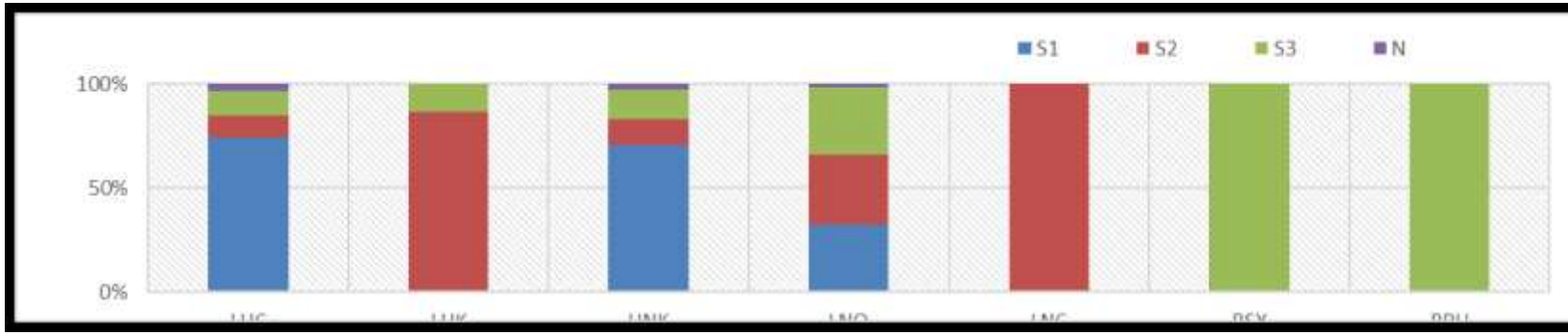
Future trends of agricultural land use systems

Group of Land use system	Total area of investigation (ha)	Highly Suitable (S1)	Moderately Suitable (S2)	Marginally Suitable (S3)	Not Suitable (N)
Rice	4959.31	74.39	13.9	11.71	-
Rice – fish	250.74	217.74	33	-	-
Vegetables	784.46	75.54	21.93	2.53	-
Perennial fruit trees	1631.01	42.38	23.81	33.81	-
Perennial industrial plants (tea)	137.0	-	100	-	-
Production forests	755.8	-	100	-	-
Protection forests	356.5	-	100	-	-

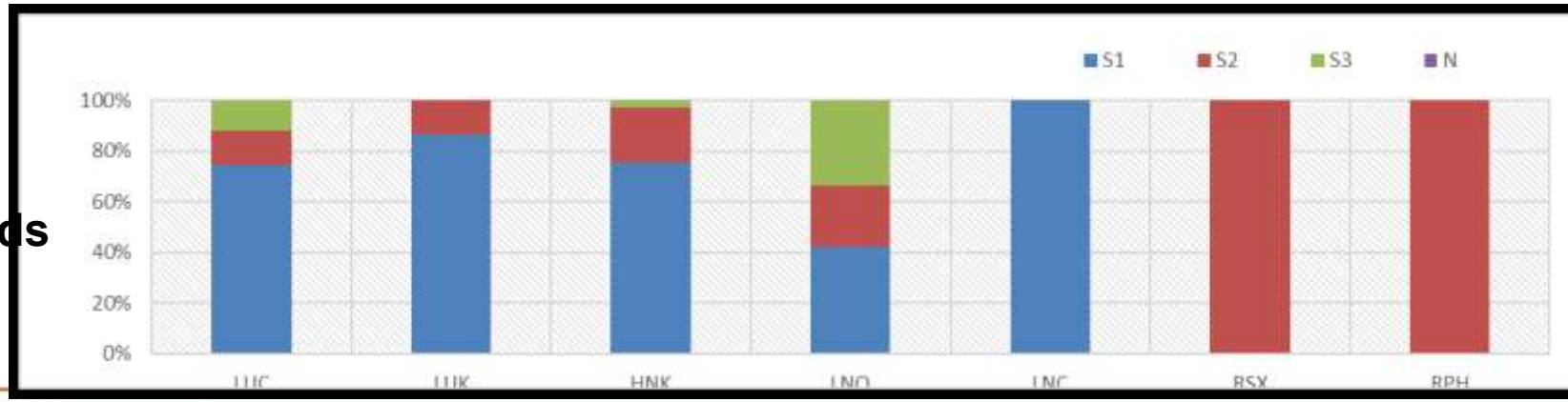
Limited factor: irrigation and drainage regime
→improving irrigation systems

Compare the level of ecological adaptation

Present



Future trends



CONCLUSION

- Evaluation of land use system is an important scientific basis for the sustainable agricultural land use planning.
- The agricultural land use system in Quoc Oai district is quite diverse with 46 LUS based on the analysis of 34 LU and 7 LUT.
- The percentage of Highly Suitable (S1) and Moderately Suitable (S2) is high, especially rice, fruit trees and vegetables. Quoc Oai district needs to focus on improving irrigation systems.
- In order to serve the spatial orientation of more objective and accurate land use planning, it is necessary to further evaluate the economic, social and environmental efficiency of agricultural land use systems.

THANK YOU

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The difference between land evaluation and LUS evaluation

Comparison criteria	Land evaluation	LUS evaluation
Structure model	Not (will arrange the objects upwards)	Available integrated system
Systematic	Not interested	Structural simulation allows a complete consideration of the interrelationship between components.
Result of evaluation	Capability classification	Suitability classification