Employing Precision Forestry in Greece: A Multicriteria Analysis
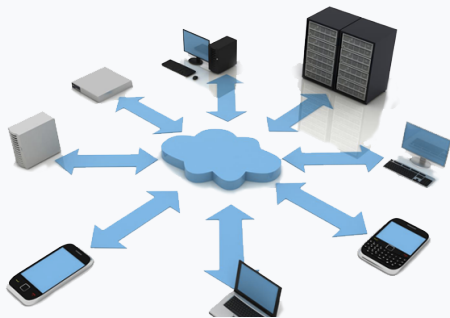
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Precision Forestry (PF)

- Precision Forestry (PF) is enabled by a wide range of innovative Information and Communication Technologies (ICT) in the sustainable forest management.

- PF takes advantage of ecological processes in forest ecosystems aiming at the environmental protection.

- The profitability of forestry is dependent on accurate forest resource information in order to optimize and complete various forest-management tasks.

- The main benefits of employing PF deal with deforestation, forest fires, illegal logging, reduction in costs of forest mapping and forest management.

ICT

- The definition of Information and Communications Technologies (ICTs) is an umbrella term that include any communication device or system encompassing, inter alia, radio, television, mobile phones, computer and networking hardware and software, satellite systems, as well as the various services and applications associated with them.

- ICTs cover any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form.

Aim of the Paper

- This paper studies the employ of PF in Greek Forest Services.

- The research with the method of questionnaires was conducted in the first quarter of 2020 in eight Forest Services in Macedonia, Greece.
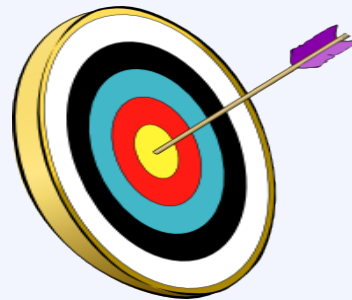
Methodology (1/3)

- The eight Forest Services were evaluated and ranked according to the level of their digital transformation using the superiority ranking method PROMETHEE-GAIA using Visual Promethee Software.

- PROMETHEE family (Preferenece Ranking Organization METHod for Enrichment Evaluation) consists of outranking methods for solving multicriteria problems.

Methodology (2/3)

- The eight Forest Services constitute the alternatives.

- The criteria that were studied are the questions in the questionnaire about
    - the access to Information Technology (IT)
    - the data sources
    - the thematic area of these digital data
    - the Departments that uses special computer programs

- The criteria were used to describe variables x_1, x_2, ..., x_{25}.

Methodology (3/3)

Variable	Characteristic	Variable	Characteristic
X_1	Access to PC	X_{14}	Data for forest ecosystems viability
X_2	Access to e-mail	X_{15}	Data for biodiversity
X_3	Access to Internet	X_{16}	Data for forest productivity
X_4	Access to map viewers	X_{17}	Data for protective functions of forest resources
X_5	Access to DBMS	X_{18}	Data for socio-economic functions of forest resources
X_6	Access to GIS	X_{19}	Data for forest policy
X_7	Data collection – Existing DB	X_{20}	Software for forest management
X_8	Data collection – Air photo interpretation	X_{21}	Software for technical forest services
X_9	Data collection – Satellite images	X_{22}	Software for forest protection
X_{10}	Data collection – Reports of Forest Service employees	X_{23}	Software for management accounting
X_{11}	Data collection from other Agencies	X_{24}	Software for materials management
X_{12}	Data for forest areas	X_{25}	Software for the hunting office
X_{13}	Data for CO2 concentration		

Results (1/5)

Rank	action		Phi	Phi+	Phi-
1	FS_Edessa	⬜	0,3886	0,3886	0,0000
1	FRI_Thessaloniki	⬜	0,3886	0,3886	0,0000
3	FS_Aridaia	⬜	0,0229	0,2000	0,1771
4	FAM_Kozani	⬜	-0,0229	0,1657	0,1886
5	FAM_Edessa	⬜	-0,0686	0,1657	0,2343
6	FS_Thessaloniki	⬜	-0,1143	0,1429	0,2571
7	FAM_Pieria	⬜	-0,2514	0,0971	0,3486
8	FS_Tsotili	⬜	-0,3429	0,0857	0,4286

Figure 1. PROMETHEE table
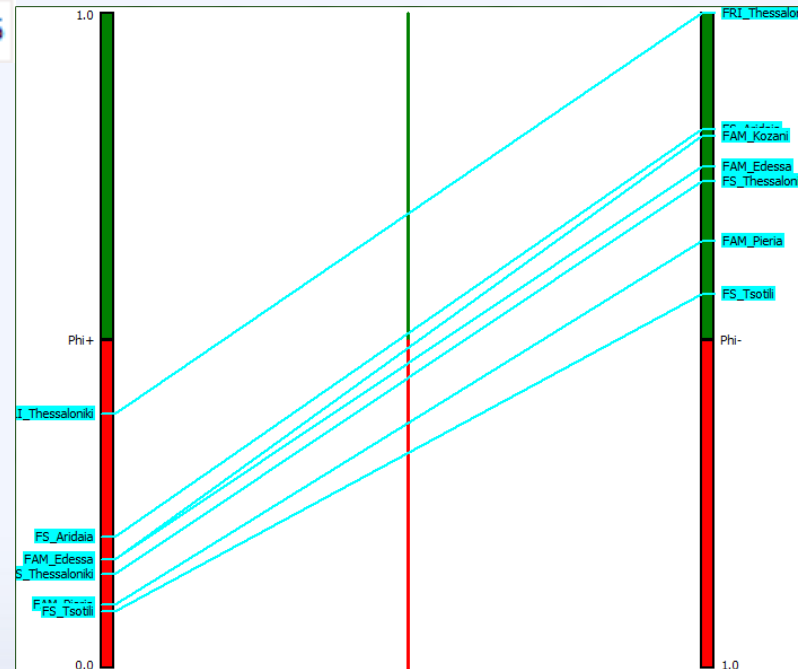
Figure 2. PROMETHEE I partial ranking
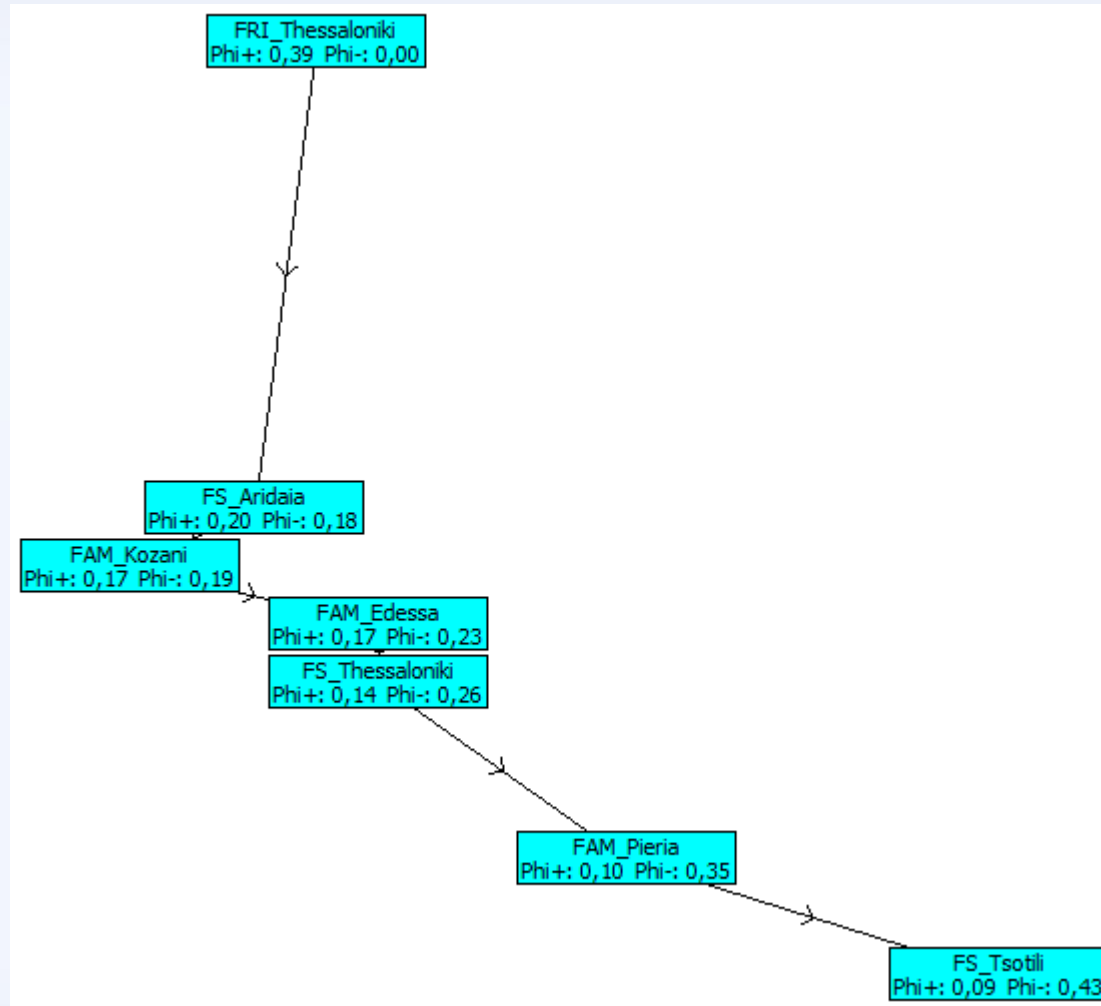
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Results (2/5)

Figure 3. PROMETHEE network
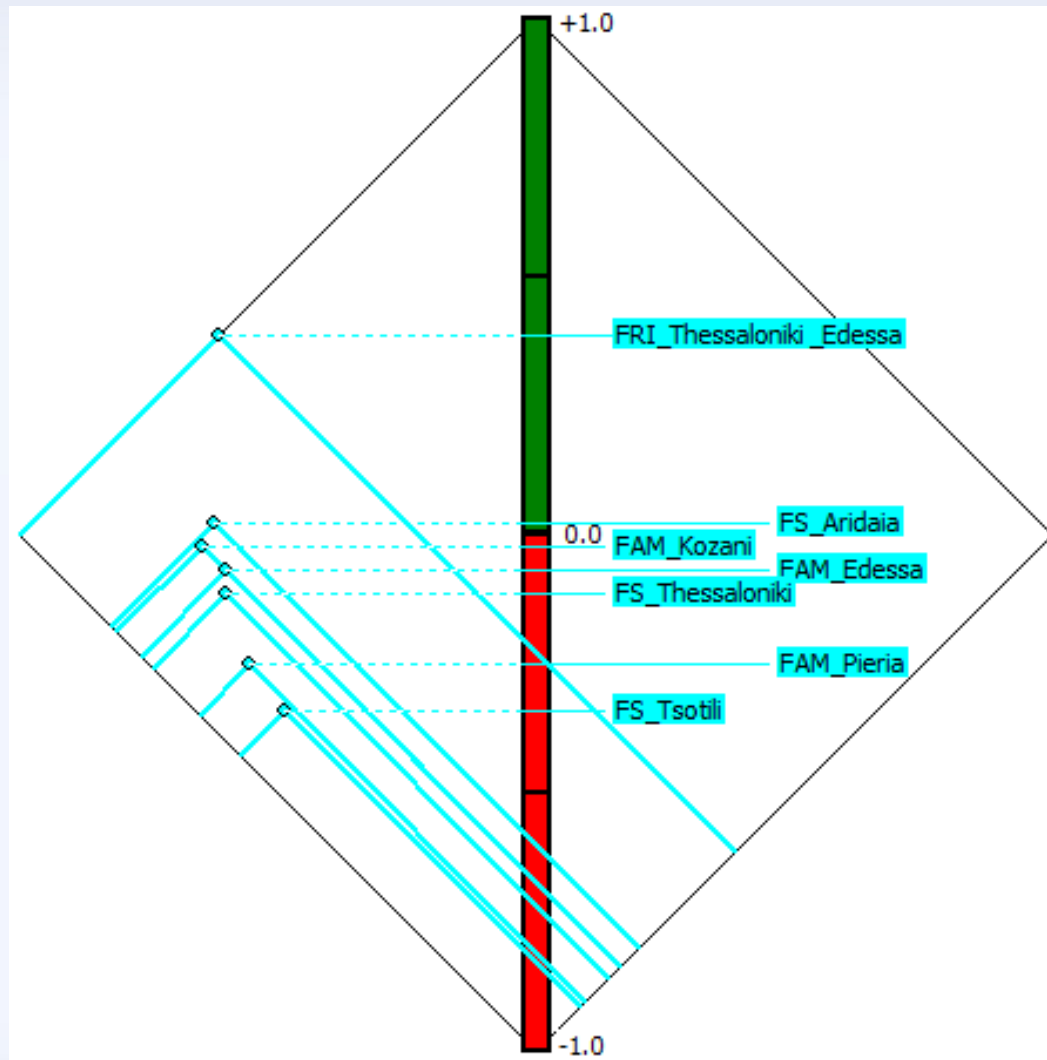
Results (3/5)

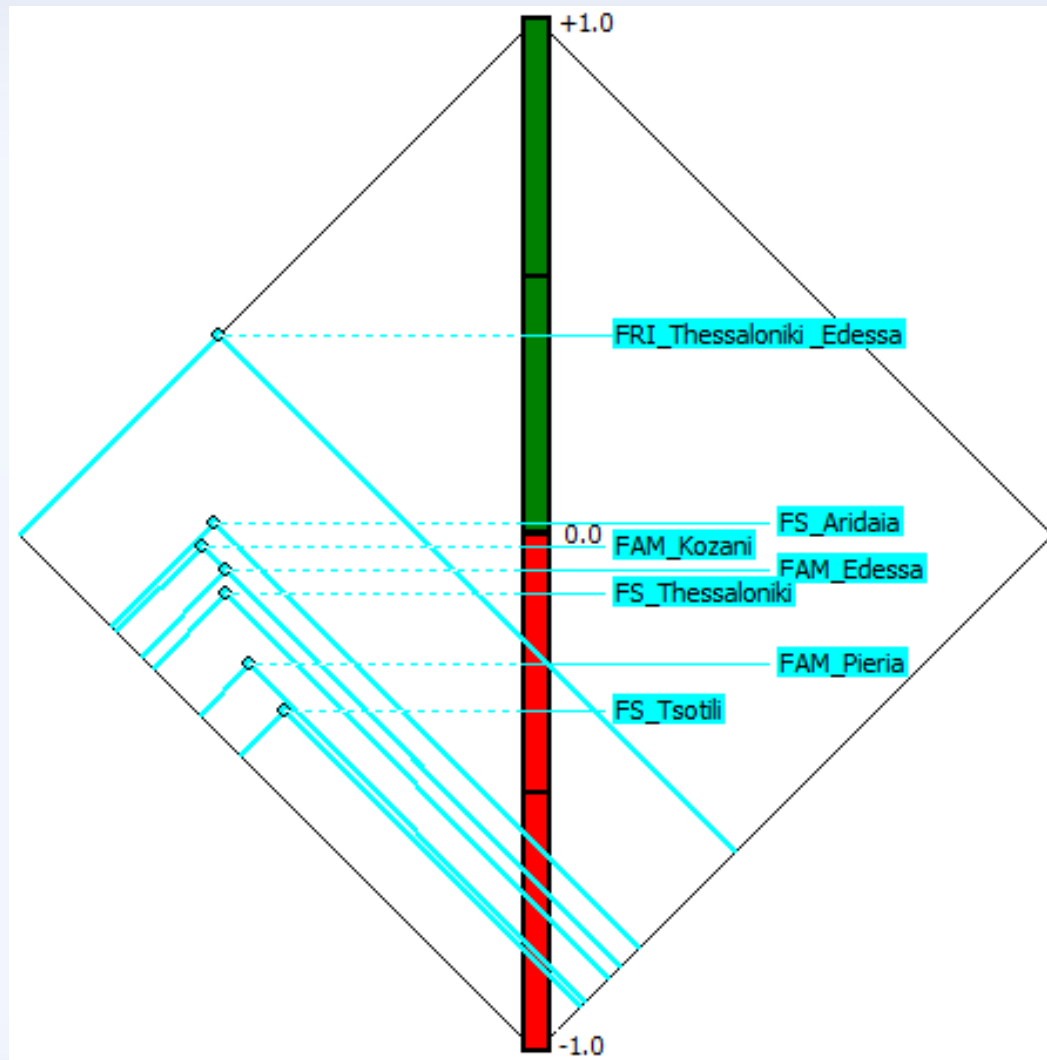Figure 4. PROMETHEE diamond

Results (4/5)

Figure 5. PROMETHEE diamond
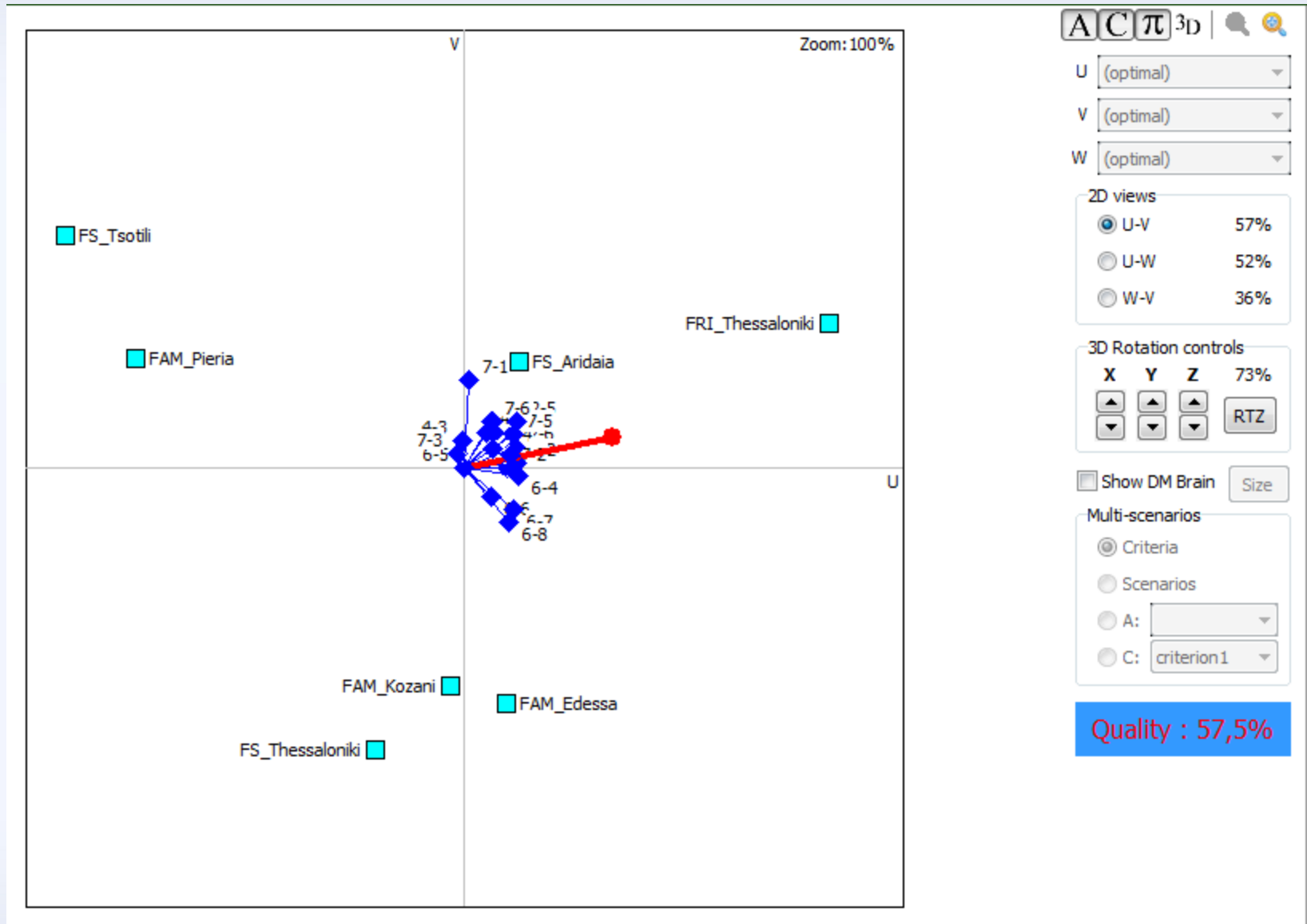
Results (5/5)

Figure 5. GAIA plane

Conclusions (1/2)

- The findings of the research show that, the values estimated for total net flows φ present a spectrum of values between +0,38 to -0,34 and that indicates a big difference concerning "superiority" between the first and the last case in the ranking of Forest Services in Macedonia, Greece.

- So, it is necessary forest operators to expand the use of ICT and optimize their daily workflow.

- The Forest Service of Edessa and the Forest Service of Thessaloniki are identified as the optimum ones and they could be used as models with the highest level of digital transformation.

Conclusions (2/2)

- The Forest Service employees
  - have free access to all the types of IT (PC, E-mail, Internet – Web browsers, Map viewers, DB systems, GIS)
  - collect digital data from existing DB, air photo interpretation, satellite images, reports of forest employees and they collaborate with other public agencies
  - observe, assess and monitor the forest conditions regarding the forest area, the CO_2 concentration, the forest ecosystems viability, the biodiversity, the productive functions, the socio-economic functions and the forest policy

Thank you !!!