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DIFFERENCES IN PERCEPTION AMONG EXPERIENCED AND NON-EXPERIENCED ELECTRICAL VEHICLE USERS IN THE AGRICULTURAL SECTOR

15. Symposium Energieinnovation 2018

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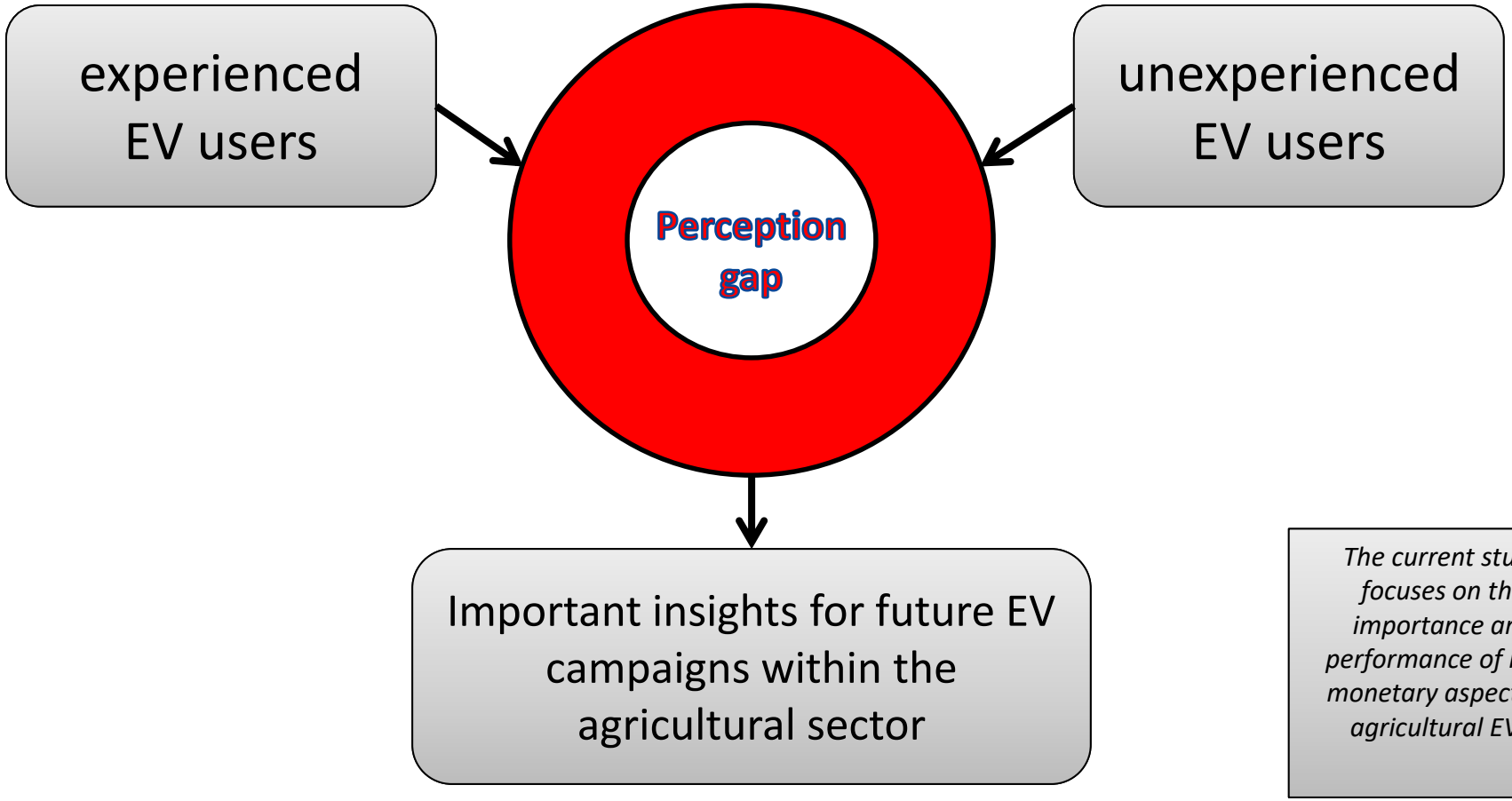
Agenda

- Introduction: challenges for the agricultural sector
- Research gap
- Method
- Results: the perception of attributes regarding agricultural Electrical Vehicles (EVs)
- Summary and Conclusion
- Policy implications

Introduction

- Impact of climate change – challenges for the agricultural sector too
- Agricultural sector: current energy and carbon intensity is far beyond sustainable levels (Caetano et al., 2017)
- E-mobility:
  - significant advances over the past years
  - "just" one item in a complex puzzle (Ajanovic and Haas, 2016) … but …
  - local air quality improved
  - reduction in GHG emissions

Research Gap



The current study focuses on the importance and performance of non-monetary aspects of agricultural EVs.

Method (1)

- Survey instrument and data collection:
  - quantitative online survey with standardized questionnaire
  - pre-test on ten people
  - final questionnaire: introduction, general questions, screening questions, socio-demographic questions, control questions
- Definition of attributes
  - choice of attributes: comprehensive literature review

Method (2)

Attributes of agricultural EVs

Battery recharge time	Self-sufficient power	Range	Environmental friendliness	Image support
Public charging station	Private charging Station	Energy consumption	General driving performance	Hilly Area Driving performance
	Driving performance when loaded	Transportation capability of people	Transportation capability of goods	

Method (3)

- Sampling and evaluation procedure
  - 2 surveys with 2 samplings (participants and non-participants of EV project of Chamber of Agriculture Styria)
  - 334 respondents (22 participants; 312 non-participants)
    - 101 respondents: experienced e-mobility farmers
      - 30 respondents: owned an EV
      - 71 respondents: did not own an EV
    - 233 respondents: unexperienced e-mobility farmers
  - Data analysis: SPSS
  - Data mapped on importance-satisfaction matrix

Results (1) - demographic

Experience in e-mobility			
Total	in possession of an e-vehicle	experience in e-mobility	no experience in e-mobility
N=334	9 %	21 %	70 %
Age			
Total	18-35 years	36-53 years	<53 years
N=334	35 % experienced 23 % unexperienced	50 % experienced 50 % unexperienced	16 % experienced 27 % unexperienced
Business Type			
Total	livestock farm	wineries and fruit growers	arable farms	others
N=334	58%	20%	51%	17%

weak negative but significant correlation with respect to age and e-mobility experience

arable farmers almost no EV experience; significant and strong correlation

Results (2) - demographic

Operation type of the business					
Total	conventional farming			organic farming	
N=334	77%			33%	
Energy generation					
Total	battery storage	photovoltaic system	wind- or hydropower	other source of power generation	none of this applies
N=334	3%	49%	2%	1%	48%
Special farm features					
Total	farm-gate sale		guest beds	none of this applies	
N=334	31%		18%	59%	
Technical affinity					
Total	very positive	positive	partly	negative	very negative
N=334	52%	43%	5%	>1%	>1%

experienced EV users have more positive attitude towards new technologies

highly significant result between photovoltaic installation and EV experience

farmers who sell directly from farms are more likely to have EV experience

Perception of Attributes (1)

Most important attributes of agricultural EVs *(following table)*

Agricultural EVs	Total		Experienced		Unexperienced		Asymptotic Significance (2-sided)
	Rank	Share [%]	Rank	Share [%]	Rank	Share [%]	
Battery recharge time	6	23	9	11	5	29	0.000
Self-sufficient power	1	52	1	65	1	46	0.001
Range	3	41	3	36	2	43	0.214
Environmental friendliness	5	25	4	30	7	23	0.177
Image support	12	5	10	10	13	3	0.008
Public charging station	13	5	13	3	12	6	0.305
Private charging station	4	29	5	29	4	30	0.868
Energy consumption	10	11	11	7	9	12	0.135
General driving performance	11	9	12	5	11	11	0.073
Hilly area driving performance	9	12	8	13	10	12	0.74
Driving performance when loaded	7	23	6	19	6	25	0.226
Transportation capability of people	8	19	7	15	8	21	0.161
Transportation capability of goods	2	42	2	53	3	37	0.005

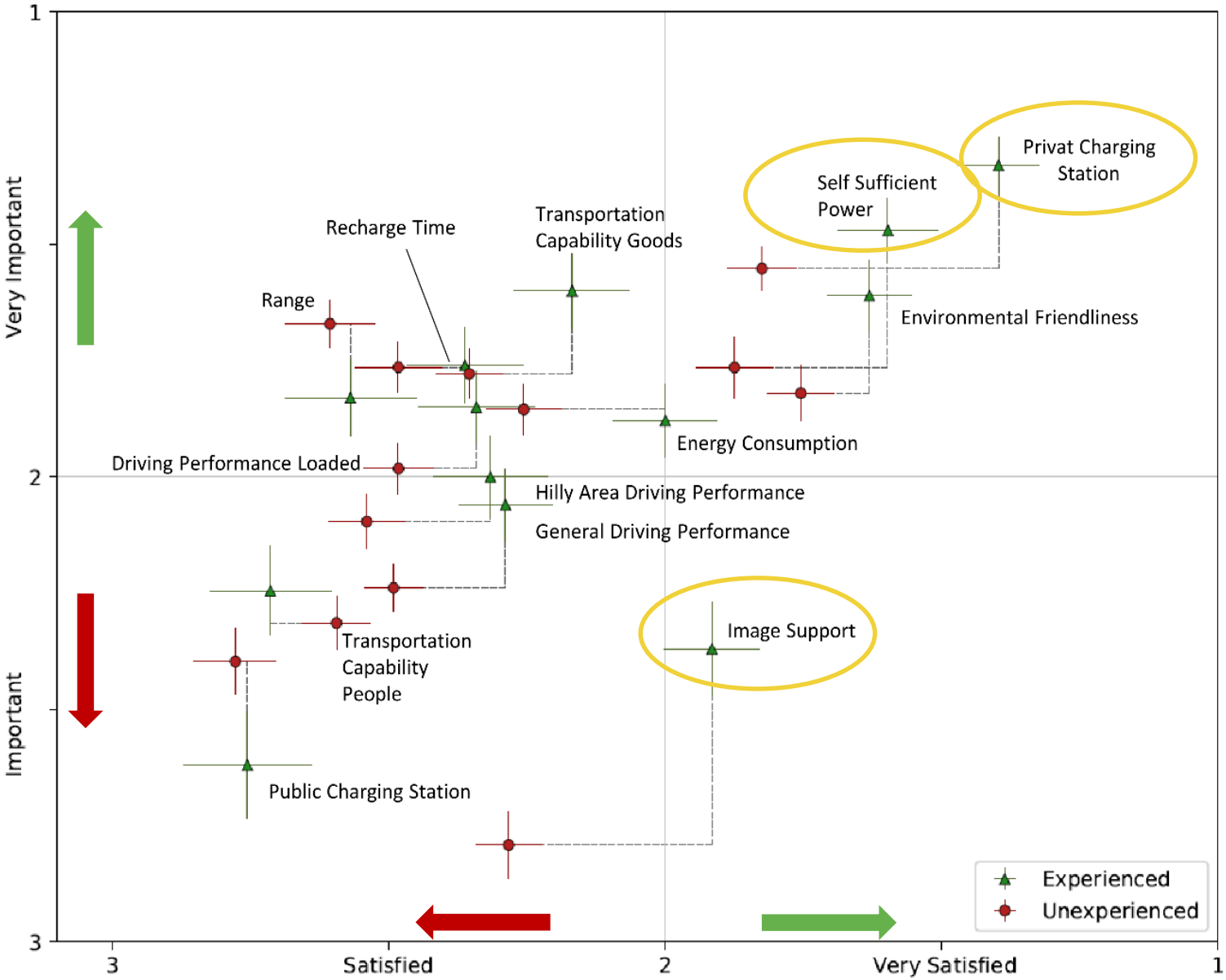
Perception of Attributes (2)

1) Importance and performance of attributes of agricultural Evs *(following table)*

2) Importance-Satisfaction-Matrix for agricultural EVs including standard error crosses (n=290) *(following figure)*

Importance and Performance

Agricultural EVs	Importance			Performance		
	Mean Exp.	Mean Unexp.	p-value	Mean Exp.	Mean Unexp.	p-value
Battery recharge time	1.76	1.764	0.966	2.363	2.483	0.360
Self-sufficient power	1.47	1.765	0.002	1.598	1.875	0.016
Range	1.83	1.671	0.102	2.570	2.607	0.798
Environmental friendliness	1.61	1.820	0.031	1.631	1.755	0.198
Image support	2.37	2.792	0.000	1.916	2.283	0.000
Public charging station	2.62	2.397	0.102	2.756	2.778	0.875
Private charging station	1.33	1.552	0.004	1.398	1.825	0.000
Energy consumption	1.879	1.855	0.807	2.0	2.256	0.029
General driving performance	2.06	2.239	0.052	2.289	2.492	0.045
Hilly area driving performance	2.0	2.096	0.355	2.316	2.540	0.073
Driving performance when loaded	1.85	1.982	0.168	2.342	2.483	0.253
Transportation capability of people	2.245	2.314	0.532	2.714	2.595	0.343
Transportation capability of goods	1.6	1.778	0.067	2.169	2.355	0.123


1
2
3
Very Important
Important
Recharge Time
Transportation
Capability Goods
Range
Self Sufficient
Power
Privat Charging
Station
Environmental Friendliness
Energy Consumption
Driving Performance Loaded
Hilly Area Driving Performance
General Driving Performance
Transportation
Capability
People
Image Support
Public Charging Station
Experienced
Unexperienced
3
Satisfied
2
Very Satisfied
1

Summary and Conclusion

- Results: in line with previous studies
- All 13 attributes: rather important and satisfactory
- Barriers: „range", „recharge time" and availability of „public charging stations"
- Relatively more important / less satisfactory: „range" and „charging time"
- Importance: highly influenced by EV experience
- Performance/importance ratings - most important: "image support", "environmental friendliness", "self-sufficient power use" and "private charging station"

Policy implications

- Important driver: production of electric energy and the infrastructure needed to charge EVs on the farm
  - providing support
- Farmers are clearly interested in EVs for agricultural purposes
  - implementation in the agricultural sector is likely to be much easier than elsewhere

THANK YOU FOR YOUR ATTENTION

Source:
https://www.fotolia.com/tag/emobility

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