

1. Semi-structured interviews

Date:

Thank you for your participation in the interview.

The interview is anonymous and its results will be used only for scientific purposes.

I. Part 1 – The farm

1. Location of the farm (province)

2. City

3. Structure of use and crops

Crops		Surface area (ha)	Amount of organic fertilizer used for the crops (t/year)	Amount of mineral fertilizer used for the crops (t/year)	Average Crop yield (t/ha)
Total farm area					
Wheat					
Rye					
Triticale					
Oats					
Grain mixtures					
Rapeseed					
Barley					
Potatoes					
Corn					
Energy plants					
Permanent grasslands					
Orchards and perennial plantations					
Others					
Animal breeding	Items	Production size (t/year)	Grazing system (free-range, confined)	Manure production (t/year)	Liquid manure production (l/year)
Cattle					
Pigs					
Sheep					
Poultry					
Horses					

Milk production (l/year)					
Others					

4. Technical equipment of the farm (Please add number of items in a farm)

Tractors (power kW)		Tractor sprayers	
Delivery truck, truck		Manure spreaders	
Farm trailers		Tankers/septic tankers	
Plough		Combine harvester	
Harrows/cultivator		Beetroot harvester	
Cultivation aggregates		Potato harvester	
Sowing units		Milking machines	
Seeders		Coolers	

II. Part 2 - Sustainable agriculture



The analysis of solutions propagated in the European Union shows that sustainable agriculture is an alternative concept for the model of intensive development of agriculture, which assumes carrying out all actions with regard to agriculture including a welfare of future generations. Sustainable agriculture combines production aims with environmental requirements (the so-called eco-development).

5. Please tick according to your opinion

I have already known the concept of sustainable agriculture according to the above

definition

YES

NO

6. I understand sustainable agriculture differently

YES

NO

How?

7. Have you heard about subsidies for reforestation on your farm?

YES

NO

8. I plan to forest 7% of my farm

YES

NO

Why?

9. Sustainable agriculture is or may be a chance for me to improve profitability of my farm

YES

NO

I DON'T KNOW

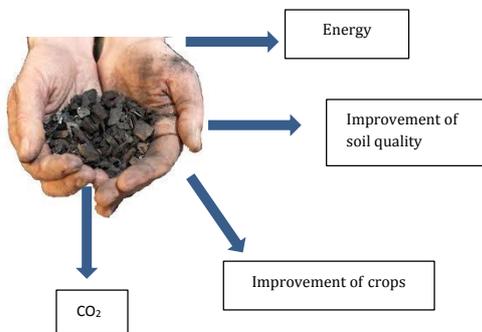
Why?

III. Part 3 - Waste management

10. Please enter main wastes generated in your farm, approximate number and form of their disposal

Organic waste	Amount (kg)	Utilization manner	Observations (e.g. problems with utilization)
1...			
2...			
3...			
4...			
5...			
Other non-organic			

IV. Part 4 - Biochar



Box 1

Biochar – char that is produced during the combustion of organic residues. Biochar is produced in special stoves at temperatures above 300 ° C with little air. There is a large amount of biomass residue needed to produce substantial amounts of biochar. Biochar may be used in agriculture to improve soil pH, sorption properties, organic matter content and soil fertility. Biochar therefore may improve yields on poor and degraded soils. Biochar can also be used for energy production, bioremediation and carbon sequestration in soil.

11. Please tick one of the below:

Are you familiar with biochar (as given in Box 1)?

YES

NO

I have not heard and know nothing about biochar

I have heard about biochar but in a different context

What meaning/context?

12. Please, tick one of the below:

I am interested in using such biochar in my farm

YES

NO

I DO NOT KNOW YET

Why?

13. I am interested in biochar production in my farm

YES

NO

MAYBE

If yes, which organic waste you could use for production of biochar?

14. I would be interested in biochar production in cooperation with other producers/farm owners

YES

NO

MAYBE

15. What main problems do you deal with at your farm? Please choose as many options as you wish

Soil acidity	
Low quality soil	
Too high or too low water retention	
Too low amount of humus in soil	
No money to improve soil	
No money for better equipment	

Problems with technical infrastructure	
Other- please list	

V. Part 5 - Personal data

16. Age

17. Education (please tick the applicable)

Primary	
Vocational agricultural	
Vocational non-agricultural	
Secondary agricultural	
Secondary non-agricultural	
Higher agricultural	
Higher non-agricultural	

18. I work at my farm

less than 5 years	
5-10 years	
10-20 years	
20-30 years	
Longer than 30 years	

19. Agriculture is my only source of income

YES NO

If no, then how many % of income from agriculture constitute the source of income?

20. Please select one:

I have been working in agriculture since always	
I have been working in agriculture for... (please enter the number of years)	

THANK YOU

The questionnaire is anonymous but if you give your consent to contact you in case any additional questions arise please leave your phone number or e-mail.

Moreover, in case of questions please contact us at: alatawiec@gmail.com

2. Probit and logit analyses

Marginal effects after probit
 $y = \text{Pr}(\text{know_biochar})$ (predict)
 $= .25895908$

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
province*	.1519884	.0819	1.86	0.063	-.008531 .312508	.531469
total_~a	.000335	.00053	0.63	0.531	-.000713 .001383	40.95
know_s~g*	.1602304	.07359	2.18	0.029	.016004 .304457	.713287
plan_t~t*	-.1352021	.13894	-0.97	0.330	-.407514 .13711	.048951
age	.0012769	.0031	0.41	0.681	-.004802 .007356	43.4825
higher~u*	.0143867	.13741	0.10	0.917	-.254937 .283711	.104895
tehica~g*	.1130551	.10345	1.09	0.274	-.089694 .315804	.195804
agricu~s*	-.0234719	.08436	-0.28	0.781	-.188812 .141868	.552448

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Province*	Malopolskie=1, other = 0
Total_~a	Área total
Know_s~g*	Knows sustainable agriculture =1, other = 0
Plan_t~t*	Plans to reforest 7%=1, other = 0
age	age
Higher~u*	High agricultural education=1, other = 0
Tehca~g*	Technical non agricultural education=1, other = 0
Agricu~s*	Agriculture is the only source of profit=1, other = 0

The probability of being familiar with biochar is 25.9%. If the respondent is from the Malopolskie, the probability increases by 15% ($p > 0.05$, but $p < 0.1$). If the respondent knows sustainable agriculture, the probability to be familiar with biochar increases by 16% ($p < 0.05$). Summing up, in Malopolskie biochar is more known ($p = 0.063$) and who knows sustainable agriculture also knows biochar ($p = 0.029$). Probability to be interested in using biochar is 19% and if the respondent has knowledge about biochar the probability increases by 27%.

Marginal effects after probit
y = Pr(interested_producing_biochar) (predict)
= .04964683

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
know_b~r*	.0261139	.04328	0.60	0.546	-.058712	.11094		.272152
i~usin~r*	.1859353	.0816	2.28	0.023	.026005	.345866		.196203
know_s~g*	.0652139	.03075	2.12	0.034	.004952	.125476		.721519

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Know_b~r*	Is familiar with biochar =1, other = 0
I~usin~*	Interested in using biochar = 1, other = 0
Know_s~g*	Knows sustainable agriculture = 1, other = 0

The probability to be interested in producing biochar is 5%. The fact to be familiar with biochar is not statistically significant yet if the respondent has an interest in using biochar the probability in producing biochar increases significantly by 19%. Furthermore, if the farmer knows sustainable agriculture it increases the chance to produce biochar by 6%. In other words, those that have interest in using also have more propensity in producing.

Know_b~r*	Is familiar with biochar = 1, other = 0
Know_s~g*	Knows sustainable agriculture = 1, other = 0
Total_~a	Total area
age	Age

Marginal effects after probit
y = Pr(interested_using_biochar) (predict)
= .19145187

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
know_b~r*	.2700704	.08608	3.14	0.002	.10135	.438791		.277778
know_s~g*	-.0316545	.07877	-0.40	0.688	-.186045	.122736		.715278
total_~a	-.0000304	.00042	-0.07	0.943	-.000862	.000801		41.4295
age	.0018392	.00273	0.67	0.500	-.003508	.007186		43.3681

(*) dy/dx is for discrete change of dummy variable from 0 to 1

3. Follow-up questionnaire

N = 51

Are you potentially interested in biochar use?

		Why YES or NO?			
		Frequency	Percentage	Percentage of important	Accumulated percentage
Important	No assistance within this scope	1	2.0	2.0	2.0
	No information and knowledge	16	31.4	31.4	33.3
	No effect on environment	1	2.0	2.0	35.3
	I am not convinced	2	3.9	3.9	39.2
	I am not interested	1	2.0	2.0	41.2
	Small number of research concerning biochar	1	2.0	2.0	43.1
	Reduction of diseases and enhancement of soil	1	2.0	2.0	45.1
	Improvement of soil structure	7	13.7	13.7	58.8
	Improvement of soil structure, savings	1	2.0	2.0	60.8
	Higher yield	4	7.8	7.8	68.6
	Higher yield, savings	3	5.9	5.9	74.5
	Too high cost	11	21.6	21.6	96.1
	Increases pro-ecology actions	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

Contingency table: interest in biochar and justification why yes or why no

		Are you potentially interested in biochar use?		Total
		Yes	No	
Why YES or NO?	No counselling within this scope	0	1	1
	No information and knowledge	0	16	16
	No effect on environment	0	1	1
	I am not convinced	0	2	2
	No interest	0	1	1
	Small number of research concerning biochar	0	1	1
	Reduction of diseases and enhancement of soil	1	0	1
	Improvement of soil structure	7	0	7
	Improvement of soil structure	1	0	1
	Higher yield	4	0	4
	Higher yield, savings	3	0	3
	Too high cost	0	11	11
	Increases pro-ecology actions	2	0	2
	Total	18	33	51

Attitude to ecology

What is your attitude to ecology?					
		Frequency	Percentage	Percentage of important	Accumulated percentage
Important	It is very important to me	38	74.5	74.5	74.5
	It is important to me	11	21.6	21.6	96.1
	It is neither important nor unimportant (I have a neutral attitude)	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

Contingency table: attitude to ecology and willingness to use biochar

		Are you potentially interested in biochar use?		Total
		Yes	No	
What is your attitude to ecology?	It is very important to me	16	22	38
	It is important to me	2	9	11
	It is neither important nor unimportant (I have a neutral attitude)	0	2	2
Total		18	33	51

1. Generally, the respondents of the follow up questionnaire expressed positive attitude towards ecology since, for 74% of the investigated it is very crucial and for the next 22% it is important. There may be a bias as these respondents were attending a conference of theme centred around

pro-ecological solutions in agriculture. But it is also currently fashionable to be 'eco'.

2. Lack of interest in biochar is related to lack of knowledge (we are afraid of unknown) and to its costs. Improvement of soil structure was also mentioned in the context of minimizing the need for fertilizers and related costs (rather than environmental benefits which somewhat contradicts 'eco' attitude).
3. If the respondent is willing to use biochar (contingency table), soil structure and higher crops were indicated 8 times. Besides, references to savings occur. Only two respondents indicated ecology issues. In case of no willingness to use biochar the issue of lack of information (16 indications) and too high cost (11 indications) appeared. Besides, the same respondents indicate that they are very 'eco' or at least 'eco'. In other words, they do not consider biochar in terms of ecology. Therefore, actions encouraging farmers to use such solutions should indicate economy factors (related to improvement of soil structure or higher yields). Ecology issue is not determinative as also can be inferred from point 2 above ('eco' attitude is rather confusing when it comes to cost-benefit analysis by the farmer). Here, the theory of cognitive dissonance is visible. People reduce the stress caused by the difference between self-assessment and reality through evaluation of reality, which is compliant to self-assessment, namely by focusing on economic issues in case of biochar or lack of knowledge (but not because of ecological reasons) and not because of ecology issues. Since, they have to admit that economy issues are more important for them than ecology issues and according to their indications (almost 100% 'eco').