Tamm, L., Smit, A.B., Hospers, M., Janssens, S.R.M., Buurma, S., Mølgaard, J.P., Lærke, P.E., Hansen, H.H., Hermans, A., Bødker, L., Bertrand, C., Lambion, J., Finckh, M.R., Schüler, C., Lammerts van Bueren, E., Ruissen, T., Nielsen, B.J., Solberg, S., Speiser, B., Wolfe, M.S., Phillips, S., Wilcoxon, S., Leifert, C.

Assessment of the Socio-Economic Impact of Late Blight and State-of-the-Art Management in European Organic Potato Production Systems

Annex 1: Survey: Phytophthora management in organic potato growing

The full report is available at http://orgprints.org/2936

This report was carried out as part of the European Project "Development of a systems approach for the management of late blight in EU-organic potato production" (Blight-Mop; QLRT-1999-31065)

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Reversed version dated 1 May 2001

Jan Buurma, LEI – The Hague

Survey

Phytophthora management in organic potato growing

Notes on the survey:

Within a few years the use of copper compounds for controlling late blight *(Phytophthora infestans)* in the organic potato growing will be banned throughout all of Western Europe. In view of this an EU project was started to gather substitute measures and to make these ready for use in the field situation,

This survey is one of the first parts of the project and will be carried out in seven countries, namely Switzerland, France, the United Kingdom, the Netherlands, Germany, Denmark and Norway. The purpose of the survey is two-fold: (1) to establish which methods organic potato growers in the various European counties currently use to manage late blight, (2) to establish the economic importance of copper compounds for organic potato growing in the various European countries.

The survey data will be used to find out what the key points are for a successful management of late blight in the various cultivation areas or climate zones and how organic potato growing without the use of copper compounds can be improved or continued.

The data from the survey will be processed in a coded form and used solely for research purposes. The research institutes involved with the project guarantee that the data provided will be treated with the strictest confidence.

Respondent _____

1. Company details

1.1 In 2000, what was your farm area and what was the area of land cultivated? How large were the crop areas in the cropping plan/cultivation plan?

crop names	ha	
potatoes	___,__	|
_____	___,__	|
_____	___,__	|
_____	___,__	|> *(specify crops and areas)*
_____	___,__	|
_____	___,__	|
_____	___,__	|
	----- +	
area under cultivation in 2000	___,__	
nature and landscape in 2000	___,__	*(woodlands, conservation areas, fences)*
	----- +	
total farm area in 2000	___,__	

1.2 In 2000, what was the composition of the labour potential on your farm?
Please specify the number of employees according to category and time present.
(fill in number of staff; full-time = ≥20 hours/week; part-time = <20 hours/week)

category	≥6 months/year		<6 months/year	
	full-time	part-time	full-time	part-time
farm managers	_____	_____	_____	_____
family members	_____	_____	_____	_____
personnel living on the farm	_____	_____	_____	_____
personnel living off the farm	_____	_____	_____	_____
volunteers	_____	_____	_____	_____
	--- +	--- +	--- +	--- +
labour potential in 2000	_____	_____	_____	_____

1.3 In 2000, what were the most important production units on your farm? Please indicate the amount of time spent (in %) on each production unit in 2000. *(assume the time spent by the entire labour potential in 2000)*

production unit	% time spent
forestry	_____
animal husbandry	_____
arable farming (incl. potatoes)	_____
outdoor vegetable growing	_____
fruit growing/viticulture	_____
greenhouse vegetable growing	_____
other, namely.....	_____
	----- +
total	100%

1.4 In 2000, how important was potato cultivation on your farm?
Can you give an indication of the importance (in % of time spent) of potato cultivation on your farm in 2000?

potatoes = ____ % of time spent

1.5 During the year 2000, what were the most important sales outlets for your farm as a whole? Please give an impression of how the gross turnover was split up over the sales outlets mentioned.

sales outlet	% gross turnover
own use	_____
direct farm sales	_____
farmer's market	_____
organic vegetable boxes	_____
wholesaler	_____
sales co-operative	_____
grower's association	_____
other, namely	_____
	----- +
total	100%

1.6 During the last five years, have you experienced Phytophthora outbreaks on your potato crops which led to a considerable loss of yield?
(aim of this question: to get an impression of the farmer's risk perception of late blight)
(circle the correct answers and then ask for an estimate of the post-harvest loss)

year	outbreaks experienced?	time of outbreaks	fysical yield at harvest	post-harvest loss (infected tubers)
1996	yes/no	early/late	___ tonnes/ha	___ %
1997	yes/no	early/late	___ tonnes/ha	___ %
1998	yes/no	early/late	___ tonnes/ha	___ %
1999	yes/no	early/late	___ tonnes/ha	___ %
2000	yes/no	early/late	___ tonnes/ha	___ %

1.7 During the last five years has a fellow potato grower (conventional or organic) criticized you for negligence in controlling Phytophthora on your farm?
(circle the correct answers)

year	criticized for negligence?	production method critic(s)
1996	yes/no	conventional/organic/both
1997	yes/no	conventional/organic/both
1998	yes/no	conventional/organic/both
1999	yes/no	conventional/organic/both
2000	yes/no	conventional/organic/both

2. Business objectives

2.1 Under which label of organic farming are you producing on your farm?

Name of label: ……..

2.2 In your opinion, which objectives most influence what you do on your farm?
From the possible answers on the accompanying card, please choose the three objectives which you think most influence what you do on the farm.
(aim: determine whether the farmer's aim is directed towards idealistic or materialistic objectives)
(cross in column 1 = most important; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
produce food which is highly healthy and safe	0	0	0
obtain good market prices for the products grown	0	0	0
retain/maintain family ownership of the farm	0	0	0
produce without exhausting natural resources	0	0	0
live and work in harmony with nature and the landscape	0	0	0
obtain a reasonable income or salary from the farm	0	0	0
social contacts with staff and consumers	0	0	0
leave behind a viable farm for the next generation	0	0	0
other, namely ……	0	0	0

2.3 Which lines of development do you believe to be the most suitable for achieving your objectives at present (the year 2001)? Please indicate on the following list which three lines are at present (the year 2001) the most applicable for you.
(aim of this question: determine whether the respondent is focussed on ecological or economic aspects)
(column 1 = most applicable; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
increasing the farm area	0	0	0
reduce labour hours by increasing mechanisation	0	0	0
improving the biological activity of the soil	0	0	0
expanding direct sales to consumers	0	0	0
expanding the nature areas on the farm	0	0	0
reduce labour hours by increasing extensification	0	0	0
strengthen preventative measures against pests/diseases	0	0	0
improving nutrient cycles on the farm	0	0	0
other, namely ……	0	0	0

2.4 What, in your opinion, are the three most important opportunities and threats for the development of organic farming at present (the year 2001)? Which current developments in society do you think most influence the future of your farm?
(aim of this question: determine whether the respondent is optimistic or pessimistic about the future)
(column 1 =most influential; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
concerns about food safety in Europe	0	0	0
scarcity of unskilled labourers	0	0	0
scaling-up in the marketing of agricultural products	0	0	0
call for socially responsible production methods	0	0	0
rapid growth of organic farming in Europe	0	0	0
call for preservation of valuable man-made landscapes	0	0	0
EU legislation on nitrogen/phosphate leaching	0	0	0
continually decreasing producers prices for organic products	0	0	0
other, namely …….	0	0	0

2.5 What, in your opinion, are the most important strengths and weaknesses of your farming business at present (the year 2001)? Please indicate which three characteristics from the following list are at present the most applicable to your farm.
(aim of this question: determining whether the respondent is optimistic or pessimistic about the future)
(column 1 = most applicable; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
pests and diseases which cause much crop damage	0	0	0
soil type suitable for organic production	0	0	0
dissatisfaction about income from the farming business	0	0	0
have built up a good client base/market organisation	0	0	0
climate zone suitable for organic farming	0	0	0
insufficient labourers for good weed control	0	0	0
pests, diseases and weeds reasonably under control	0	0	0
other, namely ……	0	0	0

2.6 What were the three most important reasons for you to include potatoes in your cropping plan or cultivation plan (of 2000 and/or 2001)?
(aim of this question: determine whether the respondent experiences potatoes as "a benefit" of as "a hindrance")
(column 1 =most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
mostly good financial results	0	0	0
necessary for rotation in combine harvestable crops	0	0	0
request from buyers/market organisation	0	0	0
specialisation, affinity with the crop	0	0	0
necessary for direct sales/own consumption	0	0	0
chance to suppress perennial weeds	0	0	0
other, namely ……	0	0	0

2.7 On your farm, what are the most threatening harmful organisms during the cultivation/storage of potatoes? Please indicate the three most important in the table below.
(aim of this question: determine how concerned the respondent is about Phytophthora)
(column 1 =most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
potato root eelworm	0	0	0
Colorado potato beetle	0	0	0
late blight (Phytophthora infestans)	0	0	0
common potato scab (Streptomyces scabies)	0	0	0
black scab of potato (Rhizoctonia solani)	0	0	0
bacterial diseases	0	0	0
vascular wilt disease (Verticillium dahliae)	0	0	0
dry rot (Fusarium spp)	0	0	0
other, namely ……	0	0	0

2.8 What preventative measures do you take to minimise outbreaks and/or damage by Phytophthora as much as possible? Please indicate in the columns below the three most important preventative measures you took during the 2000 season.
(aim of question: determine which control strategy was most important for respondent)
(column 1 = most important; column 2 = second most; column 3 = third most)

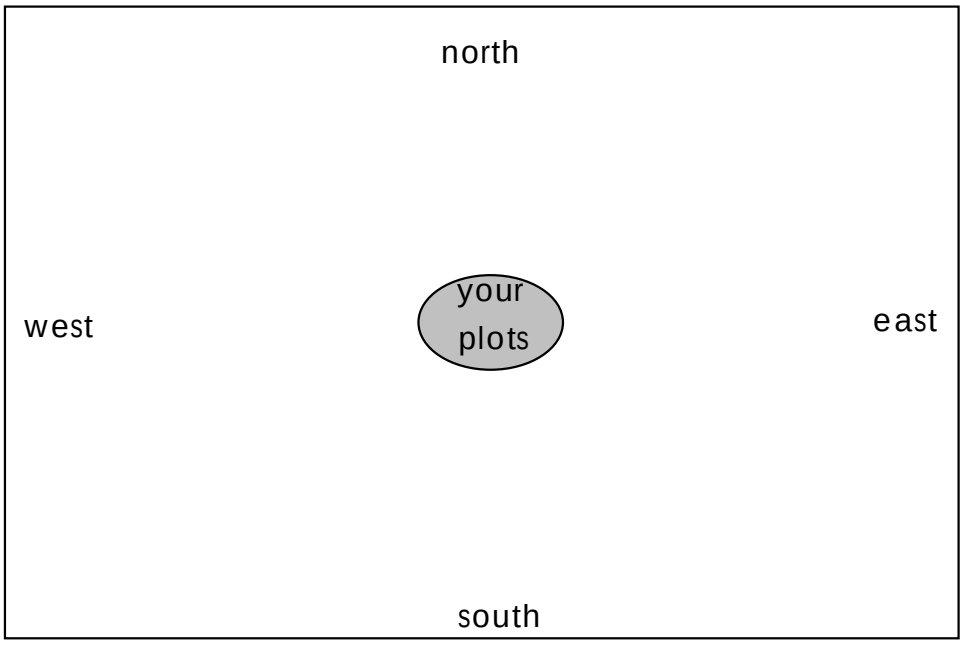
(CARD)	1	2	3
plot with windy/sunny position chosen	0	0	0
variety with high Phytophthora resistance chosen	0	0	0
early maturing variety planted as early as possible	0	0	0
waste piles covered and volunteers removed	0	0	0
high quality/healthy seed potatoes purchased	0	0	0
low planting density applied for light crop	0	0	0
high ridges built up to limit tuber infection	0	0	0
plenty of distance kept from neighbour's potato plots	0	0	0
other, namely ……	0	0	0

3. Plot characteristics

3.1 In question 1.1 you specified the area of potatoes on your farm. Please indicate over which plots the potato cultivation was spread in 2000, as well as the matching varieties and areas.

Plot	Plot name	Variety name	Area	Destination
1	_____	_____	___,___ ha	seed/ware/proc
		_____	___,___ ha	seed/ware/proc
2	_____	_____	___,___ ha	seed/ware/proc
		_____	___,___ ha	seed/ware/proc
3	_____	_____	___,___ ha	seed/ware/proc
		_____	___,___ ha	seed/ware/proc
4	_____	_____	___,___ ha	seed/ware/proc
		_____	___,___ ha	seed/ware/proc
			------ +	
Area of potatoes in 2000 *(compare with question 1.1)*			___,___ ha	

3.2 In which wind direction and at what distance were the nearest potato plots on other farms located in relation to your own potato plots in 2000? *(please indicate the wind direction and distance on the diagram below)*



3.3 From question 3.1, choose the plot/variety which was the most important or the most representative for potato cultivation on your farm during 2000 (to be called the survey plot or survey variety).

Plot	Plot name	Variety name	Area	Destination
__	_____	_____	___,___ ha	seed/ware/proc

In the following questions this plot/variety will be referred to as the survey plot or survey variety.

3.4 In the summary below, please can you fill in the following characteristics for the survey plot? If necessary, please refer to the results of a soil analysis to do this.

soil type → _____
(national name + possible specifications)

acidity → pH = _____

organic matter level → ____ % organic matter

phosphate level → _____
(national indicator + possible specifications)

potassium level → _____
(national indicator + possible specifications)

drainage/ditches → good/moderate/poor

post-winter soil structure → weathered/compacted

organic cultivation since →
0 1998 – 1999
0 1995 – 1997
0 1990 – 1994
0 1980 – 1989
0 before 1980

position with respect to the sun →
0 horizontal position
0 north slope
0 north-east slope
0 east slope
0 south-east slope
0 south slope
0 south-west slope
0 west slope
0 north-west slope

3.5 Which factors were the most decisive for growing potatoes on the survey plot?
Please indicate below which three factors are the most important in your situation.
(column 1 = most important; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
previous crop which leaves behind a good soil structure	0	0	0
plot where disease cycles must be broken			
availability of water/possibility for irrigation	0	0	0
plot where perennial weeds must be controlled	0	0	0
soil which is easy to cultivate in the spring	0	0	0
plot with little shadow and a windy position	0	0	0
sufficient distance from neighbouring plots with potatoes or tomatoes	0	0	0
plot with good drainage/permeable soil	0	0	0
other, namely …….	0	0	0

3.6 Have you ever observed noticeable differences (for example during crop husbandry) in Phytophthora outbreaks within or between your potato plots?

0 no → *continue with question 4.1*
0 yes

3.7 If yes, on which plots or places was the Phytophthora outbreak the most serious?

(more than one answer may be given)

The Phytophthora outbreak was the most serious on plots/places with:

0 poor drainage
0 little sun and wind
0 poor crop growth
0 a poor soil structure
0 luxuriant crop growth
0 water/moisture shortage
0 a variety susceptible to Phytophthora
0 an inappropriate previous crop, namely ……
0 other, namely ……

4. Fertilisation

4.1 In the table below, please indicate the crop rotation in the survey plot during the period 1994-2000. Can you also indicate the application of green manuring and basic manuring? *(aim of this question: gain an impression of the previous crop, cultivation frequency and organic matter provision on the **survey plot** chosen in question 3.3)*

Year	Main crop	Green manuring? *(if yes, which crop)*	Basic manuring? *(if yes, which type of manure)*
1994	_____	no/yes: _____	no/yes: _____
1995	_____	no/yes: _____	no/yes: _____
1996	_____	no/yes: _____	no/yes: _____
1997	_____	no/yes: _____	no/yes: _____
1998	_____	no/yes: _____	no/yes: _____
1999	_____	no/yes: _____	no/yes: _____
2000	Potatoes	no/yes: _____	no/yes: _____

4.2 For the most recent basic manuring stated in question 4.1, please indicate the type of manure used, the quantity used, the composting period and the application time.
*(Please remember this concerns the most recent basic manuring for the **survey plot** chosen in question 3.3)*

Type of manure *(animal type/form)*	Quantity *(tonne/ha or m³/ha)*	Composting? *(no/yes; if yes, duration)*	Application time *(autumn/spring; year)*
_____manure	____ tonne/m³	no/yes: ____ mth	_____
_____manure	____ tonne/m³	no/yes: ____ mth	_____

4.3 What were the most important reasons for your choice of manure type in question 4.2? Please indicate in the columns below what the three most important factors were.
(column 1 = most important reason; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
no other types available on own farm	0	0	0
nutrient content suitable for requirements of potatoes	0	0	0
no other types available locally	0	0	0
potatoes grow well on the type of manure chosen	0	0	0
more cheaply available than other types of manure	0	0	0
necessary for maintaining/improving organic matter level	0	0	0
manure type chosen fits in well with the crop rotation	0	0	0
other, namely …….	0	0	0

4.4 In 2000 was top manuring (after planting) applied to the survey plot *(as chosen in question 3.3)*

0 no → *continue with question 4.8*
0 yes

4.5 If yes, what were your most important reasons for applying top manuring? Please indicate in the columns below what the three most important factors were.
(column 1 =most important reason; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
no basic manuring applied/could be applied	0	0	0
necessary to obtain a good crop development	0	0	0
last basic manuring was barely sufficient	0	0	0

crop showed signs of nutrient deficiencies	0	0	0
insufficient nutrient level according to soil analysis	0	0	0
expectation that mineralisation would occur at too late a stage	0	0	0
other, namely ……	0	0	0

4.6 For the top manuring, please indicate the type of manure used, the quantity used and the stage at which it was applied *(e.g. before ploughing; before planting; before ridge formation; crop stage).*
(Please remember this concerns the top manuring for the ***survey plot*** *chosen in question 3.3)*

Type of manure *(type of animal; trade name)*	Quantity *(amount +unit/ha)*	Application stage *(cultivation stage or stage of crop growth)*
_____	____ tonnes - m^3 - kg	_____
_____	____ tonnes - m^3 - kg	_____

4.7 What were the most important reasons for your choice of manure type or types? Please indicate the three most important factors below.
(column 1 =most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
availability of the type of manure on the farm	0	0	0
meets the specific requirements of the crop	0	0	0
compensates for the nutrient deficiency established by the soil analysis	0	0	0
more cheaply available than the other types of manure	0	0	0
improves the organic matter level on the plot	0	0	0
can be applied with a fertiliser spreader	0	0	0
other, namely ……	0	0	0

4.8 If you look back at the haulm development and the tuber yield in the growing season 2000, what is your assessment of the manure applied?

0 manure was poor/poor crop
0 manure was good/ideal crop
0 manure was more than enough/luxuriant crop
0 other, namely ……

5. Planting material

5.1 In question 3.1 you indicated the potato varieties grown on your farm in 2000. During the last five years, have you changed the varieties chosen?

0 no → *continue with question 5.3*
0 yes

5.2 If yes, what were your reasons for making these changes?

0 availability of seed potatoes
0 at request of/on advise from buyers
0 to prevent Phytophthora breaking resistance
0 other, namely …….

5.3 In question 3.3 you have indicated the following plot/variety as the most important or the most representative for potato cultivation on your farm during 2000.

Plot	Plot name	Variety name	Area	Destination
__	_____	_____	___,___ ha	seed/ware/proc

In the following questions this plot/variety will be referred to as the ***survey plot*** *or* ***survey variety****.*

5.4 Which factors were the most decisive in your choice of the survey variety? Please indicate the three most important factors.
(column 1 = most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
purchase price of the seed potatoes	0	0	0
haulm resistance against Phytophthora	0	0	0
good yield and size grade	0	0	0
buyer's demand/regulations	0	0	0
tuber resistance against Phytophthora	0	0	0
good price formation on the market	0	0	0
availability of seed potatoes	0	0	0
earliness of tuber formation/maturation	0	0	0
good storability after harvest	0	0	0
other, namely …….	0	0	0

5.5 In the summary below, please fill in the details requested for the planting material of the survey variety. *(Circle 'mm' or 'gr(am)' with 'Size grade')*

Size grade	Quantity	Price	Production method
___ - ___ mm / gr	_____ kg	_____ .../kg	organic/conventional
___ - ___ mm / gr	_____ kg	_____ .../kg	organic/conventional
___ - ___ mm / gr	_____ kg	_____ .../kg	organic/conventional
___ - ___ mm / gr	_____ kg	_____ .../kg	organic/conventional

5.6 Where did the planting material used as the survey variety originate from?

own cultivation	____ %	
domestic production	____ %	*(own country)*
imported from abroad	____ %	
	---- +	
	100 %	

5.7 Did you yourself store the planting material of the survey variety in 1999/2000?

0 no ⟶ *continue with question 5.9*
0 yes

5.8 If yes, under what circumstances?
0 in shed without storage facilities
0 in storage place with cooling from outside air
0 in storage place with mechanical cooling
0 other, namely ……..

5.9 Did you chit the planting material of the survey variety in 2000?

0 no ⟶ *continue with question 5.11*
0 yes

5.10 If yes, with which method and for how many weeks?

0 in chitting trays	for ____ weeks
0 in hanging bags	for ____ weeks
0 other, namely ……	for ____ weeks

5.11 Did you provide a heat treatment at the start of the chitting period?

0 no
0 yes

5.12 What was the length and quality of the chits at the time of planting?

length of the chits ⟶ ___ cm

quality of the chits ⟶ firm/ moderate/weak

6. Planting system

6.1 In the summary below, please indicate which cultivation methods you used prior to the potato cultivation on the survey plot *(question 3.4)* in 2000?
(period autumn 1999 – spring 2000)

Cultivation methods	Frequency *(no. of times)*	Periods carried out *(months + years)*
Ploughing	_____	_____ ____; _____ ____
Digging	_____	_____ ____; _____ ____
Grubbing	_____	_____ ____; _____ ____
Harrowing (pulled)	_____	_____ ____; _____ ____
Harrowing (driven)	_____	_____ ____; _____ ____
Rotary tilling	_____	_____ ____; _____ ____
Other, namely …….	_____	_____ ____; _____ ____

6.2 On which date/in which week did you plant the potatoes on the survey plot in 2000?

planting date ___ _____ 2000
or *day* *month*
planting week ___ _____ 2000
week *month*

6.3 Please give an impression of the depth, dampness and structure of the seed bed at the time of planting 2000 (on the survey plot).

depth seed bed	____ cm	*(depth loose soil layer)*
structure seed bed	crumbly/clod like	*(circle the correct answer)*
structure subsoil	good/compacted	*(circle the correct answer)*
dampness seed bed	wet/damp/dry	*(circle the correct answer)*
dampness subsoil	wet/damp/dry	*(circle the correct answer)*

6.4 In what manner/with what type of machinery did you plant the potatoes on the survey plot in 2000? Did you use a contractor or was this done using your own machinery?

Method used	How it was carried out
0 placed in the furrows by hand	
0 with planting machinery (for vegetable plants etc.)	contractor/own machinery
0 with belt-type potato planter	contractor/own machinery
0 with common potato planter	contractor/own machinery
0 other, namely …….	contractor/own machinery

6.5 Which cultivation system did you use on the survey plot in 2000? And what was the distance between the rows and between the plants?

cultivation system	ridge/bed width *(midpoint to midpoint)*	rows per ridge/bed	distance in rows
0 row cultivation	_____ cm	n.a.	_____ cm
0 ridge cultivation	_____ cm	1	_____ cm
0 bed cultivation	_____ cm	__	_____ cm
0 other	*make a drawing (aerial view) of the planting pattern with distances*		

(space for diagram of planting pattern)

6.6 Please provide an estimate of the planting depth you used in 2000 on the most important or most representative plot.

furrow depth = ____ cm *(with respect to upper surface seed bed)*

6.7 In which direction did the rows run on the survey plot in 2000?

0 north – south
0 north-east – south-west
0 east – west
0 south-east – north-west

6.8 What is your assessment of the quality of the planting on the survey plot in 2000?

0 good
0 moderate, explanation:
_____
0 poor, explanation:
_____

7. Ridge formation and weed control

7.1 Please can you indicate in the table below which tillage methods you successively used for ridge formation and weed control on the survey plot in 2000.
(time: day no-month, week no-month or days after planting; if necessary consult the accompanying weather report)
(cultivation methods: harrowing, hoeing, ridging, inter-row rotary cultivation, hand weeding, etc.)
(crop stage: see accompanying diagram with pictures and codes)

Time	Cultivation method	Crop stage code
_____	_____	stage code _____
_____	_____	stage code _____
_____	_____	stage code _____
_____	_____	stage code _____
_____	_____	stage code _____
_____	_____	stage code _____

7.2 What is your assessment of the final quality (form, volume, structure) of the ridges?

0 not applicable (bed cultivation, row cultivation) *continue with question 7.4*
0 good → *continue with question 7.4*
0 moderate
0 poor

7.3 If moderate or poor, please indicate the three most important shortcomings.
(column 1 = most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
too little volume/low ridges	0	0	0
poor structure/many clods	0	0	0
plants not in the middle of the row	0	0	0
compacted soil between the ridges	0	0	0
other, namely ……..	0	0	0

7.4 What is your assessment of the weed coverage during the course of the growth season? Please give an indication of the weed coverage on the survey plot during the year 2000.

0 almost free of weeds → *continue with question 7.6*
0 low = not competing with the growth of the potatoes
0 high = competing with the growth of the potatoes

7.5 Please indicate the three prevailing species of weed on the survey plot during the growing season of the year 2000.
(column 1 = most common; column 2 = second most; column 3 = third most)

(CARD)	1	2	3
creeping thistle (*Cirsium arvense*)	0	0	0
stinging nettle (*Urtica dioica*)	0	0	0
mayweed (*Matricaria inodorata*)	0	0	0
bindweed (*Galium aparine*)	0	0	0
gallant soldier (*Galinsoga ciliata*)	0	0	0
couch grass (*Agropyron repens*)	0	0	0
common orache (*Atriplex hastata*)	0	0	0
goosefoot (*Chenopodium album*)	0	0	0
sowthistle (*Sonchus arvensis*)	0	0	0
stichwort (*Stellaria media*)	0	0	0
lady's thumb (*Polygonum persica*)	0	0	0
annual meadow grass (*Poa annua*)	0	0	0
other, namely …….	0	0	0

7.6 During the year 2000 did you use irrigation on the survey plot?

0 no
0 yes ⟶ *continue with question 7.8*

7.7 If no, please indicate why you did not use irrigation on the survey plot in 2000.

0 no water available
0 crop had no water shortage
0 afraid of Phytophthora spreading
0 no sprinkler system available
0 other, namely …….

⟶ *continue with question 8.1*

7.8 If yes, please indicate at what times, in which crop stage and how many mm of irrigation you applied to the survey plot in 2000.
(date: day no.-month, week no.-month; if necessary consult the accompanying weather report)
(time of day: dawn, morning, noon, afternoon, evening, night)
(crop stage: see accompanying diagram with pictures and codes)

Time/period	Time of day	Crop stage	Quantity
_____	_____	stage code ____	____ mm
_____	_____	stage code ____	____ mm
_____	_____	stage code ____	____ mm
_____	_____	stage code ____	____ mm
_____	_____	stage code ____	____ mm

7.9 Please indicate the three most important factors for using irrigation in your case (on the survey plot in 2000).
(column 1 = most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
maintain crop growth	0	0	0
limit chances of potato scab	0	0	0
maintain mineralisation	0	0	0
fertiliser sprinkling/limit salt damage	0	0	0
other, namely ……	0	0	0

8. Crop development and Phytophthora outbreaks

8.1 Please indicate the times at which the potatoes on the survey plot reached the following crop stages. *(if necessary, link to times of crop husbandry activities)*

Crop stage		Time *(day no.-month; week no.-month)*
10	emergence *(first leaves visible)*	_____
30	start of length growth *(crop height 20 cm)*	_____
40	closed crop *(crop height 40 cm)*	_____
60	flowering crop *(crop in full bloom)*	_____
80	start of maturation *(first leaves yellow)*	_____

8.2 During the course of the growing season, did periods of growth stagnation occur in the potato crop on the survey plot?

0 no ⟶ *continue with question 8.4*
0 yes

8.3 If yes, please indicate the most important cause of growth stagnation as well as the period *(week no, month)* and the crop stage.

Cause of growth stagnation	Period	Crop stage code
0 night frost	_____	stage code ____
0 moisture deficiency	_____	stage code ____
0 low temperatures (<10°C)	_____	stage code ____
0 mineral deficiency	_____	stage code ____
0 water surplus	_____	stage code ____
0 high temperatures (>25°C)	_____	stage code ____
0 soil structure problems	_____	stage code ____
0 other, namely ……	_____	stage code ____
0 don't know	_____	stage code ____

8.4 What is you assessment of the growth and the condition of the crop before Phytophthora or other harmful organisms started to attack it?

0 Good, explanation:
0 Moderate, explanation:
0 Poor, explanation:

8.5 Did you observe signs of Phytopthora on your survey plot in 2000?

0 no ----------> *continue with question 9.1*
0 yes

8.6 If yes, in which period and in which crop stage did you first observe signs of Phytophthora on your survey plot in 2000?
(if necessary link to the accompanying weather report)

Time/period	Crop stage code	Climate conditions
_____	stage code ____	_____
(day no.-month or week no.-month)	*(at moment of first observation)*	

8.7 How were the first signs of Phytophthora spread over the survey plot?

0 equally spread
0 a few infection points
0 certain parts of the plot, namely …….

8.8 In observing the first signs of Phytophthora in 2000, could you make a link to the source of the first infection?

0 no
0 yes, namely …….

8.9 How did the Phytophthora outbreak further develop on the survey plot?
(only one answer possible, choose the most characteristic answer)

0 in a jerky manner, dependant on the temperature and the humidity
0 in a spot like manner, dependant on the soil/climate differences across the plot
0 in a spot like manner, dependant on the prevailing wind direction on the plot
0 explosive, the outbreak spread like wild fire
0 gradually, the outbreak spread in a slow but sure manner
0 other, namely……

8.10 Which successive measures did you take to curtail the Phytophthora outbreak on the survey plot?
(chronologically: column 1 = first ; column 2 = second ; column 3 = third)

(CARD)	1	2	3
plant strengtheners applied or sprayed	0	0	0
infected leaves removed	0	0	0
infected plants removed	0	0	0
infection points rendered harmless/burned	0	0	0
copper compounds applied/sprayed	0	0	0
plot prematurely burned	0	0	0
other, namely ……	0	0	0

9. Phytophthora-control

9.1 During the last five years have you sprayed with copper compounds in order to control Phytophthora in potatoes?

0 yes
0 no → *continue with question 9.3*

9.2 If yes, in which years?

0 1996
0 1997
0 1998
0 1999
0 2000

→ *continue with question 9.4*

9.3 If no, why not? Please indicate the most important reason for not spraying with copper compounds. *(only one answer possible)*

(CARD)

0 not permitted by certification body
0 bad for the soil life, especially earthworms
0 not necessary due to use of extracts and/or preparations
0 does not fit in with my views on organic farming
0 not necessary due to low infection pressure of Phytophthora
0 no good spraying equipment available on the farm
0 not necessary due to high tuber resistance of varieties grown
0 crop was already mature when Phytophthora struck
0 other, namely ……

9.4 During the last five years, have you applied plant extracts, compost extracts or (bio-dynamic) preparations to strengthen your potato crop and/or protect it against Phytophthora?

0 yes
0 no ⟶ *continue with question 9.6*

9.5 If yes, in which years and with which extracts or preparations?

0 1996 namely ……
0 1997 namely ……
0 1998 namely ……
0 1999 namely ……
0 2000 namely ……

9.6 In 2000 did you spray your survey variety with copper compounds or did you apply plant extracts/preparations for the purpose of controlling Phytophthora?

0 yes
0 no ⟶ *continue with question 9.12*

9.7 If yes, please specify the applications concerned in the table below.

no.	date of application	Substances applied: *Trade name or description*	Total quantity used *(specify use and units)*	Area treated (ha)
1				
2				
3				
4				
5				
6				
7				
8				

9.8 In which (infection) stage did you apply the first spray stated in question 9.7?
(only one answer possible)

0 when Phytophthora had not been observed anywhere in the region
0 when warning system forecasted a danger from Phytophthora

0 when my advisor told me to start spraying
0 when I estimated there was a risk due to temperature and leaf wetness/dew periods
0 when conventional growers mentioned the first outbreaks
0 when I discovered the first outbreak on my most susceptible plot
0 when I discovered the first outbreak on my survey plot
0 when the outbreak on my survey plot started to become serious
0 other, namely ……

9.9 After the first spraying in the survey variety, did you carry out subsequent sprayings against Phytophthora?

0 no ⟶ *continue with question 9.13*
0 yes

9.10 If yes, please indicate in the columns below the three most important reasons for carrying out subsequent sprayings.
(column 1 = most important reason; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
persistent periods of rain/damp weather	0	0	0
spread of Phytophthora outbreak through the crop	0	0	0
comments from fellow growers in the area	0	0	0
initial spraying no longer provided protection	0	0	0
crop still too young for haulms to be destroyed	0	0	0
anxious about large-scale outbreak of Phytophthora	0	0	0
other, namely ……	0	0	0

9.11 Please give an estimate of the number of growth days that you gained and/or days by which you could postpone haulm destruction due to applying the sprays stated in question 9.7. Please also give an estimate of the additional yield (kg/ha) which you obtained as a result of the extra days gained.

extra days gained ⟶ _____ days
additional yield obtained ⟶ _____ kg/ha

9.12 Please also indicate which part of the extra days gained and/or additional yield can be attributed to the application of copper compounds.

copper compounds _____ %
extracts or preparations _____ %
------- +
100 %

9.13 Please indicate your experience of the Phytophthora infection pressure on the potatoes on your farm in 2000 compared with other years.
(only one answer possible)

0 comparable with other years
0 first outbreak came earlier than in other years
0 first outbreak came later than in other years
0 Phytophthora outbreak was more serious than in previous years
0 Phytophthora outbreak was less serious than in previous years
0 need for haulm destruction was earlier than in previous years
0 need for haulm destruction was later than in previous years

0 other, namely ……

10. Maturation and haulm destruction

10.1 In 2000 did you destroy the haulms of your survey variety?

0 no
0 yes ⟶ *continue with question 10.3*

10.2 If no, why not? Please indicate in the columns below the three most important reasons for deciding not to carry out haulm destruction in the survey variety.
(column 1 = most important reason; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
crop had already died back sufficiently	0	0	0
no machinery available for haulm destruction	0	0	0
little or no Phytophthora outbreak on the leaves	0	0	0
cost of haulm destruction was greater than costs resulting from Phytophthora damage	0	0	0
variety cultivated was scarcely susceptible to tuber infection	0	0	0
plot ploughed in due to Phytophthora problems	0	0	0
other, namely …….	0	0	0

⟶ *continue with question 11.1*

10.3 If yes, on what date in 2000 did you start potato haulm destruction on your survey variety? Please also indicate whether this date was early, normal or late in comparison with previous years.

Date: …. …… 2000 early/normal/late
day month *in comparison with other years*

10.4 In which stage of maturation were the plants of the survey variety at the moment when haulm destruction was carried out in 2000?
(only one answer possible)

0 crop stage 65 = crop in full bloom
0 crop stage 69 = crop had finished flowering
0 crop stage 79 = completely green crop
0 crop stage 81 = first leaves yellow
0 crop stage 83 = half of the leaves yellow
0 crop stage 85 = most leaves yellow
0 crop stage __ = namely ……

10.5 What was your most important reason for carrying out haulm destruction at that stage?
(only one answer possible)

0 to prevent Phytophthora infecting the tubers
0 to limit the risk of infection for other plots/varieties
0 to prevent complaints/claims for damages from colleagues/third parties
0 legal obligation to adequately control Phytopthora
0 to be able to start harvesting on time (early delivery)
0 to prevent viral infection by aphids (seed potatoes)
0 to meet the deadline for seed potato approval
0 other, namely ……

10.6 Please indicate in the table below which procedures you carried out for haulm destruction in the survey variety in 2000.
(time: day no, month or week no.-month)
(procedures: haulm shredding, haulm pulling, haulm burning, root cutting)

Time	Procedure	How it was carried out
_____	_____	contractor/own machines
_____	_____	contractor/own machines
_____	_____	contractor/own machines
_____	_____	contractor/own machines

10.7 If haulm burning was carried out, please specify the amount and kind of fuel used.

quantity of fuel used: _____ _____ _____
quantity *unit* *kind*

10.8 Which of the descriptions below best describes the weather conditions at the time when haulm destruction was carried out on the survey plot in 2000?
(only one answer possible)

0 wet soil and damp weather
0 wet soil and dry weather
0 damp soil and damp weather
0 damp soil and dry weather
0 dry soil and damp weather
0 dry soil and dry weather
0 other, namely …….

10.9 What is your assessment of the result obtained from carrying out haulm destruction measures?

0 successful, little regrowth
0 moderately successful
0 not successful, much regrowth

11. Harvest and storage

11.1 In which period did you lift the potatoes of the survey variety in 2000?
Please indicate whether this period is early, normal or late in comparison with previous years.

Period: ……. ……. 2000 early/normal/late
week *month* *in comparison with other years*

11.2 How would you describe the weather conditions in the weeks prior to the harvest of the survey variety in 2000?
(in connection with Phytophthora infection of tubers; only one answer possible)

0 heavy rain (>20 mm/occasion)
0 changeable (5-20 mm/week)
0 dry (<5 mm/week)

11.3 How were the potatoes of the survey variety lifted in 2000?
(in connection with Phytophthora infection of tubers; only one answer possible)

0 potato lifter + collected in crates/sacks
0 potato harvester + transport in crates/sacks
0 potato harvester + transport with tipper trailer
0 other, namely …….

11.4 How would you describe the soil conditions during the lifting of the survey variety in 2000?
(in connection with Phytophthora infection of tubers; only one answer possible)

0 very dry, tubers came out of the ground very clean
0 damp, tubers came out of the ground fairly clean
0 very wet, tubers came out of the ground very dirty
0 other, namely …….

11.5 What precautions did you take to remove tubers infected by Phytophthora whilst harvesting the survey variety in 2000?
(in connection with removal of Phytophthora; more than one answer may be given)

0 none, no infected tubers
0 none, infected tubers let through
0 infected tubers left in the ground to rot
0 infected tubers sorted out during lifting
0 infected tubers sorted out when put into storage
0 other, namely ……

11.6 What was your impression of the tuber infection by Phytophthora when harvesting the survey variety in 2000 in comparison with other years?

tuber infection: light/normal/heavy

11.7 How did you store the potatoes from the survey variety in 2000? Please also indicate the length of the storage period.

Storage method	proportion of area	storage period
Not stored/sold from the field	____ %	0 months

In shed without storage facilities	____ %	___ months
In storage place with cooling from outside air	____ %	___ months
In storage place with mechanical cooling	____ %	___ months
Other, namely …….	____ %	___ months
	------- +	
Total for survey variety in 2000	100 %	

11.8 What piling method did you use to store the potatoes from the survey variety in 2000? Please supply the details requested.

Sort of pile	proportion of area	Specification
Not stored/sold from the field	____ %	n.a.
In crates	____ %	content/crate ____ m^3
In sacks	____ %	staple height ____ m
Bulk storage	____ %	pile height ____ m
Other, namely ……	____ %	
	------ +	
Total for survey variety in 2000	100 %	

11.9 What preventative measures did you take to combat the spread of Phytophthora under the potatoes of the survey variety in 2000?
(more answers possible)

0 none
0 haulm remains, clods and stones removed when put into storage
0 intensive ventilation to dry the product
0 during the storage period unhealthy tubers were removed
0 temperature and relative humidity were regularly checked
0 other, namely …….

12. Yield and sales

12.1 In question 3.4 you indicated what your survey variety was in 2000.

Plot	Plot name	Variety name	Area	Destination
__	_____	_____	___,___ ha	seed/ware/proc

12.2 Please give an estimate of the yield of the standing crop, low-grade product /undersized and marketable quantity for your survey variety in 2000?

	quantities
gross yield (ungraded product)	_____ tonnes
low-grade product/undersized (animal feed)	_____ tonnes
	--------- -
marketable in 2000/2001	_____ tonnes

12.3 What is your assessment of the non-marketable part of the harvest (low-grade product/undersized/animal feed) in question 12.2 in comparison with other years?

0 low
0 normal
0 high

12.4 For your survey variety in 2000 please indicate the sales pattern and associated prices in the table below. Please also indicate the form in which the product was sold. *(packaged product = sorted and packed; bulk product = ungraded product and bulk sales)*

period	quantity	price obtained	sales method
July/August	____ tonnes	____ .../kg	packaged/bulk
September/October	____ tonnes	____ .../kg	packaged/bulk
November/December	____ tonnes	____ .../kg	packaged/bulk
January/February	____ tonnes	____ .../kg	packaged/bulk
March/April	____ tonnes	____ .../kg	packaged/bulk
May/June	____ tonnes	____ .../kg	packaged/bulk

12.5 In the sales period 2000/2001, did your most important buyers make comments or complain about the product quality of the survey variety?

0 no ⟶ *continue with question 12.7*
0 yes

12.6 If yes, please indicate what their most important comments or complaints were.

(CARD)	1	2	3
much tare/low-grade product	0	0	0
poor cooking/baking quality	0	0	0
glassiness of the tuber	0	0	0
small size grade	0	0	0
much bruising	0	0	0
much soft rot	0	0	0
much dry rot	0	0	0
much Rhizotonia	0	0	0
others, namely ……	0	0	0

12.7 Were the comments or complaints about the product quality of the survey variety in 2000/2001 such that a price reduction was applied or that a batch was rejected?

0 no
0 yes, price reduction of …. %
0 yes, batch rejected

12.8 What is your assessment of the kg-yield, product quality, farm gate prices and profitability of the survey variety for the harvest 2000 on your farm?
(please circle the appropriate comment)

kg-yield	very high	high	normal	low	very low
product quality	very high	high	normal	low	very low
farm gate price	very high	high	normal	low	very low
profitability	very high	high	normal	low	very low

13. Knowledge and experience

13.1 What is your year of birth?

19___

13.2 When did you start or when did you convert to organic cultivation crop production?

0 1998 – 1999
0 1995 – 1997
0 1990 – 1994
0 1980 – 1989
0 before 1980

13.3 How many years of experience do you have in the organic cultivation of potatoes?

0 1 - 2 years
0 3 - 5 years

0 6 -10 years
0 ≥10 years

13.4 To what level have you been educated? Please also indicate if the education concerned was geared towards agriculture and/or organic production.
(mark highest and indicate nature)

		agricultural?	organic?
0	low vocational level	yes/no	yes/no
0	medium vocational level	yes/no	yes/no
0	Bachelor's degree level	yes/no	yes/no
0	Master's degree level	yes/no	yes/no
0	other, namely ……	yes/no	yes/no

13.5 Please indicate which farmer's journals you regularly read and how much time you spent in 2000 reading the farmer's journals stated.

no.	name of the farmer's journal	Number of issues per year	time spent reading each issue (in minutes)
1			15 / 30 / 60 / 120
2			15 / 30 / 60 / 120
3			15 / 30 / 60 / 120
4			15 / 30 / 60 / 120
5			15 / 30 / 60 / 120
6			15 / 30 / 60 / 120

13.6 In 2000, did you utilize the internet to obtain technical or economic information to support your farming activities?

0 no ------- > *continue with question 13.8*
0 yes

13.7 If yes, how much time did you spend in 2000 obtaining such information from the internet?

____ hours per week

13.8 In 2000 did you utilize any Phytophthora warning system?

0 no
0 yes, namely ……..

13.9 In 2000 did you obtain technical or economic advice from researchers, extensionists or advisors to support your farming activities?

0 no ⟶ *continue with question 13.11*
0 yes

13.10 If yes, which subjects did you request advice on in 2000?
(more than one answer may be given)

0 weed control
0 soil and soil life
0 manure use/composting
0 diseases and pests
0 crop choice
0 variety choice
0 development of nature areas
0 crop rotation
0 other, namely ……

13.11 In 2000, did you participate in study groups, projects or excursions where practical knowledge and experience about the organic cultivation of potatoes was exchanged?

0 no → *continue with question 13.13*
0 yes

13.12 If yes, over which subjects did you exchange knowledge/experiences?
(more answers possible)

0 crops and varieties cultivated
0 timing of manuring, planting and harvesting
0 quantities of manure, seed potatoes, adjuvants
0 quality of seed bed/soil structure
0 timing and methods for weed control
0 crop development, diseases and pests
0 first outbreak and progression of Phytophthora
0 crop yields obtained
0 other, namely ……

13.13 In 2000, did you keep records about the cultivation activities carried out or about the condition of the crops and the yields in 2000?

0 no → *continue with question 14.1*
0 yes

13.14 If yes, what was your purpose in keeping these records?
(more answers possible)

0 to meet the certification requirements of buyers
0 to record the cultivation history of plots
0 to make comparisons with previous years
0 to make comparisons with fellow growers
0 to make cost calculations
0 other, namely …….

14. Experiences of and visions concerning Phytophthora

14.1 In your opinion, where do the primary infections from Phytophthora come from? Which sources do you think are the three most important for the occurrence of Phytophthora?
(column 1 = most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
infected tubers in the seed potatoes	0	0	0
waste piles (grading ground, low-grade product)	0	0	0
volunteer plants in other crops	0	0	0
spores been blown across from the south	0	0	0
susceptible varieties on conventional farms	0	0	0
cultivation of early potatoes under plastic	0	0	0
other, namely …….	0	0	0

14.2 On which experience is your opinion in question 14.1 based?
(CARD; no more than three answers may be given)

0 outbreaks start in varieties with high tuber resistance
0 outbreaks start on the south of the farm
0 outbreaks start in the vicinity of waste piles
0 outbreaks start on plots with early varieties
0 outbreaks start in the vicinity of volunteers
0 outbreaks start with incidental infection points in the plot
0 outbreaks start on plots with susceptible varieties
0 other, namely …….

14.3 In your experience, in which situations does Phytophthora spread the most quickly? Please indicate what you think are the three most important causes of a rapid spread.
(column 1 = most important; column 2 = second most important; column 3 = third most important)

(CARD)	1	2	3
varieties with a low leaf resistance	0	0	0
poor crops with poorly developed haulms	0	0	0
highly shaded, well sheltered corners	0	0	0
heavy crops with well developed haulms	0	0	0
night frost/dew sensitive corners	0	0	0
unbalanced manuring	0	0	0
other, namely ……	0	0	0

14.4 Procedure which worked by chance *(idea from Marieke de Vrij, the Netherlands)*:
An arable farmer planted potatoes on a plot where alfalfa had been grown the previous year. Due to a defect on the plough the alfalfa on a small part of the plot was scarcely ploughed under. The arable farmer was disconcerted to find a “mixed cultivation” of potatoes and alfalfa on the part of the plot concerned. A couple of months later the arable farmer was surprised to discover that the potatoes in the “mixed cultivation” were clearly less affected by Phytophthora than the

potatoes on the normal part of the plot. This is an example of a procedure that worked by chance (by the way: this is not a real-life story)

During your career as a farmer/vegetable grower have you had experiences which could be described as "procedures which worked by chance"?
In other words: have you ever experienced or done "crazy things" on your farm which are now part of your cultivation strategy?

0 no → *continue with question 14.6*
0 yes

14.5 If yes, please give a short description of the activities or experiences.

1.
2.

14.6 Within a few years the use of copper compounds for controlling Phytophthora in potatoes will be banned throughout Europe. How will this affect the acreage of potatoes cultivated on your farm?

0 will be expanded, as the higher prices will make cultivation more attractive
0 will be expanded, as despite the lower yield I wish to continue serving my customers
0 neutral, as the use of copper was already banned in my country
0 neutral, as I expect there will be substitute compounds
0 neutral, as the lower yields will result in higher prices
0 reduction, as due to the lower yields production will no longer be attractive
0 reduction, as the measures will make cultivation technically impossible
0 other, namely ……

14.7 During the last five years, have you sprayed with copper compounds on your farm to control Phytophthora on potatoes?

0 no ⟶ *continue with question 14.9*
0 yes

14.8 If yes, what changes do you think you will you make to the cultivation system to compensate for the loss of copper compounds?

0 none, as I want to stop growing potatoes
0 none, as I accept the possible loss in yield
0 I will find a solution using less susceptible varieties
0 I will find a solution by advancing the growing season
0 I will find a solution by improving farming hygiene
0 I will find a solution by using Phytophthora free seed potatoes
0 I will find a solution by improving the choice of plot
0 other, namely …….

14.9 Do you have any questions or suggestions as a result of this survey? For example, for research or training related to Phytophthora control in potatoes. Did you find satisfactory solutions to the Phytophthora problem (if you had a problem)? If yes, how?

14.10 To what extent are you interested in the outcomes from this survey?

0 send the entire report (in English)
0 send just a summary (in your mother language)
0 not interested

---- END OF THE SURVEY ----