Trait or process		Specific monitor- ing issue identified from an ERA <sup>1</sup>	Monitoring methods (HOW) <sup>2</sup>		Environment e.g. field, natural habi- tats	Time for monitoring duration of period,
(WHAT RISK)		(WHAT CHAR- ACTER)	CSM <sup>4</sup> (if identified by an ERA)	General Surveillance	applicable to CSM/GS <sup>3</sup> (WHERE)	timing applicable to CSM/GS
Persistence and Invasiveness & selective advantage or disadvantage	volunteers (in fields) establish- ment of the GMP <sup>5</sup> out- side of fields	Monitoring of tuber- and seedborne volun- teers/groundkeepers Monitoring of GMP out- side fields	<ul> <li>Floristic volunteer mapping (frequency, abundance, persistence)</li> <li>Gene detection method</li> <li>VDI 4330 Part 5 (Sampling of plant material for the detection of genetically engineered nucleic acids in the environment)</li> <li>VDI 4330 Part 7 (Qualitative methods for the detection of genetically engineered nucleic acids in the environment)</li> <li>Floristic mapping (presence, abundance, persistence of GMP/potatoes outside the field</li> <li>Floristic mapping for clearly detectable hybrids or modification of distribution in volunteers or feral distribution</li> <li>Ecological surveys in wider areas, including: <ul> <li>Floristic mapping</li> <li>Population &amp; plant community monitoring</li> <li>VDI 4330 Part 9 (Vegetation survey)</li> </ul> </li> </ul>	<ul> <li>Floristic Volunteer mapping (frequency, abundance, persistence)</li> <li>other survey methods</li> <li>Ecological surveys in wider areas, including: <ul> <li>Floristic mapping</li> <li>Population &amp; plant community monitoring</li> <li>VDI 4330 Part 9</li> </ul> </li> <li>Habitat monitoring / Land use to identify potential recipient organisms: volunteers and feral plants, in wider areas</li> <li>Gene detection method</li> <li>VDI 4330 Part 5 + 7</li> <li>Pollen monitoring: <ul> <li>Technical pollen sampler VDI 4334 Part 3</li> <li>Biological pollen sampler VDI 4334 Part 4</li> </ul> </li> </ul>	In representative environments where the GMP might survive as volunteer, e.g agricultural fields and field margins Field margins and natural habi- tats in representative GMO- growing regions,	During the consent period During the authorisation period, and long term if necessary. During the growing sea- son
	Spread, persistence and accumu- lation of GMP in the environment	No relevant monitoring issues other than those accounted for above				
		No relevant monitoring issues other than those accounted for above	o relevant monitoring sues other than those counted for above			
	Presence of GMP prod- ucts in the environment	No relevant monitoring issues				

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 <sup>&</sup>lt;sup>1</sup> ERA – Environmental Risk Assessment
 <sup>2</sup> Kjellson G. and Strandberg, M. (2001) Monitoring and surveillance of genetically modified higher plants. Guidlines for procedures and analysis of environmental effects. Birkhäuser Verlag Basel. 119 pp. VDI-Handbook Biotechnology, Part I: GMO-Monitoring, VDI 4330 (www.vdi.de)
 <sup>3</sup> GS – General Surveillance
 <sup>4</sup> CSM – Case Specific Monitoring
 <sup>5</sup> GMP = genetically modified plant

Trait or process (WHAT RISK)		Specific monitor- ing issue identified from an ERA <sup>1</sup>	Monitoring meth	Environment e.g. field, natural habi- tats	Time for monitoring duration of period,	
		(WHAT CHAR- ACTER)	CSM <sup>4</sup> (if identified by an ERA)	General Surveillance	applicable to CSM/GS <sup>3</sup> (WHERE)	timing applicable to CSM/GS (WHEN)
Potential for Gene transfer	vertical to crop plants (volunteers, feral), lead- ing to plants with one or several GM traits vertical to wild plants	Monitoring of volunteers, feral plants (Monitoring of gene flow from 1.field to volunteers 2. from field to feral plants) No relevant monitoring issues. There are no wild relatives in EU.	Floristic mapping for clearly detectable hybrids or modification of distribution in volunteers or feral distribution Gene detection method VDI 4330 Part 5 + 7 Pollen monitoring: Technical pollen sampler VDI 4334 Part 3 Biological pollen sampler VDI 4334 Part 4 Assessment of flower abortion			
	horizontal to micro- organisms in soil, and living on or next to the GMP	No relevant monitoring issues. The traits do not confer a selective ad- vantage, genes are already present and methodology is undeveloped.				
Interaction between GMP and target organisms	reduced abundance and diversity of weeds or development of new weed species	No relevant monitoring issues. There is no target organism.				

Trait or process (WHAT RISK)		Specific monitor- ing issue identified from an ERA <sup>1</sup>	Monitoring methods (HOW) <sup>2</sup>		Environment e.g. field, natural habi- tats	Time for monitoring duration of period,
		(WHAT CHAR- ACTER)	CSM <sup>4</sup> (if identified by an ERA)	General Surveillance	applicable to CSM/GS <sup>3</sup> (WHERE)	timing applicable to CSM/GS (WHEN)
	resistance development in animals Resistance development in plants secondary pests	No relevant monitoring issues. There is no target organism No relevant monitoring issues. There is no target organism No relevant monitoring issues. There is no target organism	Monitoring abundance and if necessary other	Identification of relevant monitoring objec-	In representative fields and field	During the period of con-
nteraction between GMP and bon-target organisms	non-target organisms	of relevant (indicator) species representing a larger set of non-target organisms	Assessment of glycalkaloid levels, sugars (mono- and disaccarides), protease inhibitors, lectins in the GMP Assessment of amylopectin:amylose ratios in tubers	tives and parameters which are suitable on non-target organisms in the environment: Surveillance of abundance of relevant (indi- cator) species representing a larger set of non-target organisms eg: Hypogaeic phytophages Hypogaeic predators Parasitoids Earth worms (Lumbricidae) Nematodes Springtails (Collembola)	margins where the GMP is grown Studies in natural habitats can be requested after unexpected re- sults from the monitoring of GMP presence outside fields.	sent

Trait or process (WHAT RISK)		Specific monitor- ing issue identified from an ERA <sup>1</sup>	Monitoring methods (HOW) <sup>2</sup>		Environment e.g. field, natural habi- tats	Time for monitoring duration of period,
		(WHAT CHAR- ACTER)	CSM <sup>4</sup> (if identified by an ERA)	General Surveillance	applicable to CSM/GS <sup>3</sup> (WHERE)	timing applicable to CSM/GS (WHEN)
	Changes of susceptibil- ity to non- target pests & diseases	Monitoring the damage caused by pests, diseases or pesticide use.	Assessment of glycalkaloid levels, sugars (mono- and disaccarides), protease inhibitors, lectins in the GMP pest and disease surveys	Pest and diseases survey linked to crops practices Pest survey (e.g. collection by knocking them off plants, count of damage by infesta- tion) or survey on pesticide use in the crop	In the fields where the GMP is grown	During cultivation During the period of con- sent
	Other Im- pacts on habitat di- versity and biodiversity	Monitoring changes in diversity, relative fre- quencies and fitness at different levels of the food chain, other than the specific items listed be- fore Monitoring of relevant indicators		Identification and observation of relevant surveillance programs that provide informa- tion relevant to indicators in order to ad- dress protection targets. Compilation and evaluation of available data on unusual effects from existing sur- veillance and monitoring programmes (e.g. bird monitoring programmes, biodiver-sity monitoring, butterfly monitoring). Depending on the usefulness of existing surveillance programmes the cost effective amendment of relevant indicators or the amendment of existing programs by rele- vant indicators Large scale observations Biodiversity indicators.	In representative fields and field margins where the GMP is grown, as well as natural habi- tats Representative and/or relevant bio geographical regions	No time limit

Trait or process (WHAT RISK)		Specific monitor- ing issue identified from an ERA <sup>1</sup> (WHAT CHAR- ACTER)	Monitoring methods (HOW) <sup>2</sup>			Environment e.g. field, natural habi- tats	Time for monitoring duration of period,
			CSM <sup>4</sup> (if identified by an ERA)	General Surveillance	applicable to CSM/G (WHERE)	applicable to CSM/GS <sup>3</sup> (WHERE)	timing applicable to CSM/GS (WHEN)
Changes in biogeochemi- cal processes		Monitoring relevant soil functions/parameters	Germination and growth tests, soil parameters as pH, nutrient content, consistency etc. Substrate-induced respiration Fumigation-extraction method Infrared carbon dioxide analyser with flow rate indication/determination of oxygen absorption Total DNA extraction (DGGE) Monitoring for altered root exudations (e.g. Pseudomonas populations; DGGE profiles of 16S and 18S rDNA	Germination and growth tests, soil parame- ters as pH, nutrient content, consistency, root exudates etc. Substrate-induced respiration Fumigation-extraction method Infrared carbon dioxide analyser with flow rate indication/determination of oxygen absorption Total DNA extraction (DGGE) Monitoring for altered root exudations (e.g. Pseudomonas populations; DGGE profiles of 16S and 18S rDNA		In representative fields where the GMP is grown	During the authorisation period, and long term if necessary. During cultivation
Changes in cultivation practices		Monitor changes in farm- ing practice (e.g. amount and type of pesticides, application of fertilizers, tillage, crop rotation, use of energy)	Pesticide use indicators - Link with Directive 91/414 and Thematic Strategy for Pesticides	Pesticide use indicators - Link with Di- rective 91/414 and Thematic Strategy for Pesticides Farmer surveys, Questionnaires <sup>6</sup>		In fields and field margins	

<sup>&</sup>lt;sup>6</sup> Some experts were of the opinion, that farmer questionnaires might be useful to provide information on agronomic issues. This solely visual method is not appropriate to detect environmental effects on the environment within fields and in the field margins - it does not provide scientifically sound environmental data