Table 2. The demand for retailers and holding capacity

Retailer	Holding Capacity	Period							Retailer	Holding Capacity	Period						
		t_1	t_2	t_3	t_4	t_5	t_6	t_7			t_1	t_2	t_3	t_4	t_5	t_6	t_7
m_1	15	15	15	15	15	15	15	5	m_{22}	15	15	10					
m_2	10	10	10	10	10	10			m_{23}	20	20	20	20	20			
m_3	22	22	21	20	20	20	20		m_{24}	20	20	20	17	10			
m_4	15	15	10	10	10				m_{25}	10	10	10	7				
m_5	13	13	13	10	10				m_{26}	20	20	10					
m_6	15	15	10	10	10	10			m_{27}	36	36	30	30	30			
m_7	15	15	15	15	15	15	10		m_{28}	13	12	13					
m_8	10	10	10	10	10	10			m_{29}	10	10	10					
m_9	10	10	10	10	10	10			m_{30}	22	22	20	20				
m_{10}	15	15	10						m_{31}	11	11	10	10				
m_{11}	10	10	5						m_{32}	20	20	20	20	12			
m_{12}	15	15	15	10	10	10	10	10	m_{33}	10	10	5					
m_{13}	50	50	35	32	28				m_{34}	15	15	10					
m_{14}	10	10	10						m_{35}	20	20	20	20	10			
m_{15}	10	10	10	10	6				m_{36}	20	20	15	10				
m_{16}	15	15	10	10					m_{37}	25	25	20	10				
m_{17}	10	10	10	10	10				m_{38}	10	10	10					
m_{18}	20	20	11						m_{39}	15	15						
m_{19}	10	10	10	10					m_{40}	20	20	10	10				
m_{20}	15	15	10	10	10				m_{41}	20	20	12					
m_{21}	10	10	10						m_{42}	15	15	13					

Table 3. Meatpacking facility specifications of the problem

Packing Facility	Inventory Holding Cost ($)	Warehouse Capacity	Maximum Production Capacity	Fixed Production Cost ($)	Variable Production Cost ($)
p_1	9	4000	900	475	611
p_2	9	100	300	455	727
p_3	14	100	600	909	909
p_4	14	500	900	818	818

Table 4. Trip distances among packing facilities and cold storage facilities (KM)

Node	p_1	p_2	p_3	p_4	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_{10}	s_{11}	s_{12}
p_1	0	632	2322	1796	1811	1797	1790	1422	1589	631	1987	1953	1844	1240	690	1488
p_2	651	0	2008	1482	1496	1481	1476	1226	979	2	1509	1640	1609	1073	754	1172
p_3	2306	1991	0	612	560	571	612	1188	1488	1991	790	485	923	1387	1781	898
p_4	1790	1475	617	0	49	45	22	746	879	1477	193	164	794	956	1265	458
s_1	1804	1489	582	45	0	20	62	724	939	1489	230	130	785	922	1279	433
s_2	1792	1477	569	42	20	0	50	712	927	1477	232	145	773	910	1267	421
s_3	1789	1474	630	20	60	53	0	754	876	1474	206	178	791	944	1264	455
s_4	1399	1217	1200	747	762	747	740	0	1365	1217	938	799	451	200	760	349
s_5	1616	976	1498	886	927	939	884	1315	0	976	769	1045	1609	1394	1409	1138
s_6	651	2	2008	1482	1498	1483	1476	1227	981	0	1511	1640	1610	1077	754	1174
s_7	1978	1504	784	189	226	228	202	934	794	1504	0	332	980	1142	1452	644
s_8	1939	1624	474	153	122	149	172	788	1030	1596	331	0	849	986	1385	497
s_9	1765	1620	931	792	786	771	785	449	1600	1620	983	812	0	566	1158	565
s_{10}	1215	1070	1394	941	957	942	935	201	1396	1069	1132	993	567	0	576	523
s_{11}	676	747	1799	1247	1289	1274	1267	748	1421	747	1465	1431	1154	566	0	965
s_{12}	1480	1165	906	454	435	420	447	347	1120	1165	645	506	557	536	955	0

Table 5. Trip distances among carcass suppliers and packing facilities (KM)

Node	c_1	c_2	c_3	c_4	c_5	p_1	p_2	p_3	p_4
c_1	0					1806	1584	606	15
c_2		0				1506	1192	880	438
c_3			0			1569	952	1500	890
c_4				0		5	635	2311	1794
c_5					0	628	4	1993	1482
p_1	1800	1502	1565	4	628	0	632	2322	1796
p_2	1492	1187	938	635	3	651	0	2008	1482
p_3	603	889	1489	2326	2007	2306	1991	0	612
p_4	12	437	878	1800	1476	1790	1475	617	0

Table 11. Transferred red meat among nodes (Scenario 3)

Node		Vehicle	Period						
			t_1	t_2	t_3	t_4	t_5	t_6	t_7
c_2	p_1	v_1	277.5						
c_2	p_2	v_1	15						
c_3	p_1	v_1	240						
c_3	p_2	v_1	60						
c_4	p_1	v_1	300	98.75	20				
c_4	p_2	v_1		75	75	52.5			
c_5	p_1	v_2						10	
c_5	p_2	v_1	300	300	300	300	75	40	

Table 9. The inventory level in nodes

Node	Period							Node	Period						
	t_1	t_2	t_3	t_4	t_5	t_6	t_7		t_1	t_2	t_3	t_4	t_5	t_6	t_7
p_1		4						m_{21}	10						
p_2				4	8			m_{22}	5						
m_1		5	10	15		5		m_{23}							
m_2	10			10				m_{24}							
m_3	18				20			m_{25}	10						
m_4		10						m_{26}							
m_5	3	10						m_{27}		10					
m_6		10		10				m_{28}	13						
m_7		5		5	10			m_{29}	10						
m_8	10			10				m_{30}	20						
m_9	10			10				m_{31}	5	10					
m_{10}	5							m_{32}							
m_{11}	5							m_{33}	5						
m_{12}	5	10		10		10		m_{34}	10						
m_{13}	10		8					m_{35}							
m_{14}	10							m_{36}							
m_{15}	10		6					m_{37}	10	10					
m_{16}		10						m_{38}	10						
m_{17}	10		10					m_{39}							
m_{18}	11							m_{40}	20	10					
m_{19}	10							m_{41}							
m_{20}	5		10					m_{42}	13						

Table 6. Trip distances among cold storage facilities and retailers (KM)

Node	s_1	s_2	s_3	s_4	s_5	s_6	s_7	s_8	s_9	s_{10}	s_{11}	s_{12}
m_1	44	47	32	758	880	1487	190	156	803	957	1274	467
m_2	59	57	31	762	874	1492	190	177	809	962	1280	473
m_3	37	42	36	758	893	1487	199	147	801	957	1288	452
m_4	53	58	37	766	881	1492	188	160	818	966	1284	473
m_5	33	40	34	755	891	1485	205	146	799	955	1273	466
m_6	47	45	19	750	876	1479	191	164	796	949	1267	460
m_7	59	55	32	762	877	1491	186	168	809	961	1280	472
m_8	44	50	35	760	892	1489	194	153	806	959	1277	470
m_9	63	63	43	773	888	1502	183	163	819	972	1290	483
m_{10}	42	46	40	755	887	1485	192	152	802	950	1273	466
m_{11}	93	91	44	727	852	1456	230	210	775	926	1244	437
m_{12}	24	41	75	762	932	1526	233	111	807	996	1314	455
m_{13}	934	939	890	1292	30	952	813	1051	1615	1371	1395	1141
m_{14}	768	773	725	1239	241	1111	517	886	1450	1364	1486	1007
m_{15}	1146	1131	1124	1008	522	458	1052	1287	1387	1086	1047	862
m_{16}	318	320	295	1026	679	1432	80	424	1073	1225	1388	737
m_{17}	162	147	140	575	955	1364	338	257	658	774	1153	285
m_{18}	125	142	176	781	1033	1584	335	8	842	979	1372	490
m_{19}	312	329	363	920	1220	1724	522	190	823	1119	1512	630
m_{20}	304	321	354	950	1211	1753	288	182	924	1148	1541	659
m_{21}	451	455	428	1089	547	1307	213	557	1242	1214	1397	803
m_{22}	259	264	215	892	662	1371	231	376	940	1091	1230	602
m_{23}	744	761	794	1352	1652	2155	953	622	1005	1550	1943	1061
m_{24}	599	589	649	1207	1507	2010	808	477	1120	1405	1798	916
m_{25}	649	634	665	878	1543	1814	854	596	434	995	1534	658
m_{26}	567	558	618	1175	1475	1978	558	445	1089	1374	1767	885
m_{27}	430	416	435	321	1139	1184	641	502	531	501	925	37
m_{28}	1049	1034	1027	295	1666	1360	1224	1086	475	305	744	635
m_{29}	519	504	531	268	1335	1280	728	590	487	457	968	131
m_{30}	799	783	798	430	1612	1602	995	824	22	548	1106	547
m_{31}	1486	1472	1465	1216	969	9	1500	1628	1599	1064	722	1163
m_{32}	940	925	918	182	1379	1076	1116	976	547	22	580	507
m_{33}	764	748	742	6	1317	1217	939	801	446	195	753	350
m_{34}	471	455	486	1009	1364	1812	675	417	598	1216	1600	718
m_{35}	478	463	494	786	892	1779	683	425	473	959	1277	587
m_{36}	998	982	976	727	938	519	1173	1139	1110	574	496	673
m_{37}	468	453	467	611	1281	1565	664	493	316	860	1285	409
m_{38}	267	252	267	561	1081	1490	464	338	525	785	1279	302
m_{39}	564	581	614	1172	1471	1975	773	442	938	1370	1763	881
m_{40}	1286	1270	1264	768	1417	726	1461	1427	1168	585	2	961
m_{41}	301	286	317	731	1195	1643	506	248	568	1038	1431	549
m_{42}	625	610	603	386	931	870	801	767	768	464	658	301

Table 7. Trip distances among packing facilities and retailers (KM)

Node	p_1	p_2	p_3	p_4	Node	p_1	p_2	p_3	p_4
m_1	1802	1487	608	13	m_{22}	1757	1371	829	217
m_2	1806	1492	629	18	m_{23}	2470	2155	188	775
m_3	1802	1489	600	30	m_{24}	2325	2010	121	630
m_4	1810	1496	613	22	m_{25}	2129	1814	621	663
m_5	1799	1485	598	15	m_{26}	2293	1978	328	599
m_6	1794	1479	616	6	m_{27}	1499	1184	894	441
m_7	1806	1491	620	18	m_{28}	1403	1360	1397	1033
m_8	1804	1489	606	16	m_{29}	1595	1280	990	537
m_9	1817	1502	616	29	m_{30}	1747	1602	943	804
m_{10}	1799	1485	604	12	m_{31}	651	9	1997	1471
m_{11}	1771	1456	663	55	m_{32}	1221	1076	1377	930
m_{12}	1841	1526	563	56	m_{33}	1394	1217	1201	748
m_{13}	1592	952	1504	892	m_{34}	2127	1812	326	484
m_{14}	1751	1111	1338	727	m_{35}	1804	1489	461	492
m_{15}	1098	458	1656	1130	m_{36}	834	519	1508	982
m_{16}	1915	1432	874	279	m_{37}	1880	1565	628	473
m_{17}	1679	1352	658	147	m_{38}	1805	1490	612	273
m_{18}	1899	1584	462	157	m_{39}	2290	1975	18	595
m_{19}	2038	1724	276	344	m_{40}	655	724	1795	1270
m_{20}	2068	1753	472	335	m_{41}	1958	1643	444	315
m_{21}	1923	1307	1011	416	m_{42}	1185	870	1135	609

Table 8. Transferred red meat among nodes

Node		Vehicle	Period							Node		Vehicle	Period						
			t_1	t_2	t_3	t_4	t_5	t_6	t_7				t_1	t_2	t_3	t_4	t_5	t_6	t_7
c_5	p_1	v_1	817.5	98.75	20					p_2	m_5	v_1		20					
c_5	p_2	v_1	375	375	375	357.5	80	40		p_2	m_6	v_1				20			
p_1	m_1	v_1	15							p_2	m_7	v_2			10				
p_1	m_2	v_1	20							p_2	m_7	v_1				20	20		
p_1	m_3	v_1	40							p_2	m_8	v_2			10				
p_1	m_4	v_1	15							p_2	m_8	v_1	20			20			
p_1	m_5	v_1	16							p_2	m_9	v_2			10				
p_1	m_6	v_1	15	20						p_2	m_9	v_1				20			
p_1	m_7	v_1	15	20						p_2	m_{10}	v_2		5					
p_1	m_9	v_1	20							p_2	m_{11}	v_1	15						
p_1	m_{10}	v_1	20							p_2	m_{12}	v_1		20		20		20	
p_1	m_{12}	v_1	20							p_2	m_{13}	v_2		5					
p_1	m_{17}	v_1	20							p_2	m_{13}	v_1	60	20	40	20			
p_1	m_{18}	v_1	31							p_2	m_{14}	v_1	20						
p_1	m_{19}	v_1	20							p_2	m_{15}	v_1	20		16				
p_1	m_{20}	v_1	20							p_2	m_{16}	v_1	15	20					
p_1	m_{25}	v_1	20							p_2	m_{17}	v_1			20				
p_1	m_{27}	v_1	36							p_2	m_{19}	v_2			10				
p_1	m_{28}	v_2	5							p_2	m_{20}	v_2		5					
p_1	m_{28}	v_1	20							p_2	m_{20}	v_1			20				
p_1	m_{29}	v_1	20							p_2	m_{21}	v_1	20						
p_1	m_{30}	v_2	2							p_2	m_{22}	v_2		5					
p_1	m_{30}	v_1	40							p_2	m_{22}	v_1	20						
p_1	m_{32}	v_1	20	20	20					p_2	m_{23}	v_1	20	20	20	20			
p_1	m_{33}	v_1	15							p_2	m_{24}	v_2				10			
p_1	m_{34}	v_1	20							p_2	m_{24}	v_1	20	20	17				
p_1	m_{36}	v_1	20	15						p_2	m_{25}	v_2			7				
p_1	m_{37}	v_1	35							p_2	m_{26}	v_2		10					
p_1	m_{38}	v_1	20							p_2	m_{26}	v_1	20						
p_1	m_{39}	v_1	15							p_2	m_{27}	v_2				10			
p_1	m_{40}	v_1	40							p_2	m_{27}	v_1		40	20	20			
p_1	m_{41}	v_1	20							p_2	m_{30}	v_1			20				
p_1	m_{42}	v_1	19							p_2	m_{31}	v_1	16	15					
p_2	m_1	v_1		20	20	20		20		p_2	m_{32}	v_1				12			
p_2	m_2	v_2			10					p_2	m_{34}	v_2	5						
p_2	m_2	v_1				20				p_2	m_{35}	v_2				10			
p_2	m_3	v_2		3						p_2	m_{35}	v_1	20	20	20				
p_2	m_3	v_1			20	20	40			p_2	m_{36}	v_2			10				
p_2	m_4	v_2				10				p_2	m_{37}	v_1		20					
p_2	m_4	v_1		20						p_2	m_{41}	v_1		12					
p_2	m_5	v_2				10				p_2	m_{42}	v_2	9						

Table 10. Transferred red meat among nodes (Scenario 2)

Node		Vehicle	Period						
			t_1	t_2	t_3	t_4	t_5	t_6	t_7
c_5	p_1	v_1	476.25	318.75	100				
c_5	p_2	v_1	375	375	375	320	120	60	18.75
p_1	m_3	v_1	22	21	20				
p_1	m_5	v_1		13					
p_1	m_6	v_1	15						
p_1	m_7	v_1	15	15	15				
p_1	m_{10}	v_1	15						
p_1	m_{12}	v_1	15	15					
p_1	m_{18}	v_1	20						
p_1	m_{20}	v_1	15						
p_1	m_{23}	v_1	20						
p_1	m_{24}	v_1	20	20					
p_1	m_{27}	v_1	36	30					
p_1	m_{28}	v_1	12	13					
p_1	m_{30}	v_1	22	20	20				
p_1	m_{32}	v_1	20	20	20				
p_1	m_{33}	v_2	10	5					
p_1	m_{34}	v_1	15						
p_1	m_{35}	v_1	20	20					
p_1	m_{36}	v_1	20	15					
p_1	m_{37}	v_1	14	20					
p_1	m_{40}	v_2		10	10				
p_1	m_{40}	v_1	20						
p_1	m_{41}	v_1	20						
p_1	m_{42}	v_1	15	13					
p_2	m_1	v_1	15	15	15	15	15	15	
p_2	m_1	v_2							5
p_2	m_2	v_2	10	10	10	10	10		
p_2	m_3	v_1				20	20	20	
p_2	m_4	v_2		10	10	10			
p_2	m_4	v_1	15						
p_2	m_5	v_2			10	10			
p_2	m_5	v_1	13						
p_2	m_6	v_2		10	10	10	10		
p_2	m_7	v_2						10	
p_2	m_7	v_1				15	15		
p_2	m_8	v_2	10	10	10	10	10		
p_2	m_9	v_2	10	10	10	10	10		
p_2	m_{10}	v_2		10					
p_2	m_{11}	v_2	10	5		20			
p_2	m_{12}	v_2							10
p_2	m_{12}	v_2			10	10	10	10	
p_2	m_{13}	v_1	50	35	32	28			
p_2	m_{14}	v_2	10	10					
p_2	m_{15}	v_2	10	10	10	6			
p_2	m_{16}	v_2		10	10				
p_2	m_{16}	v_1	15						
p_2	m_{17}	v_2	10	10	10	10			
p_2	m_{18}	v_2		11					
p_2	m_{19}	v_2	10	10	10				

Node		Vehicle	Period						
			t_1	t_2	t_3	t_4	t_5	t_6	t_7
p_2	m_{20}	v_2		10	10	10			
p_2	m_{21}	v_2	10	10					
p_2	m_{22}	v_2		10					
p_2	m_{22}	v_1	15						
p_2	m_{23}	v_1		20	20	20			
p_2	m_{24}	v_2				10			
p_2	m_{24}	v_1			17				
p_2	m_{25}	v_2	10	10	7				
p_2	m_{26}	v_2		10					
p_2	m_{26}	v_1	20						
p_2	m_{27}	v_1			30	30			
p_2	m_{29}	v_2	10	10					
p_2	m_{31}	v_2		10	10				
p_2	m_{31}	v_1	11						
p_2	m_{32}	v_2				12			
p_2	m_{34}	v_2		10					
p_2	m_{35}	v_2				10			
p_2	m_{35}	v_1			20				
p_2	m_{36}	v_2			10				
p_2	m_{37}	v_2			10				
p_2	m_{37}	v_1	11						
p_2	m_{38}	v_2	10	10					
p_2	m_{39}	v_1	15						
p_2	m_{41}	v_1		12					