



AREI



# Institute of Agricultural Resources and Economics

Important **bioeconomy** industry research and **leading field plant breeding institute**

Māra Bleidere

Leading Researcher

Andris Lapans

Remote sensing technologies expert

# History and mission

- More than **100 years** of history
- **AREI scientists** carry out **the selection of field plant varieties**
  - the research of various field plant cultivation **technologies**
  - conduct **research** on the quality of field plants
  - **the development of sustainable rural space**
  - **economic analysis in the agricultural, food production and fishing sectors**
- **AREI** operates in **four locations in Latvia** , which constantly **ensure the transfer of knowledge into practice**

# Long-term experience



13.11. Aprīlis 14. -30-  
 mēsls) 14. Februārī 2012.g.  
 mēslojā = Lilija Saulē 3x an VITO

13.11. Aprīlis 14. -30-  
 mēsls) 14. Februārī 2012.g.  
 mēslojā = Lilija Saulē 3x an VITO

23. Februārī (ceturtdiņa)  
 x Lilijas un Saulē un citas istabas  
 mēslojā an VITO

23. Feb. sāk pūmpuru atdalīšanos!  
 vislabāk

29. Feb. agrāks uz jaļo istabā, vai tie  
 ohi nepļaukst!

2. martā (Piektdiņas vakarā) Mēslojā an VITO

3. martā (sesta) pūmpuru sāka atdalīties  
 no 7. vai 18. III vairojā kāda Saulē ķēdes?

2. III 5 = VITO

1. jūlijs 5. III ķēde (pūmpu) 15 cm  
 2. jūlijs 6. martā  
 sodien vācēt izplaukt  
 an 3. nedēļā

Sociā Aprīļa mēsls 2013.gads  
 Svaigā un dāmi Aprīļa mēsls 2013.gads

1. Aprīlī 2. Būvniecība  
 Karmāts vairojā atā mēsls (17. 16. Aprīlī) (ceturtdiņa)

9. Aprīlī mazajām  
 mēsls an Samp

KREDO NATURA un  
 pēc tam an halpānā

an KREDO NATURA  
 balz. trauju mēsls  
 3 mēsls

saulē. 6. jūlijs m  
 novārdēt ūdeni.

15. IV. APRĪLIS (sv)  
 Lohi pavasarī dūm  
 an dāpās kust sāgās  
 doži dāpās jau mēlā

28. jūlī  
 oviņi ud

No 15. - 16. Aprīlī  
 Bērziņi turināt  
 kontrolē, vācēt

15. jūlijs 7. Aprīlī (sestdiņa)  
 mēsls mājā "Taka"  
 Lohi dāpās vārdēt, pot  
 Nēgalu oīn. Māra sēkls  
 atstāva, atbēva an oīnācu  
 Dāms, šķēlīti an oīnācu  
 un vācēt oīnācu sēkļa

Kad atbēdēt pūpu. -1-  
 1. Aprīlī (Pirmdiņa) vācēt saugā un mēsls Svaigā un dāmi  
 mēsls 2. dāpās

13. Aprīlī (sestdiņa) pūpūnāce pastāvīgā  
 sēkļa mēsls.

2. stāvēj pē METEC  
 stāvējā.  
 (10. jūlija oīnācu)

15. Aprīlī (Pirmdiņa)  
 Lohi po vārdēt. LATVIJAS nācēdān  
 pūpūnāce (Mosaella alba)

Stāvēdāt  
 oīnācu pūpūnāce  
 Svaigā un dāmi  
 mēsls 2. dāpās

11. martā 1 jūds "Saulē"  
 13. - " " 2 " " " " liliā podā 2. kāts (an mazāc pūpūnāce)

15. Martā (ceturtdiņa) nogataviz pūpūnāce  
 "Saulē" kāts man pašai, an  
 4. jūlijs un 2. pūmpūnāce, sēkļa lili  
 dielo podā atbēdēt no sākām, tur varēs kaut  
 ko iestādīt vai iēsēt.

Šogad dāpā, "Saulē" lilijas  
 30. IV uz seju mēlā, un nēgāta ko vāc  
 elevu vai nē? Aug ļoti smukas.

1. Saulē an vārdēt jūlijs un  
 pūmpūnāce 5. jūlija ūd. Ligi vārdēt

6. jūlija milzīgs karmāts un "Saulē"  
 sāka ziedēt daudzās  
 7. jūlija (sesta) an karmāts pēc tam  
 milzīgs ķēdes. Iši plūdi, list  
 no vārdēt pūpūnāce

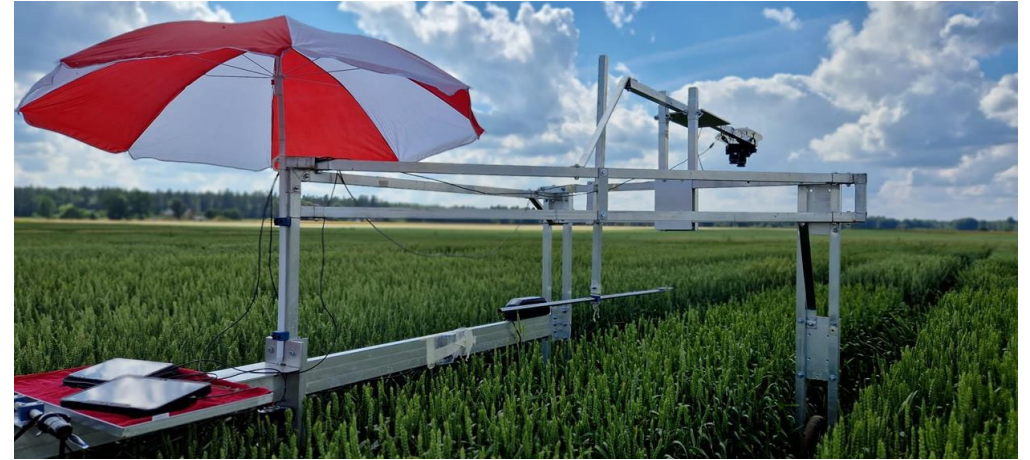
# Current practices

- Modern technologies (e.g. PA)
- Cross border cooperation (projects)
- Conferences and webinars

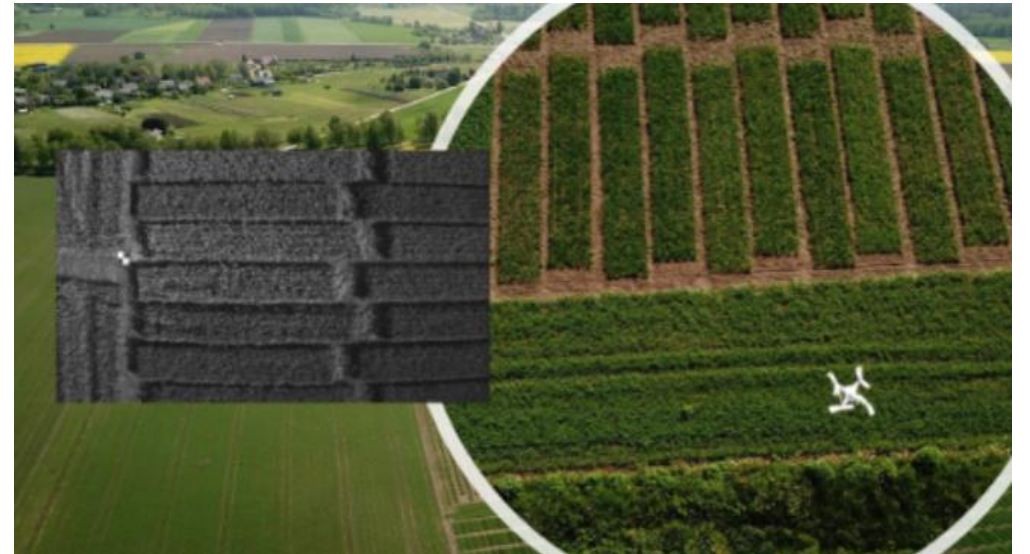


# NOBAL Wheat project

- A three-year project has established stability for US
  - Improved efficiency
  - Enhanced expertise
  - Increased productivity
  - Innovative solutions
  - Stronger collaboration
  - Market competitiveness
  - Strategic insights
- New data collection methods
- Advanced data processing
- Cross border cooperation
- Experienced consultants
- Networking
- ...



Phenomobile vs UAV



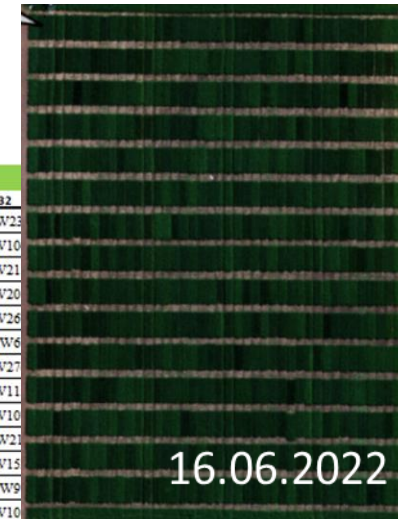
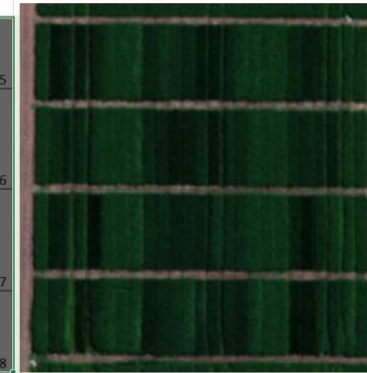
# Data series (3 years x 10 missions) using UAV



# Field design

- NUE trial design for 16 genotypes in 2 N levels
  - Split plot design - field is divided into four main blocks and the application of the two N fertilization levels randomized among those four
- Yield trial design, 300 spring wheat genotypes
  - Randomized blocks design

	N75					N150					N150					N75					
	Randomized					Randomized					Randomized					Randomized					
4	5	12	13	20	21	28	29	36	37	44	45	52	53	60	61	68	69	76	77	84	85
3	6	11	14	19	22	27	30	35	38	43	46	51	54	59	62	67	70	75	78	83	86
2	7	10	15	18	23	26	31	34	39	42	47	50	55	58	63	66	71	74	79	82	87
1	8	9	16	17	24	25	32	33	40	41	48	49	56	57	64	65	72	73	80	81	88



Replication 1; randomized																				Replication 2; randomized												40							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32								
NW244	NW68	NW278	NW171	NW174	NW254	NW151	NW173	NW77	NW228	NW2	NW15	NW66	NW246	NW181	NW232	NW264	NW261	NW300	NW49	NW117	NW60	NW71	NW263	NW181	NW111	NW261	NW209	NW300	NW256	NW13	NW23	NW164							
NW255	NW146	NW263	NW203	NW27	NW104	NW1	NW170	NW201	NW122	NW129	NW163	NW280	NW148	NW190	NW175	NW165	NW35	NW119	NW72	NW86	NW249	NW145	NW69	NW99	NW129	NW34	NW182	NW128	NW19	NW52	NW10	NW162							
NW89	NW109	NW107	NW76	NW248	NW74	NW47	NW120	NW229	NW177	NW231	NW45	NW200	NW86	NW117	NW82	NW98	NW266	NW53	NW196	NW253	NW109	NW264	NW283	NW143	NW108	NW17	NW217	NW147	NW169	NW252	NW21	NW27							
NW283	NW256	NW150	NW299	NW270	NW56	NW84	NW63	NW191	NW222	NW265	NW206	NW37	NW209	NW288	NW32	NW155	NW133	NW154	NW187	NW56	NW185	NW126	NW243	NW209	NW67	NW2	NW64	NW103	NW206	NW132	NW20	NW286							
NW290	NW79	NW157	NW81	NW118	NW115	NW22	NW61	NW12	NW172	NW91	NW142	NW277	NW75	NW260	NW24	NW136	NW88	NW143	NW253	NW231	NW68	NW12	NW110	NW218	NW192	NW237	NW35	NW154	NW31	NW32	NW26	NW47							
NW199	NW213	NW215	NW285	NW14	NW55	NW85	NW25	NW243	NW126	NW292	NW121	NW73	NW30	NW197	NW139	NW102	NW50	NW58	NW252	NW149	NW97	NW73	NW239	NW235	NW171	NW130	NW95	NW184	NW11	NW88	NW6	NW210							
NW226	NW130	NW42	NW116	NW257	NW161	NW43	NW262	NW297	NW245	NW127	NW31	NW29	NW168	NW198	NW268	NW9	NW132	NW279	NW237	NW223	NW40	NW250	NW138	NW189	NW106	NW33	NW89	NW10	NW83	NW96	NW27	NW272							
NW110	NW286	NW131	NW141	NW48	NW269	NW90	NW214	NW21	NW274	NW189	NW233	NW212	NW178	NW144	NW7	NW296	NW225	NW219	NW83	NW93	NW53	NW58	NW279	NW25	NW57	NW196	NW18	NW270	NW240	NW76	NW11	NW259							
NW87	NW4	NW18	NW193	NW8	NW112	NW52	NW294	NW291	NW247	NW69	NW3	NW51	NW6	NW185	NW59	NW11	NW249	NW16	NW34	NW208	NW141	NW166	NW172	NW288	NW133	NW16	NW70	NW247	NW43	NW241	NW10	NW8							
NW239	NW180	NW160	NW40	NW218	NW184	NW295	NW64	NW234	NW65	NW179	NW250	NW156	NW78	NW224	NW135	NW60	NW271	NW211	NW227	NW55	NW29	NW50	NW287	NW20	NW205	NW257	NW297	NW178	NW148	NW230	NW23	NW5							
NW208	NW158	NW275	NW230	NW240	NW183	NW36	NW99	NW13	NW95	NW223	NW152	NW272	NW251	NW166	NW217	NW17	NW19	NW236	NW159	NW163	NW292	NW4	NW105	NW282	NW81	NW41	NW3	NW62	NW298	NW245	NW15	NW285							
NW238	NW241	NW242	NW106	NW96	NW235	NW20	NW134	NW169	NW207	NW186	NW70	NW10	NW128	NW204	NW114	NW5	NW167	NW210	NW289	NW160	NW236	NW61	NW48	NW113	NW212	NW91	NW295	NW134	NW293	NW168	NW9	NW39							
NW80	NW103	NW111	NW221	NW33	NW284	NW205	NW62	NW195	NW94	NW182	NW216	NW93	NW273	NW258	NW140	NW26	NW38	NW41	NW145	NW227	NW204	NW125	NW120	NW280	NW144	NW84	NW268	NW180	NW215	NW200	NW10	NW102							
NW267	NW113	NW105	NW282	NW123	NW101	NW188	NW137	NW124	NW67	NW162	NW276	NW192	NW147	NW71	NW287	NW259	NW108	NW44	NW281	NW72	NW85	NW24	NW244	NW197	NW100	NW284	NW98	NW116	NW38	NW222	NW266	NW114	NW207	NW188	NW37	NW269	NW177	NW51	NW90
NW153	NW149	NW138	NW23	NW202	NW100	NW194	NW57	NW28	NW164	NW92	NW293	NW39	NW125	NW46	NW176	NW298	NW97	NW220	NW54	NW119	NW179	NW78	NW155	NW214	NW202	NW45	NW123	NW198	NW127	NW139	NW290	NW121	NW49	NW296	NW258	NW44	NW26	NW281	NW194

# Proximal phenotyping (growing stages)

- GS21 Beginning of tillering
- GS65 Full flowering
- GS73 Early milk





# UAV Missions

- 0-02-May
- 1-11-May
- 2-23-May
- 3-30-May
- 4-07-Jun
- 5-16-Jun
- 6-26-Jun
- 7-03-Jul
- 8-11-Jul
- 9-20-Jul
- 10-31-Jul



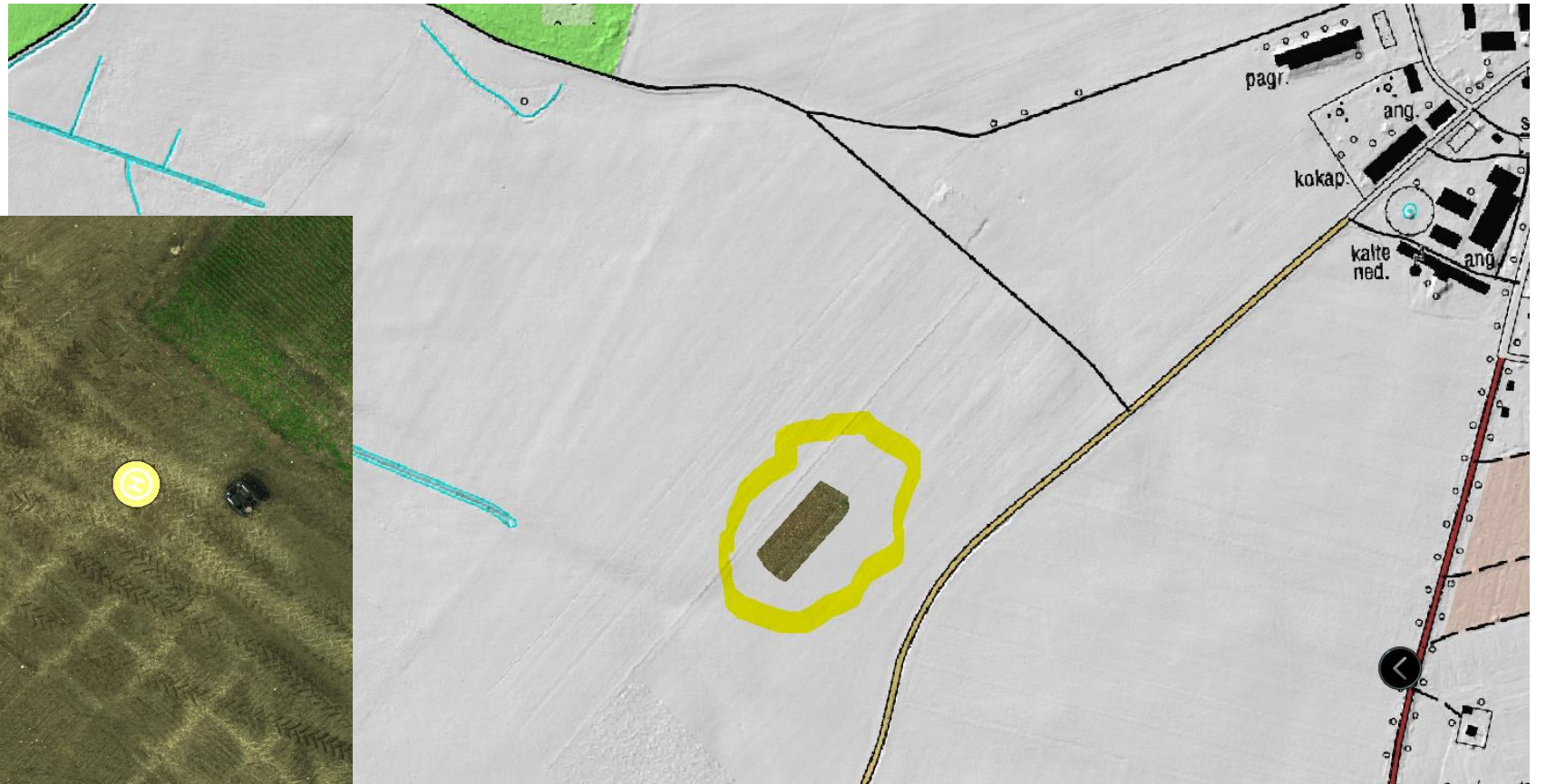
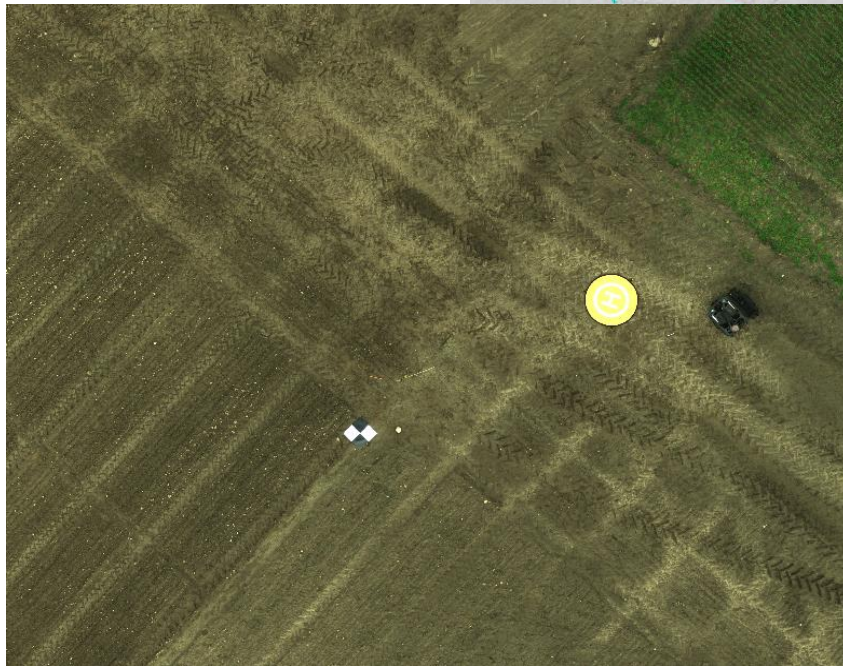
# Technical resources

- Existing
  - DJI Matrice 300
  - Sentera Multispectral
  - Pix4D Mapper
  - QGIS
- Planned
  - LiDAR
  - AI and GIS/Mapping software



# Today's activities

- Barley project
- Weed project



# Plans to go

- Continue with what we learned
- New collaboration
- Improved data integration and analysis
- AI tools



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**Phenotypic Variation and Relationships between Grain Yield, Protein Content and Unmanned Aerial Vehicle-Derived Normalized Difference Vegetation Index in Spring Wheat in Nordic–Baltic Environments**

by Zaiga Jansone <sup>1,2</sup> Zigmars Rendnieks <sup>1</sup> **Andris Lapans** <sup>1</sup> Ilmar Tamm <sup>3</sup> Anne Ingver <sup>3</sup> Andrii Gorash <sup>4</sup> Andrius Aleliunas <sup>4</sup> Gintaras Brazauskas <sup>4</sup> Sahameh Shafiee <sup>5</sup> Tomasz Mróz <sup>5</sup> Morten Lillemo <sup>5</sup> Hannes Kollist <sup>6</sup> and Māra Bleidere <sup>1,\*</sup>

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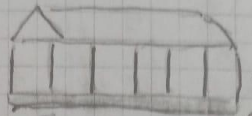
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(This article belongs to the Topic Abiotic Stress Responses in Wheat: Perspectives on Productivity and Sustainability)

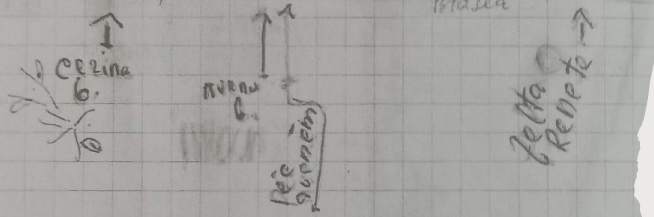
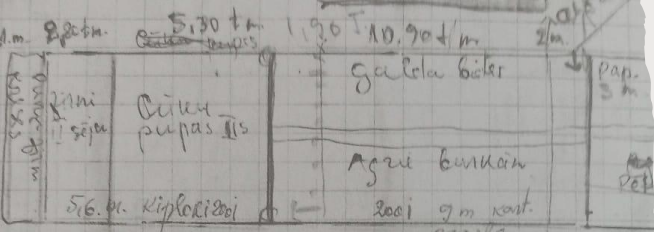
Publication

Dugu sēklas -

Vastava sākums



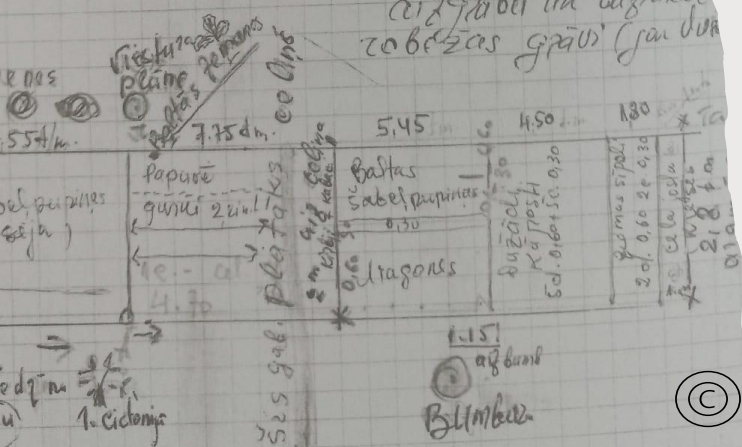
Arenas



- 11 -

gadā

Zemi uzvara 6x, bet 3x visserdīvā  
ar zāģu un ar zāģu  
zobēšanas grāvi (par dūru)



# Questions?

gali)

30 janv. 83 (16) (svētdiena)

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UJJO

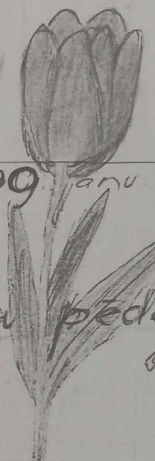
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Kuma krāsa uz 20

a (agrākā)

23 II ?

galgari ziednešē



Out 14 d.  
Nov. 30 d.  
Dec 31 d.  
Jan 25 d.  
11 d.

29 janv. 83 (17) (svētdiena)

uzplauka bēdējie. 8 ziedi

116 X iest,

110-115 dienās uz zudg.

15 VII pag. pl

15 VII uz l.

25 I 83 u 17

25 I 83 u 17



Breeders's remarks were made by Genovefa Timule