Project: TuBAvI-2 (2021-2024)

REPORT ON THE ACTIVITIES OF THE THIRD YEAR

PA UniPG

This report describes the activities performed from May 1, 2023, to March 31, 2023. The activities are described by Action, according to the original programme.

Action 1 – Phenotypical characterisation of autochthonous breeds and species

The action 1 activities were carried out in previous years, the respective data are published in the second annual report year of the project. The Ancona, Livorno (Bianca, Nera, Dorata and Argentata) and Robusta Maculata breeds are currently preserved at the poultry center of the University of Perugia. As in previous years, the best subjects for each breed have been selected and therefore each breed is organized into two families with approximately 10-13 female and 3 male subjects. To avoid inbreeding problems, each subject is individually marked with a chip. Through the use of a reader, the chip reports all the information regarding the relationship.

Task 2 Characterisation of the adaptation to low-input breeding systems and evaluation of the performances of the native breeds

The evaluation of the adaptability to extensive farming systems characterized by low-input farming (use of local raw materials, moderate energy and protein intake) and "natural" environmental parameters (temperature, humidity and light) was completed, in particular, the ability to adapt to conditions of high temperatures (heat-stress) typical of the summer season has been evaluated.

Task 3 Behavioral Characterisation

Task 3.1 Behavioural characterisation of the Leghorn breed

The trial for the characterization of the Leghorn breed (described in the 1st report) started in June 2022 was completed. In particular, the trial produced a total of 12 h of outdoor recording and 12h of indoor recording using the software Noldus XT.

Task 3.2 Behavioural characterisation of the Ancona breed
The study protocol of the following test, as for the previous one, was submitted and accepted by the University Committee of Bioethics (prot n.76527 of 3/3/2022). The trial involves the use of 54 hens

and 6 males of Ancona, the housing occurred the first week of June 2024 at 14 weeks of age. The animals were divided into two experimental groups:

I Group reared indoors: the animals were housed in 3 boxes without outdoor access with a density of 10 animals/m². In each box 9 females and 1 male were housed for a total of 27 females and 3 males. This experimental group act as the control group.

II Group with outdoor access: the breeding area is characterised by the presence of three outdoor parks each with a shelter for the animals in which the following densities was used: external 10 m²/head, internal 10 animals/m², inside each shelter will be placed 2 feeders and 2 drinking troughs. In each pen 9 females and 1 male were housed for a total of 27 females and 3 males.

The experimental test for the characterization of the Ancona breed has been completed. In particular, the behavioral trial was carried out during the months of June and July 2023, during the recordings the minimum and maximum temperatures of the day were noted. The test, as for the previous breed, produced a total of 12 hours of outdoor recording and 12 hours of indoor recording carried out using the Noldus XT software. The test was carried out using the same devices, structures and methods used for the characterization of the Leghorn breed. For this reason, individual devices (bibs) were applied to the individual animals, each outdoor areas and internal boxes had UWB Anchors positioned at the antipodes, 1 UWB Tag positioned in the centre, 1 UWB Gateway, 1 computer to collect the raw files and 10 chips placed on the bibs (Figure 1). The software was able to produce a raw report for each animal with a precise recording of the behavior every 2 seconds, detecting its spatial position within the four quadrants of the area and the Cartesian axis (x, y, z), indicating the peck and the distance covered (Figure 2).

Action 2 – Evaluation and identification of genetic resistance traits to diseases in farmed animals.

Task 4: Genetic characterisation of native chicken breeds through the study of polymorphisms in candidate genes involved in heat stress response

Task 4.1 It was completed in the previous year. The results obtained will be taken into consideration to plan future matings.

Task 4.2 DNA extraction is ongoing for new biological samples taken at the experimental section of UNIPG. In the coming months all the samples of the final dataset for the genotyping of *HSP* will be sent.

Action 3 – Verification of data consistency

Task 5. Verification of consistency of data and information

Objective 5 datasets have been prepared and are being compiled, validated and available in previous reports.

The data related to the Tasks 1.3 and 4 are under study.

Action 10 – Dissemination and preparation of thematic technical reports and technical-scientific reports

Task 6. Data processing, dissemination, and reporting

Task 6.1 the collected data was processed to produce intermediate reports etc.

Task 6.2 All data collected are disseminated in conferences and meetings of the poultry sector. For this purpose, two abstracts were accepted at the 25th Congress ASPA - Bari 13-16 June 2023 as oral presentation:

- Assessing the motivation of Leghorn hens to access outdoor space and pasture resources.
  Diletta Chiattelli, Marco Birolo, Alice Cartoni Mancinelli, Laura Menchetti, Cesare Castellini
- Preliminary validation of Ultra-Wide Band device as an innovative tool to assess chicken behaviour.
  Alice Cartoni Mancinelli, Diletta Chiattelli, Laura Menchetti, Gianmaria Bernacchia, Cesare Castellini

The project was also presented as part of the International Congress of the International Society of Animal Genetics (ISAG) held in Cape Town (South Africa) from 2nd to 7th of July 2023:

- The TuBaVi project: an example of biodiversity management in Italian local chicken breeds.
  Dominga Soglia, Francesco Perini, Nadia Stoppani, Achille Schiavone, Emiliano Lasagna

Task 6.3 all the data collected in task 5 will be processed with the aim of obtaining a manual including all the parameters characterizing the native Italian breeds Ancona and Leghorn.

References:

- Mancinelli, A. C., Chiattelli, D., Bernacchia, G., Nicconi, C., Torroni, J., Castellini, C., & Roselli, L. (2022, November). Assessment of Ultra-Wide Band device for monitoring chicken behaviour reared free-range. In *2022 IEEE Workshop on Metrology for Agriculture and Forestry (MetroAgriFor)* (pp. 91-93). IEEE.
- Lantinga, E. A., Neuteboom, J. H., & Meijs, J. A. C. (2004). Sward methods. Herbage intake handbook, 2, 23-52.

FIGURES AND TABLES
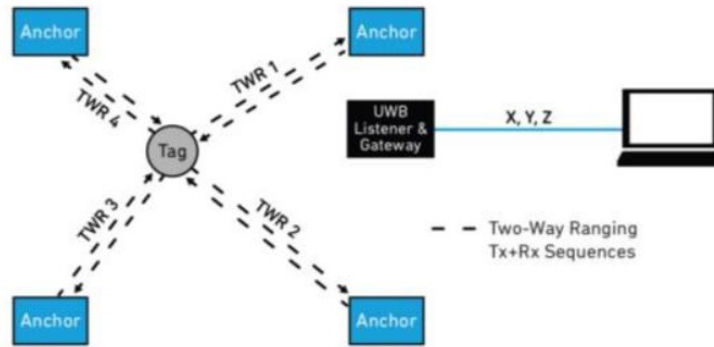
Figure 1. Operating principle of the system

Figure 2. Summary screen of software

ts	x	y	z	time	year	month	day	hour	min	s	check_beccata	distance	quadrante	Q1	Q2	Q3	Q4
0	38.837.488	19.188.728	0.60665834	16.624.494.607.988.700	2023	7	6	9	31	0	0	0.0	1	1	0	0	0
2	40.105.076	16.847.916	0.59732258	16.624.494.625.783.100	2023	7	6	9	31	2	0	0.2661988008441813	1	1	0	0	0
4	41.434.283	13.657.991	0.57025146	1.662.449.464.577.040	2023	7	6	9	31	4	0	0.34557796160163323	1	1	0	0	0
6	41.789.656	10.812.017	0.5456146	16.624.494.666.215.800	2023	7	6	9	31	6	1	0.2868075657615224	1	1	0	0	0
8	41.693.969	0.81450135	0.37376359	16.624.494.685.802.800	2023	7	6	9	31	8	1	0.26687194815081733	1	1	0	0	0
10	41.448.641	0.64917308	0.2636528	16.624.494.705.802.800	2023	7	6	9	31	10	1	0.0	1	1	0	0	0
12	412.728	0.58154219	0.21297792	16.624.494.725.782.900	2023	7	6	9	31	12	1	0.0	1	1	0	0	0
14	41.190.572	0.52898234	0.17358962	16.624.494.746.182.700	2023	7	6	9	31	14	1	0.0	1	1	0	0	0
16	41.278.667	0.39202034	0.077555507	16.624.494.765.782.800	2023	7	6	9	31	16	1	0.0	1	1	0	0	0
18	41.958.408	0.44858956	0.22356136	1.662.449.478.618.300	2023	7	6	9	31	18	1	0.0	1	1	0	0	0
20	43.117.023	0.43759146	0.23172821	16.624.494.805.782.700	2023	7	6	9	31	20	1	0.0	1	1	0	0	0
22	44.302.506	0.39112252	0.21477878	1.662.449.482.632.290	2023	7	6	9	31	22	1	0.0	1	1	0	0	0
24	44.999.809	0.41706851	0.18404558	16.624.494.846.302.700	2023	7	6	9	31	24	1	0.0	1	1	0	0	0
26	45.211.592	0.531948	0.32528543	16.624.494.865.782.800	2023	7	6	9	31	26	1	0.0	1	1	0	0	0
28	46.462.307	0.53636426	0.38650748	16.624.494.885.782.700	2023	7	6	9	31	28	1	0.0	1	1	0	0	0
30	4.736.237	0.56831437	0.35368973	1.662.449.490.576.290	2023	7	6	9	31	30	1	0.0	1	1	0	0	0
32	49.163.442	0.52493954	0.31791022	16.624.494.925.782.700	2023	7	6	9	31	32	1	0.18525652314930494	1	1	0	0	0
34	50.427.766	0.52194512	0.307893	16.624.494.945.802.600	2023	7	6	9	31	34	1	0.0	2	0	1	0	0
36	52.059.374	0.54118228	0.35982922	16.624.494.965.808.900	2023	7	6	9	31	36	1	0.0	2	0	1	0	0
38	53.305.869	0.50882596	0.38790673	16.624.449.986.208.600	2023	7	6	9	31	38	1	0.0	2	0	1	0	0
40	53.845.196	0.44718862	0.29295465	1.662.449.500.576.860	2023	7	6	9	31	40	1	0.0	2	0	1	0	0
42	5.458.921	0.42521772	0.32342219	16.624.495.026.208.600	2023	7	6	9	31	42	1	0.0	2	0	1	0	0
44	55.540.156	0.42185357	0.42871833	16.624.495.046.212.000	2023	7	6	9	31	44	0	0.0	2	0	1	0	0
46	56.253.414	0.51391745	0.55346286	16.624.495.065.771.800	2023	7	6	9	31	46	1	0.0	2	0	1	0	0
48	56.782.613	0.51788521	0.56361091	16.624.495.086.196.600	2023	7	6	9	31	48	1	0.0	2	0	1	0	0
50	56.863.647	0.51612765	0.60695869	16.624.495.106.196.100	2023	7	6	9	31	50	1	0.0	2	0	1	0	0