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Poultry farming solutions for a sustainable development of marshlands areas of South Iraq

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Abstract. The Department of Agricultural, Food and Forestry Systems of University of Florence carried out cooperation projects in the South Iraq, funded by Italian Ministry of Foreign Affairs and International Cooperation, focused on the development of rural areas. All the proposed interventions were designed taking into account some key points, such as the development of sustainable farming systems, the protection of the environment, the empowerment of women role. Among the main activities, a particular importance is given to the simple solutions for poultry breeding that represents an important economic resource for many farmers and a source of food for a large segment of the population. Therefore the main aim of the project was to define new building solutions to apply in the area of marshlands. A mobile poultry shelter was designed and built to meet the demand for meat and eggs from a typical rural family. This shelter was designed to be used for extensive breeding, with animals free to graze outside during the day. A suitable self-building methodology was applied to obtain results from farmers without specific skills for wood construction thanks to which they learn the appropriate way to build poultry shelters. As conclusion, poultry breeding can be spread in the area of marshlands using the simple self-building structures presented in the study.

Key words: marshlands, poultry shelter, rural development, self-building.

INTRODUCTION

According to the statistics section of the Food and Agriculture Organization of United Nations (FAOstat, 2013), Iraq produced 85,630 Mt of chicken in 2013, with a great increase from 2009 (33,000 Mt). Total poultry meat consumption reached 770,000 Mt in 2013, giving an average annual per capita consumption of 24 kg (USDA, 2013). The Iraqi farmers in South of Iraq, whose main occupation may be the palm dates production or the animal husbandry such as buffalos breeding, keep few local breed chickens near their premises to be consumed by the family or to be sold at the market. The local poultry breed, whose origin is difficult to trace, appears to be extremely rustic and adapted, still with a fair attitude for meat production but less for laying eggs. This kind of chicken is really appreciated on the local market and generally fetches a higher price against selected breed or imported frozen chicken. Chickens are usually sold alive in the market and slaughtered upon request of the buyer or directly from the consumer. However the presence on the market of the chickens is scarce as these animals trickle

from the farms, from individual sellers and a few dealers. This trend confirms that poultry breeding is an important economic resource for many farmers and a source of food for a large segment of the population. However rural population does not have sufficient skills to create optimal breeding conditions. Furthermore the lack of specific facilities produces difficulties in the poultry farming. In order to solve this problem, the research focused on solution 'farm-made' for breeding structures.

The mobile poultry shelter was designed respecting the self-building criteria. For that reason the shelter can be built directly by the farmer in the place of utilization or, as it is made up of independent components easily transportable, built in a simple carpentry workshop and assembled on site by the farmer using simple tools. This solution is suitable for poultry breeding located in marshlands area with high concentration of rural families. Beneficiaries can be single families or small groups of them. In particular the women, which are traditionally dedicated to poultry breeding within the family, can benefit from the spreading of the solution proposed during the research.

MATERIALS AND METHODS

The mobile poultry shelter was designed first and foremost taking into account the needs of outdoor poultry farming and the choice of building materials suitable and available in the intervention area. Afterwards a logical workflow was identified, sufficiently simple to be understood from farmers or people without specific skills in construction, in order to obtain a self-construction of the shelter.

Chickens quickly destroy the turf adjacent to their house, and over time the damage of the ground can prosecute for some distance in all directions, leading to a yard that is alternately muddy and dusty. The concentration of manure in this area also leads to a build-up of manure-borne pathogens and health problems can occur (mainly coccidiosis and roundworms). The method chosen to deal with this problem has a profound effect on the housing design. With portable houses, the chickens are moved to a new spot before the damage becomes too great (Plamondon, 2003).

A simple and proper management of animal health requires the rotation of the areas over which the breeding is carried out. For this reason, poultry shelters have to be movable with simple means available in the farms, and, therefore, the shelters must be very light. It is important to guarantee a free access to an open-air area, mainly covered with vegetation and provided with protective fences. Rearing systems, with animals kept in a free-range environment or with outdoor access, are perceived as natural, environmentally friendly and animal welfare friendly (Husak et al., 2008).

Free movement systems are fundamental in the marshlands area in order to respect environment and allow rural people to develop sustainable agriculture. This feature determines the choice of the building materials, mainly based on solid wood, steel, aluminium, synthetic materials.

For the realization of the shelter timber of small size and low quality, like building lumber, was selected and used. Besides, the solid wood has, in general, some crucial advantages. Under the same load-bearing capacity, the energy required to produce a massive wooden structure is far less than that required by other materials. Indeed, the wood is a natural storage of solar energy. Furthermore, the construction of the shelters requires extremely simple and economic tools and equipment, and easy and quick learning techniques.

In the assessment of the size of the shelter, the rules of organic production in compliance of EC Regulation 1804/99 and the EC Regulations 834/2007 and 889/2008 were considered (Table 1).

Table 1. EC Regulation 1804/99 – Minimum surface areas indoors and outdoors, and other characteristics of housing in the different species and types of production

	Indoors area (net available to animals)			Outdoors area (m^2 of area available in rotation/head)
	Nº animals m^{-2}	Perch/head (cm)	Nest	
Laying hens	6	18	7 laying hens/nest or 120 cm^2/bird (common nest)	4 (if limit 170 kg N ha^{-1} per year not exceeded)
Fattening poultry in fixed housing	10, with maximum of 21 kg live weight m^{-2}	20 (guinea fowls only)		4 broilers and guinea fowls 4,5 ducks – 10 turkeys 15 geese (if limit 170 kg N ha^{-1} per year not exceeded)
Fattening poultry in mobile housing	16(1), in mobile poultry houses with a maximum of 30 kg live weight m^{-2}			2,5 (if limit 170 kg N ha^{-1} per year not exceeded)

(1) Only in the case of mobile houses not exceeding 150 m^2 floor space.

The designed shelter has an internal useful surface of about 8 m^2. The installations can be fitted with perches for a total length of 24 m, and can be equipped with 8 individual nests. The capacity of the shelter in compliance of EC Regulation 1804/99 can be summarized in the following way:

- Laying hens: 6 heads m^{-2} x 8 m^2 = 48 heads; perches required 48 x 0.18 = 8.64 m
- Broilers (fixed shelter): 10 heads m^{-2} x 8 m^2 = 80 heads
- Broilers (mobile shelter): 16 heads m^{-2} x 8 m^2 = 128 heads.

In Fig. 1 the exploded isometric drawing of the shelter shows 8 main frames: base and roof (Frame01 and SC01), 6 external surfaces (Frame02, Frame03a, Frame03b). The figure shows also the four nets (Nest01).

Fig. 2 shows the drawing tables of the base of the shelter (Frame01). In the corners of the base steel braces (R01) that allow to move the shelter are installed.

Fig. 3 shows the drawing tables for lateral frame. It is important to stress the concept of workflow. In fact, thanks to the execution of individual actions such as cutting, drilling, and assembling, it is possible to build all the frames. Each construction procedure is not arbitrary of the farmer, but is a part of specific sequences which as a whole give rise to the workflow.

The supporting structure is completely braced on all 6 external surfaces, so that it can be stressed by even asymmetric actions without deforming. The main structure consists of flat frames incapable of being deformed, which are assembled together using only screws or nails. All frames of components have been designed with such weight and dimensions that they can be easily handled by two persons and transported by means of limited capacity. Assembling the shelter requires simple wood workshop equipment,

but it is not possible to leave out all relevant safety measures, including the use of personal protective equipment.

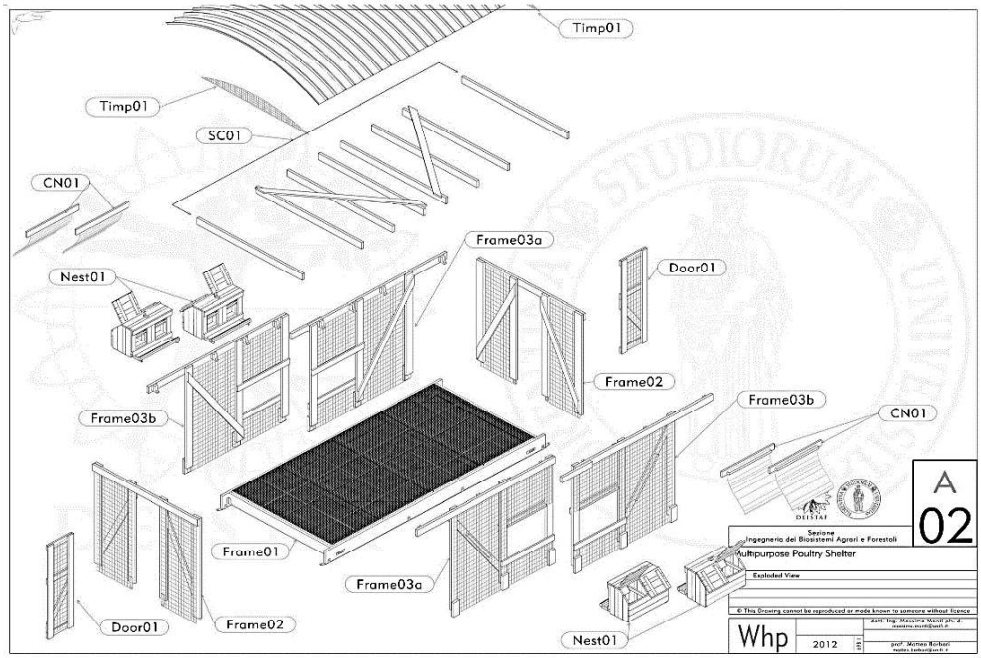

Figure 1. Technical drawing showing the assembly of frames.

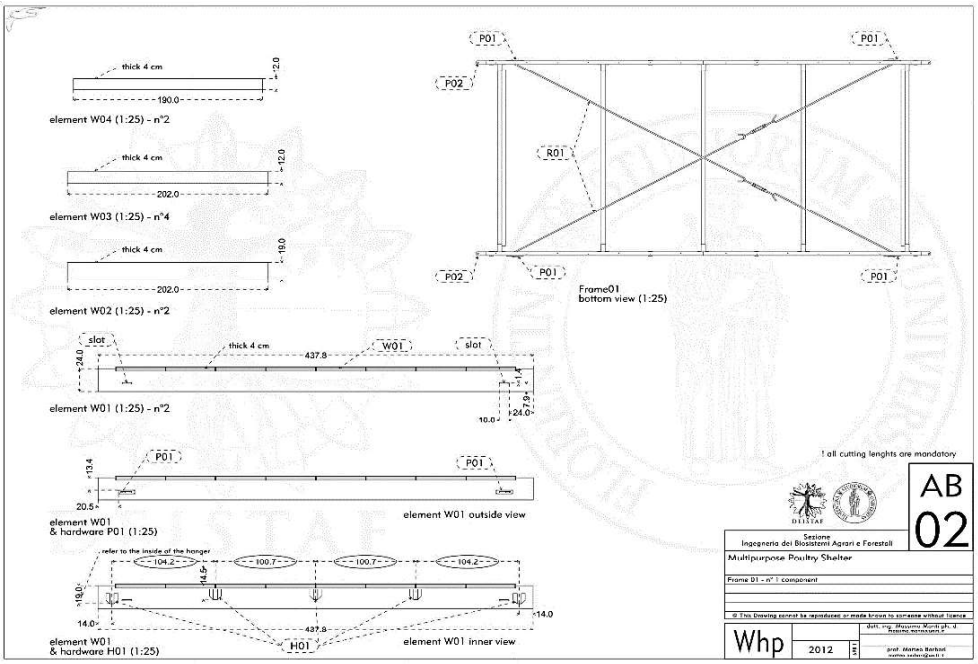

Figure 2. Technical drawing table for Frame01.

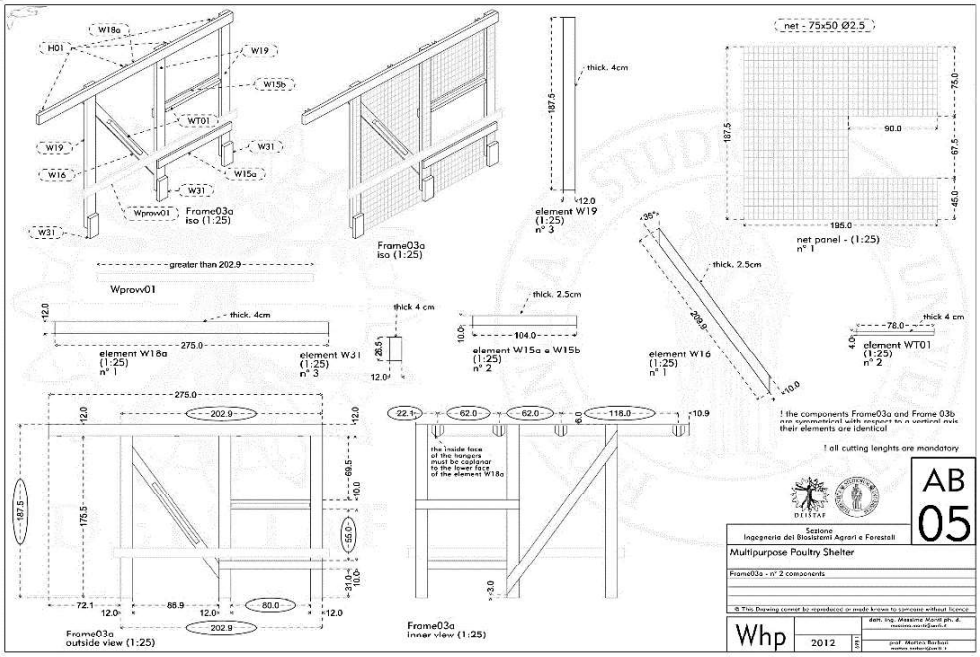

Figure 3. Technical drawing table for Frame03a.

Concerning the tools, the following ones are necessary: pliers, screwdriver, bolt cutters, wire cutters, carpenters tools, power tool and table saw. Depending of raw material wood and iron, some equipment, such as welding machine or friction sawing machine, has to be added.

Fir boards from raw carpentry (sub-measures) prismatic, nominal thickness 25 mm, length 4 m, width 100 mm, nominal thickness 40 mm, lengths 4 m and 5 m, width 240 mm or 250 mm are the main wood supply. The positioning of the metallic cylindrical shank connectors, screws or nails, has complied with certain rules dictated by current legislation, in particular from Eurocode 5: Design of timber structures – General Common Rules and Rules for Buildings (EN 1995-1-1, 2004)

Floors, other surfaces, fittings and equipment must be designed, constructed and maintained so as to minimise the risk of injury and disease, and to adequately support the birds (PIMC, 2002). In order to maintain a good state of health and to guarantee a more practical management, the shelter floor has been designed with plastic slats specific for poultry farming with 1 m^2 of size each, but it is possible substitute plastic slats, if not available, with wood slats. More important criteria to be respected concern the flooring of the shelter, which has to be rested on the frame of the base, in order to avoid a direct contact between shelter flooring and the ground.

RESULTS AND DISCUSSION

The concept of self-building has been applied during two pilot interventions carried out by Department GESAAF during two cooperation projects in the south of Iraq: 'Training program for sustainable management of the Dhi Qar Marshlands' and 'Rational management of water resources for agricultural development of rural areas in

South Iraq', funded by Italian Ministry of Foreign Affairs and International Cooperation (years 2012–2014). The specific activity presented in this study was executed in 2013.

For these pilot interventions Iraqi trainees with different educational levels were selected: farmers, technicians and students.

Workflow was applied during training carried out in the cooperation projects with the support of Italian tutor that instructed trainees to the correct procedures of work. At the end of the training the poultry shelter was built and all trainees were able to repeat with success the activities of the project building new shelters. In Fig. 4 a brief photo report shows some phases of the training related to the pilot intervention near Nasiriya.

Figure 4. Phases of construction with Iraqi trainees during pilot intervention in the project: 'Rational management of water resources for agricultural development of rural areas in South Iraq'.

After the training the capacity for two Iraqi trainees to rebuild the shelter without the Italian tutor was tested. The two Iraqi trainees, following the workflow learned during the training and using the same wood workshop of the courses, were able to replicate the shelter approximately in 8 working days. In the Table 2 the results of the building time are reported.

This test confirmed that trainees have gained technical knowledge and expertise to self-building the shelter.

One of the shelters built in Iraq was donated to a women's NGO located in the marshlands. Thanks to this facility the NGO started the production of broilers. According to the interviews conducted during an inspection in 2015 (Fig. 5), the NGO manager confirmed that with the new shelter an improvement in farm management was obtained, increasing the income due to selling alive broilers in the local market.

Table 2. Times of execution phases

Phases	Hours
Lumber selection and workshop organization	1
Cutting wood boards, thickness 40 mm	6
Cutting wood boards, thickness 25 mm	4
Cutting wood boards, thickness 40 mm	4
Preparation 6 wood boards with brackets	2
Assembly 4 lateral frame with net	4
Assembly 2 frontal frame with net	2
Assembly 2 roof frame with net	3
Assembly 2 door frame with net	1
Preparation iron sleigh	3
Welding	1
Cutting wood boards for nest	5
Assembly nest	3
Assembly base	2
Final assembly	2
Treatment with linseed oil	4
Total	47

Figure 5. Poultry shelter donated to Iraqi NGO.

CONCLUSIONS

The present work demonstrated that farmers can build the poultry shelter directly within their farm, also because specific skills are not requested. However, in order to reach this result it is important to follow correct procedures that in our research were inside a workflow resumed in tables of drawings and specific actions.

This approach conducts to several benefits, for example allows to focus on individual parts of the work restricting mistakes and waste of time. Furthermore, with

this methodology, the farmer familiarizes immediately with the processes that bring to the construction of the shelter.

As conclusion, the construction of poultry shelters could be spread in the villages of Iraqi marshlands bringing advantages in agricultural sector, favouring a sustainable development with benefits also from the social point of view.

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