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A Socio-economic Approach to Agricultural Drying Activities in the Ghardaïa Region of the Sahara

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Abstract

This study aims to analyse the socio-economic profile of agri-food producers and dryers in the Ghardaïa region of the Sahara, where agriculture is a fundamental pillar of rural livelihoods. Although agricultural drying is a relatively modest source of income and employment, it plays a significant role for smallholders and marginalised farmers, particularly among the most economically disadvantaged in the population. A stratified random sampling method was adopted to select producer-dryers from different areas of the region. Primary data were collected using structured interviews and pre-tested questionnaires administered during individual interviews. A total of 240 producer-dryers were surveyed in the study area. Statistical analysis of the data reveals that the majority of producer-dryers are women (76.7%), elderly (52.5%) and illiterate (63.4%). Around 64.1% have a farm of less than two hectares, and 61.6% are considered small farmers, cultivating less than one acre of farmland. Most respondents are engaged in subsistence farming, a field in which many have over 15 years' experience.

Keywords: Agricultural drying sector; Saharan agro-ecological zones; Local and cross-border trade dynamics; Subsistence farming; Socio-economic profile.

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1. Introduction

Agriculture remains the backbone of the Algerian economy, with almost 60% of the population relying on it for their livelihood. Of the various agricultural and related activities, livestock farming is particularly important in rural areas (Amrani, 2004). It provides small and marginal farmers with a continuous source of income, employment, nutrition, and draught power. Livestock plays a particularly important role in the mixed farming systems that dominate much of rural Algeria (Benmihoub, 2015). Algeria has one of the largest agricultural territories in the world. It covers a wide variety of areas, including mountains, plains and fallow land, as well as areas dedicated to breeding cattle, buffalo, sheep and goats. According to the 2023 General Census of Agriculture (RGA), the country's agricultural land is structured in a particularly diverse way, including herbaceous crops, fallow land, fruit plantations, vineyards and natural grasslands. The south of the country is oriented towards Saharan and pastoral agriculture, with date and olive cultivation predominant, while the north is characterised by cereals, market gardening and citrus fruits (MADR, 2002 ; MADR, 2008).

Provided it is better leveraged, agricultural drying can offer significant employment opportunities and be a key source of income for rural populations (Bendjelid et al., 2004). In the Ghardaïa region, for example, it plays a crucial role in the rural economy, particularly for smallholder farmers and landless workers. Thanks to its adaptability to diverse agro-climatic conditions, relatively low investment requirements and rapid returns, it has become a sustainable source of income in this Saharan region (Adair et al., 2022). Drying practices play a fundamental role in the Algerian rural economy. They contribute to subsistence and food security and generate additional income for thousands of smallholder and marginalised farmers. Of the various techniques, open-air drying (also known as traditional drying) is notable for its low capital requirements, ease of execution, short processing time, and adaptability to a wide range of agro-climatic conditions (Bensaha et al., 2024).

The Saharan region of Ghardaïa, with its variety of agroclimatic zones, is one of the most important areas for Saharan agriculture in Algeria. Some areas of the region have become major centres for drying practices. The rural economy of the region relies heavily on agriculture and related activities. Goat farming is a key source of income, particularly for landless workers and marginal farmers. This sector supports rural households by providing them with a regular income through market gardening, date production and manure use (Cote, 2002).

The agricultural drying sector accounts for 5.63% of the Algerian government's gross value added, and 43.70% of the gross value added by the agricultural sector and related activities. Drying processes are often referred to as 'the poor's work' and are primarily associated with impoverished, landless or marginalised farmers. Drying fruits, vegetables and meat is one of the most profitable agricultural

activities in Saharan regions, providing many smallholder farmers and precarious agricultural workers with income, employment and food security. According to the 20th General Census of Agriculture (RGA), solar drying is particularly prevalent among small farms, especially for drying figs, tomatoes, and chilli peppers. In Ghardaïa, for instance, drying agricultural produce, particularly using solar power, is a common method of preserving fruit, vegetables, spices, and other produce. Therefore, this study focused on the drying practices of rural populations in this Saharan region. Understanding the socioeconomic profile of producers engaged in drying is essential for designing targeted interventions and policies that can improve productivity, sustainability, and livelihood security (Bensaha, 2022).

Socioeconomic factors such as level of education, farm size, drying methods used, income level and access to credit can have a significant influence on management practices and the profitability of agricultural drying. Despite the economic importance of this activity in the Ghardaïa region, there is limited empirical data available on the living conditions of producers involved in drying (Bensaha et al., 2020). This study aims to address this knowledge gap by analysing the socio-economic characteristics of producers in this Saharan region. The focus is on the demographic profile, resource availability and income structure of these producers, as well as the constraints and challenges they face in carrying out their activities. The results of this research will provide evidence-based policy recommendations to improve the socio-economic situation of agricultural drying producers in rural areas and promote the sustainable development of the agricultural drying sector in the Ghardaïa region.

2. Material and methods

This study was conducted in the Ghardaïa region, located 600 km south of the capital. It is a rural area with a Saharan climate, where agriculture and related activities constitute the main source of income for the majority of the population. This region is characterized by arid agriculture, red loamy soils, and a semi-arid climate, which are suitable for the breeding of small ruminants, particularly goats, as well as market gardening.

The survey was conducted through individual interviews. A proportional stratified random sampling procedure was adopted for data collection and analysis (Olivier de sardan, 2001). Data were collected from 240 producer-dryers using a pre-tested questionnaire. The interview guide was pre-tested with 15 producers from an area not included in the sample to ensure the questions were clear, relevant and consistent. Following this, minor adjustments were made to improve the instrument's fluidity and comprehensiveness.

The collected data was analysed statistically. The primary data collection was carried out through face-to-face interviews conducted by the researcher and trained field assistants. Each interview lasted

approximately 45 to 60 minutes and was conducted at the respondent's home or farmstead. Data collection was carried out during early mornings and late evenings to ensure that respondents were available and not engaged in farm or wage labour activities (Bousbia et al., 2024).

Age: This is the respondent's age, expressed in completed years, at the time of the interview. Age is a determining factor that influences the availability of labour, the experience of producer-dryers and their willingness to adopt modern technologies.

Sex: It refers to the gender of the respondent who takes care of the goats. The respondents were categorized into male and female. Gender distribution in goat farming often reflects broader socio-cultural patterns in rural.

Education: This refers to the highest level of formal education successfully completed by the respondent, whether through school or university. Educational attainment plays a key role in raising awareness and improving the effectiveness of management and the adoption of scientific practices in agricultural drying.

Occupation of the respondent: This is the occupation that the respondent was engaged in in order to support themselves at the time of the survey. This variable indicates whether the farmer relies primarily or partially on their production for income. It also provides information on labour availability, risk diversification and income-generating potential. In rural areas of Algeria, particularly in regions such as Ghardaïa, drying is often practised alongside farming, wage labour, or other subsistence activities. This activity is defined as follows:

Primary occupation: This is the occupation from which more than 50% of the respondent's family income is generated. This enables us to identify the main source of income for the household and gain a better understanding of economic dependence, professional priorities and financial stability.

Secondary occupation: This is a profession that is practised alongside the main activity, providing an additional source of income for the respondent's household. This secondary activity enables us to evaluate the economic diversification of households, which is often crucial for enhancing their resilience in the face of economic or climatic hazards.

Farm size: This is the total quantity of dried products that the respondent's household produced at the time of the interview. Farm size is a key indicator of the scale and intensity of drying activities. It reflects the producer's economic situation, their capacity to invest, the availability of land and labour, and their dependence on the crop as a source of livelihood.

Experience in agricultural drying: This is the total number of years of direct experience that the respondent had in agricultural drying at the time of the interview. This experience is crucial for developing management practices, improving productivity and ensuring the sustainability of farms. It also reflects farmers' traditional knowledge, practical skills and adaptability in management.

3. Results and discussion

Gender

The result revealed that majority women (76.7 %) are engaged in goat farming than men (23.3%), Since men are involved other agriculture related practices. This finding is in line with Mosher (2017), Bensaha et al., (2019) reported that rural women played an important and substantial role in goat farming.

Age

The majority of drying producers (52.5%) are in the over-50 age group, while those in the 31–50 age group represent 38.8%, and those in the under-30 age group represent 8.7%. This distribution can be explained by the low involvement of the younger generation in drying practices. This finding is consistent with previous observations, which report that the majority of agricultural producers are in the older age groups (Bensaha et al., 2015).

Education

Literacy is one of the important factors which accelerates development and progress of any enterprise. The results revealed that 63.4 per cent were illiterate, whereas only 22.9 per cent of goat farmers were educated up to the secondary level. It also showed that 10.8 per cent of the goat farmers educated up to primary level and meagre numbers of graduates were involved in goat farming (2.9 %). The present finding is in agreement with the findings of Bensaha et al., (2019), Rouabhi et al., (2016).

Primary occupation

Agricultural drying is the main occupation for 73.3% of respondents, with agriculture and related activities coming in second place at 26.7%. These results are consistent with those of Ref., who also found that agricultural drying is not only the main activity, but also an important source of income — and for some farmers, a supplementary one (Bensaha et al., 2016).

Landholding

According to their landholding capacity, the majority of dry producers were smallholders (61.6%), followed by medium-sized farmers (26.7%), landless farmers (9.2%) and, lastly, large-scale farmers (2.5%). These results contrast with those of Bensaha et al., 2017, who found that the majority of dry producers in the north of the country (87.9%) and the steppe region (86%) were landless agricultural workers.

Farm size

In Algeria, the quantity of agricultural produce intended for drying varies significantly depending on the size of the farm and the capacity of the producer. The results of the survey showed that the majority of respondents (64.1%) produced "medium" quantities of products intended for drying. Meanwhile,

23.8% were classified as small producers and only 12.1% as large producers. Participants reported a total quantity of dried products ranging from 6 to 25 quintals, with an estimated average of 12 quintals per producer (Addoun et al., 2023).

This distribution reflects the predominance of medium-sized producers in the agricultural drying sector, which is representative of the general structure of agriculture in several Algerian regions, particularly rural areas in the north and the highlands. It also indicates limited production capacity, which is linked to factors such as land availability, access to drying equipment and investment levels. These results highlight the importance of supporting small and medium-sized producers, who constitute the majority of those involved in this activity, in order to improve yields and the quality and overall profitability of dried products.

Source of purchase of dry products

In the study area, the majority of producers involved in drying activities (49.2%) reported primarily using their own harvests as the raw material. This self-sufficiency reflects the direct addition of value to agricultural production, a practice commonly observed among small and medium-sized farmers in Algeria. Meanwhile, 34.6% of respondents sourced fresh produce from local traders, indicating the existence of an additional supply market for drying. Finally, 16.2% of producers reported using a mixture of products from their own production and external sources (MADR, 2012 ; Bensaha , 2022). This mixed supply method demonstrates flexibility within Algeria's agricultural drying value chain, where producers adapt their practices according to seasons, agricultural yields and market accessibility. It also highlights the partial dependence of some producers on commercial channels to ensure business continuity, particularly during periods of low production (Bensaha et al., 2019).

Experience in agricultural drying

Data analysis revealed that the majority of agricultural drying producers (47.1%) had between 21 and 30 years' experience in the field. Respondents with 11–20 years' experience represented 35.4%, while those with over 30 years' experience accounted for 11.3%. In contrast, only 6.2% of producers reported having less than 10 years' experience. The average experience of all participants was 16.39 years, with a range of 1–42 years.

These results demonstrate that agricultural drying in the study area is primarily rooted in traditional expertise acquired and passed down over many years. This highlights the importance of this practice in local agricultural customs, particularly in rural areas of Algeria, where it is both a preservation method and a sustainable source of income. However, the low proportion of young or recently engaged producers in this activity may also indicate a lack of generational renewal, possibly due to the sector's limited appeal to young people or the absence of suitable support mechanisms (Bensaha et al., 2024 ; Kherrafi et al., 2023).

4. Conclusion

In the Saharan region of Ghardaïa in Algeria, agricultural drying represents a promising way to promote sustainable agriculture, foster rural development and empower women and young farmers. Thanks to its adaptability to local climatic conditions and economic viability, as well as the growing demand for dried products, this sector offers considerable potential.

Effective extension services and the dissemination of scientific knowledge on good drying practices could raise awareness among local populations, improve farm productivity and ensure the sustainability of rural farmers' livelihoods.

The study results show that the quantity of dried products could be significantly increased by adopting improved techniques, helping to meet producers' needs and raise their socioeconomic status. The majority of producers appear to be smallholders with limited education and land resources, for whom drying is an essential source of supplementary income, particularly for the most vulnerable households. Women play a particularly significant role in this sector, reflecting their central position in managing family farms in the region. However, despite this potential, the sector faces several challenges, particularly with regard to disease management, the availability of plant protection products, and the lack of organised marketing structures.

The study highlights the need for targeted public policies, capacity-building programmes and improved access to finance to sustainably improve the living conditions of dry-farm producers in the Ghardaïa region.

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