# **Identifying stakeholders’ interest in saline quinoa farming along value chain in Morocco**

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**Abstract**

Salinity in Morocco deepened by its coastal position and low rainfall amount severe the climate change adaptation and sustainability of the country. This study objectively set to map relevant stakeholder’s interest, networks and possibly their preference in quinoa farming in Morocco. Stakeholder analysis was used to identify the relevant stakeholders along the value chain groups in quinoa farming in Morocco. These farmers were engaged in a Focus Group Discussion (FGD) where exploratory questions were asked using semi structured interview questionnaire. Classic content of the focus group discussions wasanalyzed in a mixed method approach applying triangulation method. Three value chain groups (Farmers production group, women processing group and the extension agents) were interviewed and their interests varied. The farmers production group’s interest was due to the resistance of quinoa to saline water and the women group was to innovate. However, they all had challenge of low knowledge of the crop while being optimistic that quinoa could salvage the situation on ground. The producers’ groups had no existing networks at the moment because it is a new crop and so no preferences were identified. But the women group already had network. Therefore, knowledge management technologies should be deployed to enhance the production of this adaptive crop to salinity.

**Keywords**. Quinoa, salinity, stakeholders, value chain, interest

**Introduction**

In the face of changing climate, the semi-arid regions are mostly affected with salinity as a result of sea level rise. Salinity is one abiotic stress that greatly retard agricultural production due to increased phytotoxic ions around the root zone that hinders water uptake in plants (Mokhena *et al*., 2016). Climate change also means high CO2 emission to the atmosphere. In some cases halophytes (salt tolerant), C3 plants, are promoted by high CO2 but unfortunately, high temperature and high evapotranspiration reduces their yield (Ullah *et al*., 2021) and impacts on soil salinity. In hot dry regions of North Africa such as Moroccan, farmers battle these factors to produce crop. These force them to adopt adaptation strategies to cope with the biotic and abiotic stress in the region.

Morocco, is a country with very low annual rainfall amount ranging from 100 - 1,200mm on the average across the country. This is basically because of its position on the coast which exposes the country to Sea intruition (Hssaisoune *et al*., 2020) as its source of salinity. Other anthropogenic causes also raise the salinity problem of this country and much fears if the expected decrease in precipitation occurs. Moroccan farmers have adopted the cultivation of rustic quinoa to adapt to the salinity in their environment (Hirich *et al*, 2021). Quinoa is a C3 plant that is morphologically structured to adapt to high temperature. The country has engaged several efforts in battling this challenge such as use of bio saline agriculture by engaging alternative crops to adapt to the saline conditions (Hirich *et al*., 2021). It is therefore interesting to find out what drives farmer’s interest to even build initiatives into quinoa farming. What framework affects actor’s preference and networks in their adaptation moves. There is need to access these possibilities in view of scaling up as a highlight to acceptance of alternative crops as a strategy to salinity in changing climate.

The social framework around a particular case affects its acceptance or sustainability. Projects, policies and innovative ideas fail up to 50% due to improper or non-engagement of key stakeholders (Inam *et al*., 2015). Researchers have engaged stakeholder in environmental projects and water related researches (Inam *et al*., 2015: Akramkhanov *et al*., 2018: Hargrove & Heyman, 2020) yet, ‘real change’ is still elusive. Despite the elusiveness, multilevel perspective framework was applied in Netherland by Beauchampet, (2022), to study stakeholders perspective on the issue of saline agriculture. Furtherance use of this tool is to apply same technique in Morocco to see what drives the stakeholders despite little knowledge of the salt tolerant crops. However, including the systematic approach of drawing out the interest along the value chain. Systematic process is needed to know the relationships of these stakes by employing stakeholder analysis. The identification of relevant stakeholders in this project will also extract their awareness on the situation and becomes a route to propagate the innovative techniques if they are properly involved. This study therefore objectively seeks to understand the stakeholder’s interests and networks and to determine the framework that affects their preferences.

**Methodology**

In this section, we give the study background and as well, relate the methodology for mapping the key stakeholders’ interest and networks while extracting their preferences if possible. This will be followed by the overview of stakeholder analysis. Then the data collection methods, data analysis, result/discussion and the conclusion.

**Study Background**

Saline Agriculture as a Strategy to Adapt to Climate Change (SALAD) is an intercontinental project that transverse four North Sea countries in Europe (Italy, Netherlands, Belgium, Germany) to North Africa (Morocco, Egypt) to revert the continuous resource depletion as a result of climate change. The project is a consortium of transdisciplinary researchers combating soil salinity risk which is gruesomely challenging food security. This problem has reduced food production whilst receiving little attention from both the private and public sector. It is important to harness the science and technologically innovative approach of applying alternative crop to possibly reach neo institutional theory in the attempt of attaining governance landscape. It is due to the rising sea level and other climatic and anthropogenic reasons that soil salinity is severe. In line with the Paris agreement 2030 to combat climate change, this project has focused on sustaining and innovatively developing techniques that will adapt to salinity challenges by using salt tolerant crops with the goal of upscaling crop/food chains across the regions and exchanging solutions among (source and end) stakeholders. It was imperative to harness the interests of these stakeholders to ensure adoption of developed techniques and policies. The project was designed to have different case studies, where each country with a crop of interest is designated as a case study. The case study in Morocco is focused on understanding the stakeholders’ interest and networks along the value chains of Quinoa.

**Overview of Stakeholder analysis (SHA)**

Among the definitions of stakeholder analysis given by Reed, (2008), identifications of individuals and groups who are affected by or can affect those parts of the system and prioritizing these individuals and groups for involvement in the decision-making process suits. In appropriation, we have considered social network analysis to investigate network relationships. This is to enable us analyze social interactions that map patterns of relationship and information flows to reveal stakeholders’ differences in relevance (Borgatti, 2006). Bertoni *et al*., (2022) stated one strength of SNA (Social Network Analysis) that it allows the gathering of opinion from a large number of people using transparent and replicable method which negates ascribing the most relevant to the most outspoken, most fronted and most ambitious members. This is why we employed the focus group discussion to focus on the in-depth understanding of people and the social issue. SNA uses all the centrality (in-degree, in-betweenness and closeness) measures to determine relevance which makes it complete. These measures are then theoretically connected to the subject of discuss. One difficult task marked by (Ostrom, 2009) is the ability to understand relationships among multiple level at different spatial variables. The multilevel nested framework was updated to arrest this problem and so will be employed in this paper, seeing value chain as different levels. The framework can also be used to look at a sector of a whole.

**Stakeholder identification and mapping method**

This study employed the snowballtechniqueto initiate stakeholder identification. SALAD project members were used to identify and snowball quinoa farmers/stakeholders in Laayoune, Morocco. Where farmers and their various groups were identified using structured interview questionnaire through farmers survey (Hirich, Personal discussion, 2022). The farmers survey was done by the The African Institute for Sustainable Agriculture Research (ASARI) socio economist however, there was no observation data about it. The quinoa value chain was already known by the research institute and were thus used for research outings. The following value chains were identified, producers, cooperatives/processors and extension agents.

The mapping tactics was done along the value chain system of quinoa farming. The common interest of being a quinoa producer, valorizer/women processing group, consumer, Extension agents, cooperative group, marketers etc. was the grouping factor. The approach of participation planning matrix which is based on stakeholder-issue inter-relationship (Mathur *et al*., 2007) was used. This was appropriate as we considered the different groups of farmers with same interest along a value chain. The combination of this approach with focus group discussion was employed to understand the stakeholders’ interests, networks and preferences.

**Data collection methods**

**Questionnaire development**

In developing this questionnaire, we needed to find out the farmers’ interests in farming saline quinoa, challenges they faced, the relationship they have in terms of their networks and possibly to know if they preferred saline quinoa to other crops. We targeted the different value chain members of quinoa farmers in Laayoune and gathered them in their different groups during a workshop organized by the African Sustainable Agriculture Research Institute (ASARI), Mohammed VI Polytechnic University (UM6P), Laayoune, Morocco to address Knowledge gap in quinoa farming. Three value chain groups were present at the workshop: farmers production group, the extension agent and the women processors groups. The question contents of each group were different. This was intentional since the members of the groups already belonged to designated value chain group, however, the ideas were still to get the above-mentioned information.

**Data collection via interviews**

The qualitative data collection technique used in this research was focus group discussions (FGD). This was organized for the farmers group and leading exploratory questions were asked to identify their interests, networks and their preference using semi structured questionnaire. The questionnaire was designed in English and administered in two languages (Arabic and French) with the help of UM6P research assistants. Eleven respondents formed the production value chain group and they were composed of mainly men as the region seemed to have men in production and female in processing sections. The extension agents’ group were quite mixed of male and female unlike the other two groups.

**Data analysis.**

The data analyses were done using classic content analysis with focus on describing the codes as identified by the researcher. We have employed mixed method analysis using triangulation to clearly give understanding of the phenomena studied. Quantitative representations were done using the frequency observed in the study.

**Results and Discussion**

**Drivers/interests, preference and networks of the stakeholders in the specific value chains of Quinoa**

1. **Production value chain**

The focus group discussion on what determined producers’ interest in quinoa production revealed the following; investment and profitability, salt-tolerant plants that flourish in high-salinity and high temperature (resistance to extreme weather conditions including diseases), new products adaptable to the region, creation of quinoa national and international market, value addition and job opportunities and easiness in production of the crop.

It was interesting to note that the crop’s resistant to salinity **(**Fig.1) and not profit was producers’ major reason for cultivating quinoa in Morocco. This is in agreement with the studies of Hirich, Choukr-Allah, *et al*., (2021), who stated that quinoa is a rustic crop and resistant to salinity. However, they experienced challenges and the major one was lack of government subsides (Fig.2) followed by the lack of knowledge of the crop. Lack of knowledge was expected since the crop was new in the region. That could also be the reason there was no existing networks within or outside Laayoune, Morocco for producers of quinoa. The farmers stated that the crop is new and the only way they could adopt more people to farm quinoa is if government gives subsides for production. They are currently test trying the crop and the only reason they will prefer quinoa to another crop is on the following conditions respectively; highly tolerant as they have already perceived, profitable and available technical support and subsides for the crop. For the moment, the only source of technical support is from trainings provided by ASARI-UM6P platform. They requested more of such trainings to avoid losing the existence of this crop in the region and for production to continue. This request indicates high interest in the crop despite its being a new crop.

Figure 1. The Interest of Producers Value Chain farmers in growing Quinoa

Figure 2. Challenges of the Producers value chain farmers

1. **Extension Agent Value chain**

The extension agents (EA) interviewed were mainly government workers who expressed farmers interest and acceptance they observed. Also discussed was the challenges experienced by EAs and their knowledge management strategies to enable triangulation of the drivers presented.

The EAs reported that farmers driving interest was the additional value the farmers got from the crop such as using the crop as both main product (food) and by-product to feed their animal since majority of them were animal breeders. This point contradicted the producers’ (Fig. 1) main driver reported to be the crops’ resistance to diseases, salinity and harsh weather conditions, however, it was among their interests but not the interest as represented by the frequency data. The other driver mentioned by both the EAs and the producers was ‘profit’. There is likely a communication gap between the producers and the EAs or inadequate communication skills. Hence, Antwi-Agyei & Stringer, (2021), suggested developing EAs technical skills, improving their communication skills and equipping their knowledge tanks. They reported the farmers hesitancy in accepting the crop if it is not profitable. Stating no assurance that producers will fully accept the new crop until they confirm the benefits in farming saline quinoa.

In view of likely communication gap/skill inadequacy, the producer’s relationship with the extension agents were diagnosed by studying the EAs knowledge sharing strategies. It was therefore understood from the focus group discussion that there was relatively no network relationship between the two groups in relation to quinoa production because the crop is new. The producers only obtain their information from the ASARI institute. The little information the EAs have about the producers were gathered during their Mentoring and coaching, training and visits and collaborations which was found as their knowledge sharing strategies (Table 1).

In agreement to the skill inadequacy observed from the discussion, the extension agents reported low technical knowledge of the product among others as their most challenge (Fig. 3) in delivering extension services for quinoa crop. The lack of knowledge of the quinoa in Laayoune is significantly different from the other challenges such as lack of raw materials, low market information and financial support.

Figure 3. Challenges experienced by Extension Agents for carrying out extension services for quinoa.

Table 1. Knowledge sharing strategies identified in Laayoune

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| **Mentoring and Coaching** | **collaborations** | **Training and visits** |
| Meeting to share idea every week | Linking the Farmers to cooperatives or cooperate firms  | Field visits |
| Technical project support with study, evaluation and supervision | Asking advice and consultation from the private sector | Seasonal training sessions |
| Provincial centres for consultation and advice |  | Excursion to model farms |
|  |  | Farmers field schools and |
|  |  | Workshops |

1. **Women group/processors**

The women group as well as processors were also identified as cooperatives members. They undertake the duty of processing the quinoa and making it ready for marketing in different forms. They are small cooperative composed of women and fortunately have connection with the government that they can influence the government to support them financially. However, they have no influence on the market price insurance nor do they have off takers. They do not focus only on quinoa, they also process other crops and would prefer to have other crops such as rice, oath and carob if weather condition permits. These women have network relationship with the farmers in the North region of Morocco who supply them raw materials and other needed inputs. However, they have no power over their decision to either adopt saline quinoa or not.

The interests and challenges of this group was as well studied during the focus group discussion. It was revealed that innovatively developing new products, diversifying processed products and high demand of the new crop were the main drivers of their operations. Of course, they had some challenges such as lack of awareness of quinoa benefits and how best to further process it, high price of raw materials, cost of valorisation and transformation as well as branding and packaging of the products.

**Potentials for improvements of saline agriculture value chains for quinoa in Morocco**

The desert nature of Morocco has created limited options for the farmers in especially the southern region where this study was conducted. Notwithstanding, interestingly the women processors have given hope to the use quinoa as an alternative crop in the region. There innovative food products from the crop has been reported to be on demand by the people of that community. They make different food options from quinoa to replace the existing cereals that climate change was affecting thereby institutionalizing alternative (Fig. 4). These products were formerly made from rice, oath etc but can now also come from quinoa.

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Figure 4. Different products produced from Quinoa by the women cooperatives

**Conclusions and research outlook**

The Moroccan case study has been studied and crop resistant to salinity was the major interest of the farmers for choosing the crop. It was not mainly the profit they make from the product as they do not know the profit margin for the crop yet. They also appreciate the other benefits they make from growing the crop such as using the by product for animal feed etc. On the other hand, it was notable that the women processors were more interested in their innovative adventures in producing more products as would have been made from rice or other cereals. This advancement was already attracting high demand and interest of farmers to the crop.

However, there was a cross cutting challenge of low knowledge of the crop and lack of raw materials. There is no strong existing network except for the women processors that collect raw materials from the group in the northern part of the country. This is an issue to consider and tackle. From these findings, there is possibility of accepting quinoa as an alternative in Morocco and upscaling possibilities is feasible.

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