















# **Analysis of International Market of Quinoa based products**

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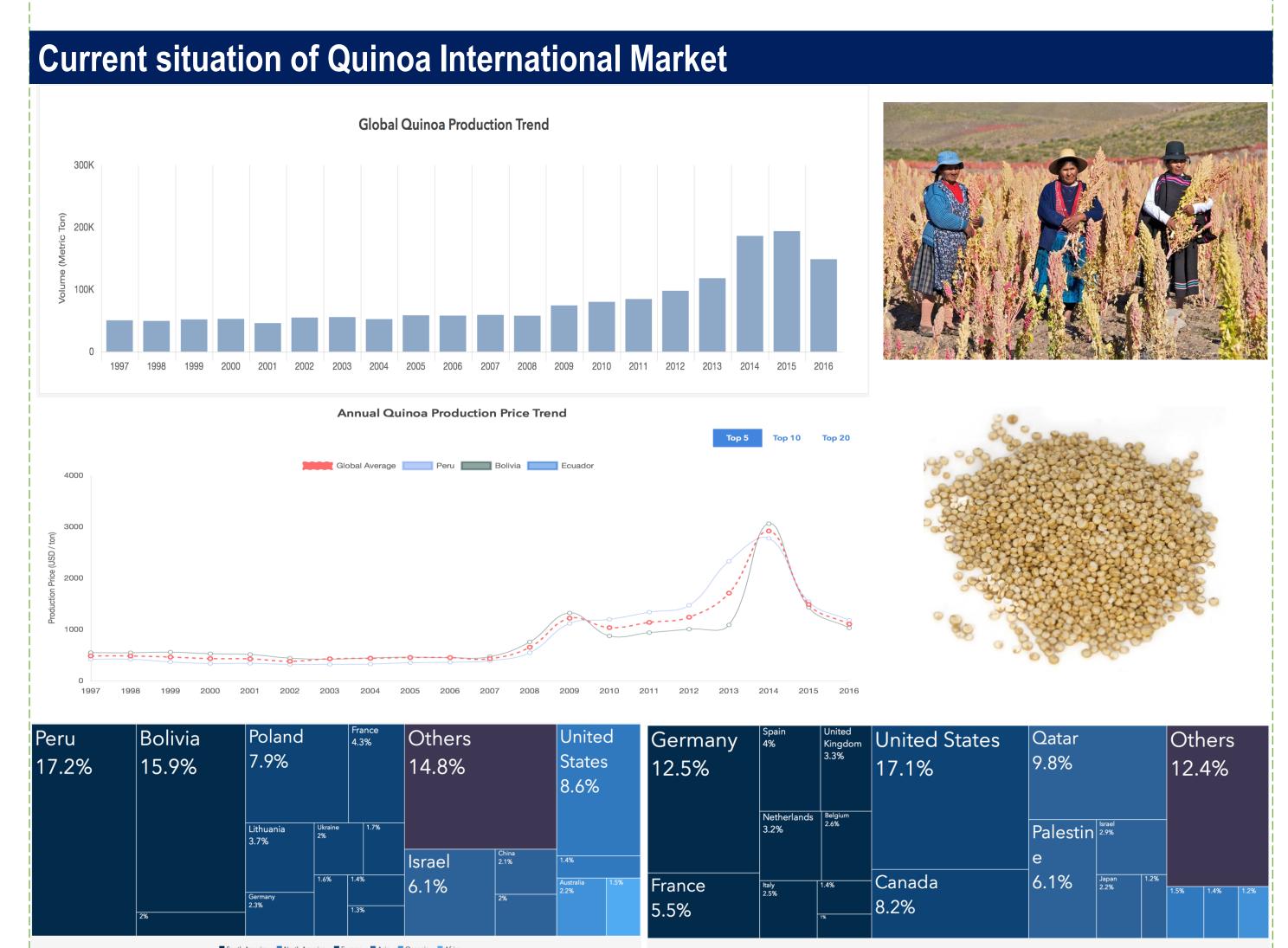
#### INTRODUCTION

Agriculture is facing nowadays, many challenges as climate change, desertification, drought, salinity...etc which call for urgent interventions to fast adaptation and diversification. In this context, introduction of crops with a high value and a high tolerance to stress would enable to address simultaneously two interrelated challenges: abiotic stresses that undermine crop production and poverty that impacts the rural poor. In recent years, quinoa (Chenopodium quinoa willd) has received much attention as a multi-purpose crop that can thrive in extreme soil and climatic conditions (Jacobsen et al., 2003). Quinoa is one of the most nutritious food crops currently known, regarded as a superfood because it contains all eight amino acids needed for human health. It is also gluten-free, has twice as much protein as maize, barley and wheat (Repo-Carrasco et al., 2003; Stikic et al., 2011), and more micronutrients than most staple grains, including wheat, rice and barley

Although Peru and Bolivia are among the poorest nations in Latin-America, more than half of the global supply of quinoa is actually coming from these countries. It was in the early 2000s that Western nations discovered Quinoa. Since then, the demand has risen and so has the price. Peru and Bolivia's gross domestic product have only benefited from this.

Quinoa has already been introduced in a dozen sites across the country and the number of quinoa growers is increasing each year, especially in Oujda, Benslimane, Fes, Laayoune, Boulmane and Marrakech. A survey was carried out by the SWUP-MED project among farmers in Rhamna Province to assess their perception of quinoa as a new crop that could potentially be introduced into their cropping systems (Pedersen et al., 2013). It found that the farmers would consider including quinoa in their production systems if there were a significant and sustainable market demand.

The object of this study is to analyze the international market of quinoa and create a database of marketed quinoa based products worldwide.

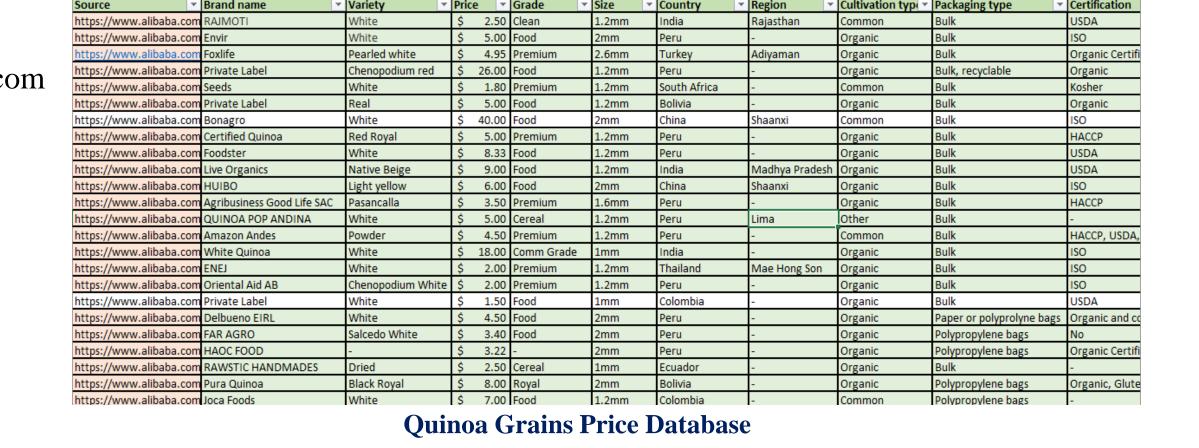


## **Database Creation**

**Quinoa top exporters** 

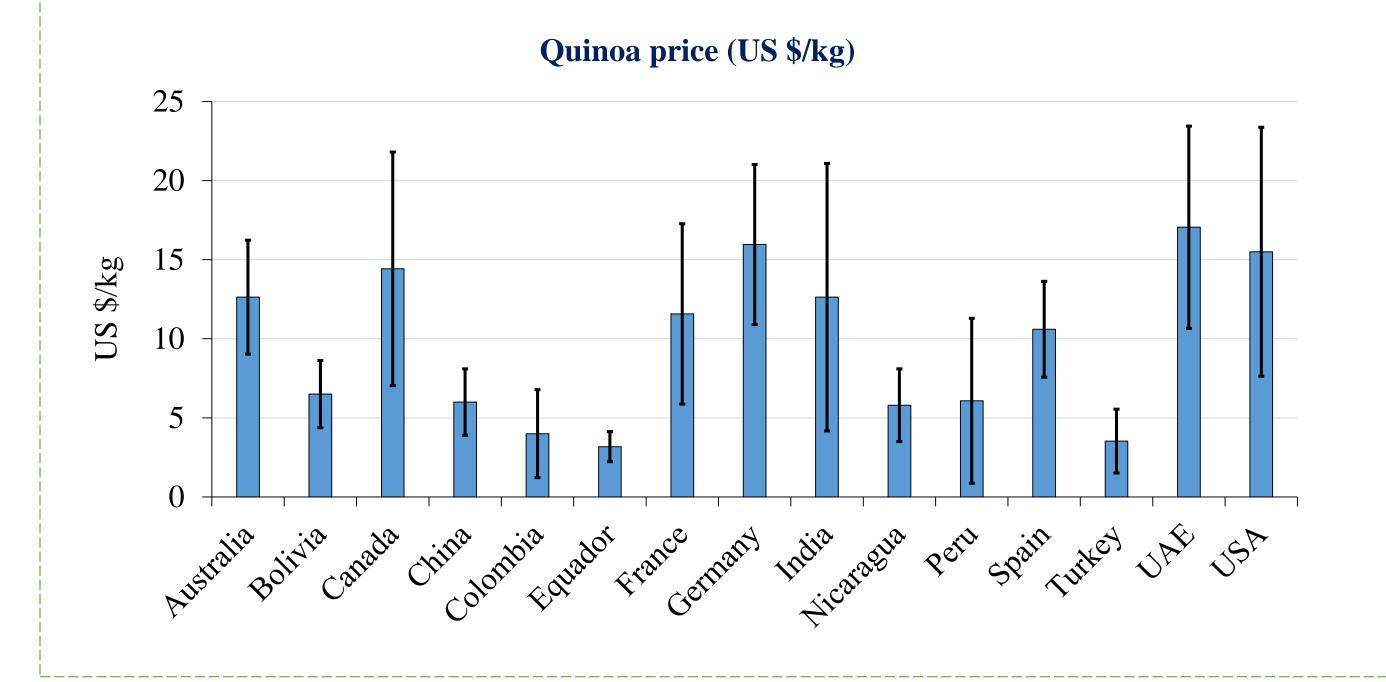
A data base counting for more than 267 entry has been created based on available online information about quinoa grains and based products. Information as cultivation type, price, quinoa color and size, country, packaging type, certification were collected. Below examples of used data sources:

- alibaba.com
- amazon.com carrefouruae.com
- uae.souq.com
- walmart.com
- carrefour.fr
- eroski.es
- coop.de
- metro.ca coles.au

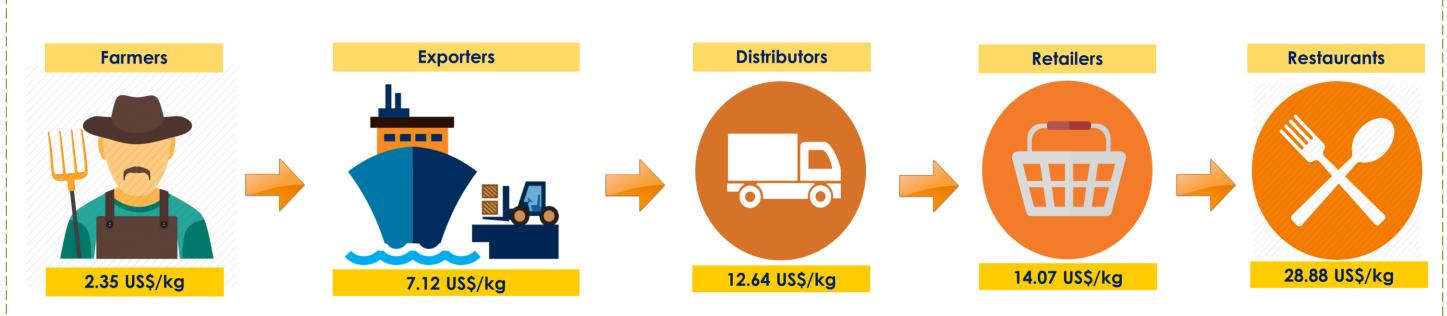


**Quinoa top importers** 

Figure below presents quinoa price of processed grains sold in each country calculated form quinoa price database. UAE presents the highest price per kilo of quinoa followed by Germany and USA while the lowest price is found in quinoa traditional country producers (Ecuador, Colombia, Bolivia).

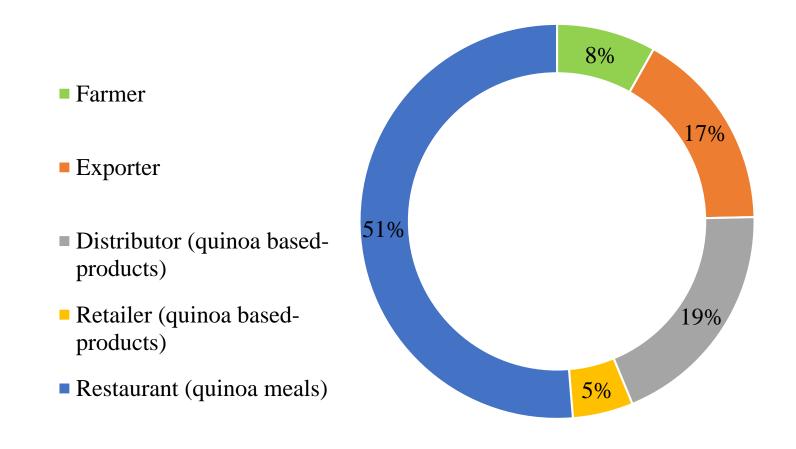


From all quinoa based-products prices collected in the database we estimated the prices at different level of the quinoa value chain as shown in figure below.



Quinoa price at different levels of the value chain

Farmers which is the main actor in quinoa value chain is gaining only 8% of the final consumer price. While restaurants are benefiting with more than 50% of the final price. The price breakdown shows that if farmers can be organized in cooperatives and reach directly retailers and restaurant, they may therefore, earn 44% of the final consumer price.



Quinoa price breakdown

### **Pricing Analysis**

The main objective of this section is to conduct regression analysis of quinoa price against several parameters for each country using R software in order to determine significant correlated parameters and therefore develop a regression model which allows to estimate quinoa grain price. World Health Organization (WHO) Database parameters were used for the regression and correlation against Quinoa prices.

| Country      | Price A |   | В   | С    | D     | E   | F   | G       | Н   | I  | J    | K  | L  | М  | N  | 0   |
|--------------|---------|---|-----|------|-------|-----|-----|---------|-----|----|------|----|----|----|----|-----|
| Australia    | 20      | 6 | 16  | i    | 33940 | 97  | 96  | 20530   | 1.1 | 88 |      | 37 | 18 | 19 | 90 | 1.8 |
| Canada       | 14      | 4 | 14  |      | 36280 | 100 | 99  | 32577   | 0.9 | 80 |      | 39 | 18 | 17 | 90 | 1.5 |
| France       | 13      | 2 | 8   |      | 32240 | 99  | 98  | 61330   | 0.6 | 77 |      | 39 | 21 | 18 | 90 | 1.9 |
| Germany      | 22      | 2 | 11  |      | 32680 | 98  | 98  | 82641   | 0   | 75 |      | 42 | 25 | 14 | 90 | 1.4 |
| Peru         | 6       | 5 | 59  | 87.9 | 6490  | 97  | 96  | 27589   | 1.1 | 73 | 10.5 | 25 | 8  | 31 | 90 | 2.5 |
| Portugal     | 11      | 2 | 19  | 93.9 | 19960 | 98  | 98  | 10579   | 0.5 | 58 |      | 39 | 22 | 16 | 90 | 1.5 |
| Qatar        | 12      | 1 | 19  | 89   |       | 94  | 93  | 821     | 3.1 | 96 |      | 31 | 3  | 21 | 90 | 2.7 |
| Spain        | 12.5    | 2 | 10  | 97.2 | 28200 | 99  | 100 | 43887   | 1.1 | 77 |      | 39 | 22 | 14 | 90 | 1.4 |
| United Arab  | 19      | 1 | 37  | 88.5 | 31190 | 88  | 88  | 4248    | 3.5 | 77 |      | 30 | 2  | 20 |    | 2.3 |
| United Kingo | d 16    | 2 | 27  | '    | 33650 | 99  | 98  | 60512   | 0.4 | 90 |      | 39 | 22 | 18 | 90 | 1.8 |
| United State | 32      | 4 | 43  |      | 44070 | 93  | 91  | 302841  | 1   | 81 |      | 36 | 17 | 21 | 90 | 2.1 |
| Uruguay      | 60      | 5 | 64  | 96.8 | 9940  | 100 | 100 | 3331    | 0.2 | 92 | 2    | 33 | 18 | 24 | 90 | 2.1 |
| Algeria      | 12.75   | 3 | 6   | 69.9 | 5940  | 94  | 96  | 33351   | 1.5 | 64 |      | 24 | 7  | 29 | 90 | 2.4 |
| China        | 23      | 7 | 3   | 90.9 | 4660  | 96  | 100 | 1328474 | 0.6 | 42 | 9.9  | 33 | 11 | 21 |    | 1.7 |
| Bolivia      | 6.5     | 5 | 97  | 86.7 | 3810  | 95  | 94  | 9354    | 1.9 | 65 | 23.2 | 21 | 7  | 38 | 82 | 3.6 |
| Ecuador      | 3.17    | 5 | 100 | 91   | 6810  | 97  | 96  | 13202   | 1.1 | 63 |      | 24 | 9  | 32 |    | 2.6 |
| India        | 12.62   | 7 | 97  | 61   | 2460  | 87  | 90  | 1151751 | 1.5 | 29 | 34.3 | 24 | 8  | 33 | 41 | 2.9 |
| Nicaragua    | 5.8     | 5 | 119 | 76.7 | 2720  | 90  | 90  | 5532    | 1.3 | 59 | 45.1 | 21 | 6  | 37 | 81 | 2.8 |
| South Africa | 1.8     | 3 | 65  | 82.4 | 8900  | 88  | 88  | 48282   | 0.7 | 60 | 10.7 | 24 | 7  | 32 |    | 2.7 |
| Thailand     | 2       | 6 | 70  | 92.6 | 7440  | 94  | 94  | 63444   | 0.7 | 33 | 2    | 33 | 12 | 21 | 90 | 1.8 |
|              |         | _ |     |      |       |     |     |         |     |    |      |    | _  |    |    |     |

**World Health Organization Database** 

Below is the R model running result:

| Coefficients:                       |              |            |         |          |   |
|-------------------------------------|--------------|------------|---------|----------|---|
|                                     | Estimate     | Std. Error | t value | Pr(>ltl) |   |
| (Intercept)                         | -2.048e+01   | 1.790e+01  | -1.144  | 0.2749   |   |
| Urban_population_growth             | -4.572e+00   | 2.859e+00  | -1.599  | 0.1358   |   |
| Urban_population_pct_of_total       | 5.170e-01    | 1.707e-01  | 3.028   | 0.0105   | * |
| Total_income                        | 1.007e-12    | 1.013e-12  | 0.994   | 0.3398   |   |
| Tax_revenue                         | -2.489e-01   | 3.279e-01  | -0.759  | 0.4624   |   |
| Income_growth                       | 3.444e+00    | 1.304e+00  | 2.641   | 0.0215   | * |
| Agriculture_contribution_to_economy | 1.445e-01    | 5.878e-01  | 0.246   | 0.8099   |   |
|                                     |              |            |         |          |   |
| Signif. codes: 0 '***' 0.001 '**' 0 | 0.01 '*' 0.0 | 05 '.' 0.1 | ' ' 1   |          |   |

After running the model in the R software we got significant correlations for the following variables:

- -The Income\_growth with a coefficient of 3.444
- -The Urban\_population\_pct\_of\_total with a coefficient of 0.517

| -The Agriculture_ | _contribution_ | _to_ | _economy with a coefficient of 0.1445 |  |
|-------------------|----------------|------|---------------------------------------|--|
|                   |                |      |                                       |  |

| Coefficients:                       |                         |
|-------------------------------------|-------------------------|
| (Intercept)                         | Urban_population_growth |
| -2.048e+01                          | -4.572e+00              |
| Urban_population_pct_of_total       | Total_income            |
| 5.170e-01                           | 1.007e-12               |
| Tax_revenue                         | Income_growth           |
| -2.489e-01                          | 3.444e+00               |
| Agriculture_contribution_to_economy |                         |
| 1.445e-01                           |                         |

The pricing equation model using the linear regression model is the following:

Quinoa retailer price = 3.444 x Income\_growth + 0.517 x Urban\_population\_pct\_of\_total + 0.1445 x Agriculture\_contribution\_to\_economy - 0.2489 x Tax\_revenue + 1.007e-12 x Total\_income - 4.572 x Urban\_population\_growth

After applying the price model on Morocco data we found that processed grain quinoa estimated price in Morocco retailers should be 18.5 US \$/kg as per the collected worldwide data. In Morocco 250 gr of processed quinoa grains as per Amendy food company is equal to 3.9 US \$. Therefore, the price for 1 kg of quinoa processed grains is equal to: 15.6 US \$/kg. In Carrefour supermarket the quinoa processed grains price for 335 g is equal to 5.6 US \$ which is almost 16.8 US \$/kg.

## CONCLUSION

This generated data out of this study indicates clearly that the international quinoa market is evoluting and demand on quinoa products is increasing. The price of quinoa in Europe countries which are near to Morocco remains relatively high which could be a great opportunity for quinoa grower in Morocco to export their products to Europe. The international quinoa price analysis reveals that quinoa prices in Morocco are more or less similar to other countries giving the local socio-economic situations. In Morocco farmers need to be organized in cooperatives and develop quinoa based products rather than selling bulk quinoa seeds and therefore, getting a high percentage of the final quinoa price.