



Researcher Ruud Timmer in a trial field of quinoa in Lelystad.

QUINOA CONQUERS THE WORLD

Eating like the Incas

Quinoa is hugely popular, spreading all around the world from its South American origins. Partly thanks to Wageningen plant breeders, quinoa is now being grown in France, England and Germany. And it may soon be grown in the Netherlands. 'This year will be decisive.'

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Harry Donker's quinoa plants in Middenmeer in North Holland province are not as tall as they should be at this time of year. A pity, because germination may now be too late. 'I should have used more fertilizer,' says the organic farmer. 'Maybe I was too stubborn. I thought: well, it grows on poor soils in the Andes. But this type seems to need more nitrogen.'

Donker does not mind too much. The aim this year was to gain experience. How far apart should the plants be, is it possible to keep weeds under control, and can you harvest the seeds properly? 'So far it is all quite doable,' says Donker, who has sown a quarter of a hectare of quinoa.

Donker is one of the 13 Dutch farmers who started growing quinoa this year. Three of them are organic farmers, while the other ten farm conventionally. 'Quinoa is now being grown on 30 hectares of land,' says Rens Kuijten of the Dutch Quinoa Group, the company which got quinoa farming launched in the Netherlands. 'At the end of the summer we shall collect the quinoa from the farmers and make sure it reaches the consumers after processing.'

Quinoa has become hugely popular in the last few years. Bolivia and Peru – where quinoa has been grown for thousands of years (see text box) can barely meet the demand. In recent years about 10,000 tonnes have been shipped to Europe per year, and it is still not enough. Quinoa has characteristics which western consumers value highly nowadays: it is gluten-free and rich in protein. Packets of quinoa have been selling like hot cakes, initially in health food stores but now in supermarkets such as Albert Heijn and Jumbo too. Early this year the shops had even sold out of quinoa for a while. Kuijten is pleased with this development, having envisaged a major role for quinoa in our diet years before the market was ready for it. Now there is a demand for it, he has devoted himself to

promoting this new crop. His aim: getting quinoa cultivation in the Netherlands off the ground and making quinoa more widely available to European consumers. He encouraged the 13 farmers to sow quinoa and he is guiding them, together with the advisory group DLV Plant, Applied Plant Research (PPO) and Plant Research International (PRI) at Wageningen UR.

RIPENING IN TIME

Wageningen started breeding quinoa in the nineteen nineties, says Robert van Loo of PRI. 'The Netherlands was looking for a fourth crop. For the sake of spreading risks, the then ministry of Agriculture thought farmers should start to grow another crop besides sugar beets, potatoes and wheat. One of the crops we set our sights on was quinoa. Primarily because of its high nutritional value.' One problem, however, was that the quinoa from the Andes was not suitable for Europe. 'The seed does not ripen fast enough here because of the longer daylight hours. Only when our days are the same length as they are in the Andes does the plant get the signal to ripen. That is too late, because then it is too wet here.'

For this reason PRI bred varieties from southern Chile, which are used to longer daylight hours, so that they do ripen fast enough in Europe. After that, PRI tackled a second breeding challenge: to breed quinoa plants without bitter seeds. 'The outer shell of the seeds contains saponin: a soapy layer which tastes very bitter.

In Bolivia they wash and scrape it off. We looked into whether we could breed quinoa varieties without saponin. The production costs could be lowered that way, certainly in Europe where labour costs are high,' explains Van Loo. By crossing the European variant with a Chilean one, Wageningen has succeeded in this. Between 2002 and 2008 PRI presented three new saponin-free varieties: Atlas, Riobamba and Pasto.

The French company AbbotAgra was the first to embark on cultivation of these varieties. In 2007, owner Jason Abbott started with 10 hectares and late expanded that to 100 hectares. He now has more than 1000 hectares in France. 'He is a pioneer,' said Van Loo. Since 2007, Abbott has held the license for the Wageningen varieties. Every farmer who wants to grow them has to knock on his door. This includes the farmers of the Dutch Quinoa Group. A conscious choice, says Van Loo. 'That way Abbott can build something up. Without that exclusivity, he would never have started growing quinoa. Setting up a chain from farmer to consumer takes a lot of time, energy and money. Abbott is only now beginning to see figures in the black.' Meanwhile he is working with farmers in Germany, England, Belgium and the Netherlands.

CHINA, VIETNAM AND CHILE

There is interest in the Dutch-bred quinoa beyond the boundaries of Europe. PRI hopes shortly to start a project in the deltas of >

‘Quinoa plants thrive
in brackish areas’

NUTRITIOUS LITTLE SEEDS

Quinoa, sometimes referred to as the food of the Incas, has been a key food crop in South America for 6000 years. Its unique characteristics have led to a rapid rise in consumption and cultivation of this crop around the world.

Quinoa

Chenopodium quinoa – a close relative of the weed goosefoot and of spinach – is resistant to low and high temperatures, drought and salinization.

Use



The seed can be processed like grain. Traditionally it is roasted and milled to make flour for bread, as well as fermented for beer or the traditional beverage chicha.

Nutritional value

The seeds are gluten-free, high-fibre, full of iron and protein and contain all the essential amino acids.



Gluten-free



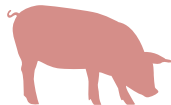
High-fibre



Iron-rich

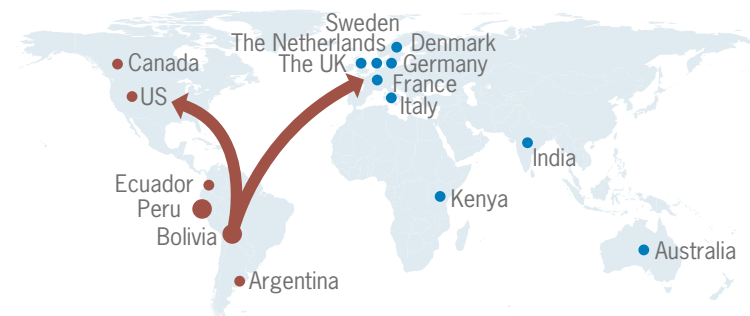


Meat substitute



Quinoa is also used as livestock feed.

Cultivation and export



- Production
- New producer
- Export

Cultivation:

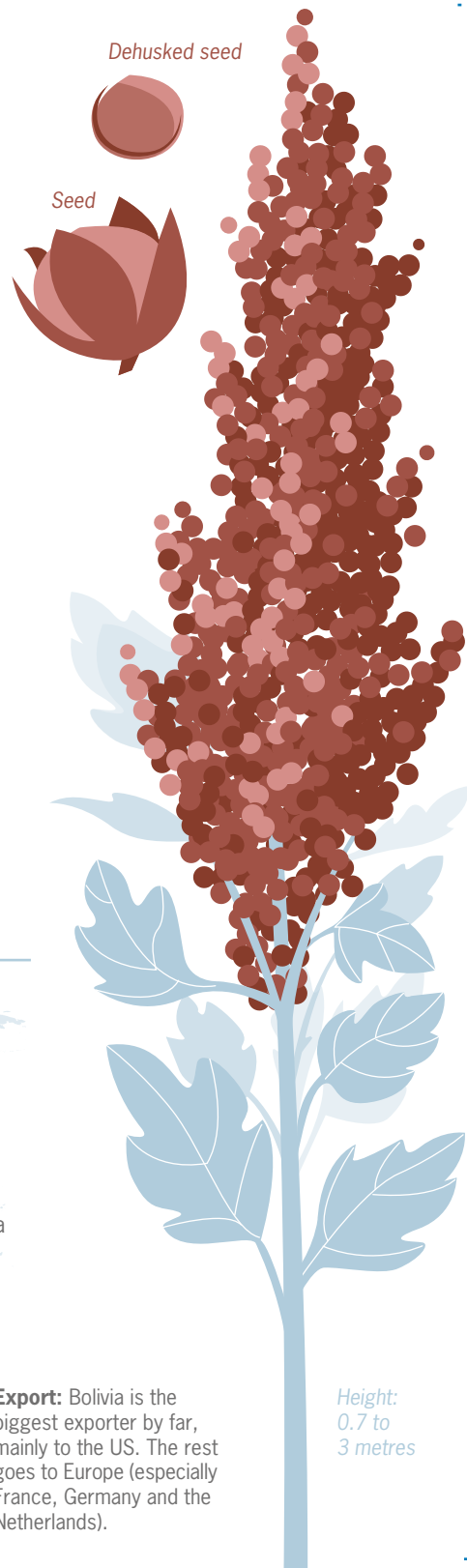
Bolivia and Peru are the biggest producers by far (c. 90%), followed by the US, Argentina, Canada and Ecuador.

New producers:

Farmers have recently started growing quinoa in France, the UK, Sweden, Denmark, the Netherlands, Italy, Kenya, India and Australia.

Export: Bolivia is the biggest exporter by far, mainly to the US. The rest goes to Europe (especially France, Germany and the Netherlands).

Height:
0.7 to
3 metres



CHOCO-QUINO

In collaboration with Wageningen UR Chile, Wageningen UR Food & Biobased Research is trying to extract the protein from the quinoa seed in order to create new, healthy food products. 'An isolated protein gives you more freedom,' says project leader Marcel Minor. 'We could make cheese with it, for instance, or sports drinks, custard, meat substitutes or baby food.'

The research group is currently experimenting with what is known as dry fractionation. This involves grinding the quinoa seeds into a powder through which air is blown: this is called wind sifting and it separates light particles from heavy ones. 'By doing this we hope to get fractions with high and low protein levels.' If the researchers succeed in extracting the protein from the seed efficiently, they will identify its characteristics: does it bind well, does it offer solidity? 'Once we have an idea about that, we can set about developing healthy products.' Three Wageningen students of Food Technology already did this last year. They extracted quinoa protein from waste water from quinoa processing and made a chocolate milk from it, intended for the local population. Their product, Choco-Quino, won them second prize in the EcoTrophelia, an annual European competition between teams of students tasked with

developing a new and sustainable nutritional product.



'This is a decisive year for quinoa farming in the Netherlands'

China, Vietnam and Chile. 'Our research and that of others shows that quinoa plants thrive in brackish areas. When fresh water is mixed with half seawater, the plants still produce the same number of seeds as they do with fresh water alone. Not many crops can match quinoa in that,' says Van Loo. Within the 'Securing water for food' programme run by USAID (US Agency for International Development, SIDA (Swedish International Development Cooperation) and the Dutch ministry of Foreign Affairs, PRI is in line for 600,000 dollars in funding for establishing quinoa farming in the deltas. Van Loo: 'We want to experiment first on a small plot of land and then after three years set up the same as in France. AbbottAgra is involved in this as well.'

So it looks as though quinoa is heading for a glorious future. Besides the established quinoa farming in South and North America, and the new initiatives in Europe and Asia, a few African countries have also started growing quinoa. Could quinoa become just as important a crop as rice, potatoes, maize or soya? The world food organization FAO would like to see that. It declared 2003 the international year of quinoa because the crop could play a major role in combatting hunger, undernutrition and poverty. But Van Loo thinks that large-scale quinoa cultivation is not realistic at present: the yields per hectare of quinoa are still much too low. They vary from 500-600 kilos per hectare in Bolivia to 2500 to 4000 kilos in Chile and Europe.

'Production of wheat, potatoes or maize, for example, is twice that.' For the time being, quinoa is still an exclusive product, comparable with something like Basmati rice. But, concedes Van Loo, never say 'never'. 'Through further research and breeding, we can of course raise production.' Should quinoa's success continue, it will mean a nice windfall for Wageningen UR, given that PRI has the breeding rights. 'Oh well, we get a small percentage of the retail price,' says Van Loo, to put that in perspective. But he acknowledges that if the amount of land under quinoa increases, it could become an interesting proposition. 'A few more researchers could get to work on it in that case.'

PRICE TRIPLED

The farmers in South America are doing well out of the current interest in quinoa. The price per kilo has tripled since 2006. But *The Times* and *The Guardian*, followed by the Dutch daily papers, have raised questions about the down sides of this boom. The price has gone up so much that the poor local population can no longer afford to buy quinoa, to the detriment of their diet. Instead of the highly nutritious quinoa, local people have started eating less nutritious staples such as pasta and rice. Growing quinoa is also said to cause soil depletion, erosion and disruption of the water table. Van Loo wonders whether this story is not exaggerated. 'In the city people don't eat quinoa; they look down on it there, and high in the Andes nearly everyone is involved in



PHOTO HOLLANDESE HOOGTE

Harvesting quinoa plants in Oruro, Bolivia.

quinoa farming. So you would expect people there all to be benefiting from the higher quinoa prices.'

As for the environmental damage, Van Loo has his doubts. Danish agronomist Sven-Erik Jacobsen sounded the alarm on this in an article in 2011. The areas where quinoa is grown are in danger of turning into deserts, he claimed in *The Journal of Agronomy and Crop Science*. But fellow agronomists do not think this warning accurately reflects the facts, as they wrote in a response in the journal. So far, there is no question of soil exhaustion.

But Gerdien Seegers of aid organization Cordaid has her doubts. Up until the end of 2012, she was involved in a project in Bolivia aiming at strengthening the quinoa chain. The Dutch embassy focused mainly on export. 'We and other NGOs wondered whether that was such a good idea. Can the highlands cope with that extra production? It is a fragile ecosystem. There is only a thin layer of fertile soil, which is very vulnerable

to wind erosion, especially if quinoa is grown on it. And in 2012 the growers' organization ANAPQUI sounded the alarm about the declining harvests and the monoculture that was growing up in the highlands.'

In 2013 the Netherlands ended its development aid to Latin America rather abruptly. That put an end to the quinoa project. 'A lot of money was invested in it by the Netherlands,' says Seegers. 'It would be useful if a study could be done on the socio-economic and ecological effects of that. Some farmers will certainly have done well out of it, but there were also conflicts with villagers with little or no land.'

POOR BOLIVIANS

Consumers who are afraid of snatching quinoa away from poor Bolivians will soon have an alternative, says Van Loo: quinoa from France, England, Germany, and soon perhaps the Netherlands too. Kuijten of

the Dutch Quinoa Group: 'This will be a decisive year. The current state of affairs is hopeful: cultivation is going well for one third of the farmers, reasonably for one third, and badly for one third. If it stays like that until the harvest, we shall carry on. Because we know why it's not working well for one third of the farmers. It's mainly to do with the choice of field, the preparation of the soil and the fertilization.' Kuijten would like to see growth to 1000 hectares within a couple of years, which would make it possible to meet current Dutch demand. Farmer Donker in Middenmeer is quietly watching developments. 'I am curious what the harvest will be like. The seed heads are vulnerable to wind and hail, so there is a danger of the seeds falling on the ground. We shall see.' But for him, a poor harvest would not be a reason to stop straightaway. "One year is not a year," we farmers always say.' ■

www.wageningenur.nl/en/quinoa