

Quinoa, a Seed Crop from the Andes Region

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Quinoa potential

One of the most important Andean crops is quinoa (*Chenopodium quinoa* Willd.), which is a very nutritious seed crop [1] of high tolerance to drought, frost, saline soils and other adverse factors [2, 3, 4]. The production of quinoa is traditionally done for food security reasons, but now the global market demand of quinoa is rapidly increasing. The main problems for satisfying this increasing market demand are related to an intensified production, which may cause soil fertility and depletion of water to increasingly constrain agricultural production [5, 6]. As the focus on the export market is likely to increase production risks, it raises the question as to whether a choice must be made between maintaining a diverse production system for food security at home or a certified organic quinoa production for export. The role of quinoa for either production for sale or subsistence is fundamentally different, so development efforts should not be limited to deal with only increases in production and yield, but also in an increasing commercial competitiveness of the sector, and quality of the produce [7]. The two factors of importance are food security (variety diversity stabilises yield), and market sale (specific quality demanded by market).

A study performed in Peru 2003-2006 considered it important to have a local as

well as an international market for quinoa in order to sustain production and development. From estimations on the local market opportunities, it became clear that quinoa was regarded as low status food by the Peruvian consumer. A part of the explanation was that quinoa is often sold with impurities and not washed adequately, making it less attractive and the preparation more time-consuming. Secondly, it was surprising to discover how hidden away the quinoa was for the tourists. In total 1 mill. tourists visit Peru each year, which represents a large domestic potential market. Furthermore, once the tourists have been exposed to quinoa in Peru, they may look for it in their home countries after returning.

Due to the growing interest in the crop, work on quinoa is on-going in several European countries [8], and the general perception is that it should be considered as a possible crop in temperate climates holding a promising potential in organic farming. Quinoa has been selected as a potential new protein crop for organic feed in Denmark. Trials in Denmark have demonstrated seed yields of 2-3 t ha⁻¹ with 12-16% protein content and 6-8% oil. Seed yields, however, have varied considerably among years and locations, because the establishment of the crop, weed control, harvest, and post-harvest techniques have not yet been optimized.

Materials and methods

Two experiments were carried out in 2004 and 2005. Both experiments included three passes separated in time of either inter-row hoeing or weed harrowing, and the experiment in 2005 also included false seed-bed as an experimental factor.

Results

Denmark

Hoeing and harrowing improved seed yield significantly in both years, however, hoeing gave higher yields than harrowing (Fig. 1). Weed dry-matter was reduced significantly by hoeing and weed harrowing, but hoeing was more efficient than harrowing. There was no difference between years on neither

yield level or effect on yield from hoeing and harrowing. The reduction of weed dry-matter was also unaffected by year. Protein content in seeds was lowest when weeds were not controlled, while an efficient control secures a significantly increased protein content in the seeds. Weed harrowing is not sufficiently effective to replace inter-row hoeing in quinoa, when the crop is established at 50 cm row distance. Weed harrowing, however, has a potential to supplement inter-row hoeing in wide spaced quinoa or as a sole control method in narrow-rowed quinoa. It may be a combination of weed control with crop management systems that will provide acceptable levels of weed control in the future in quinoa.

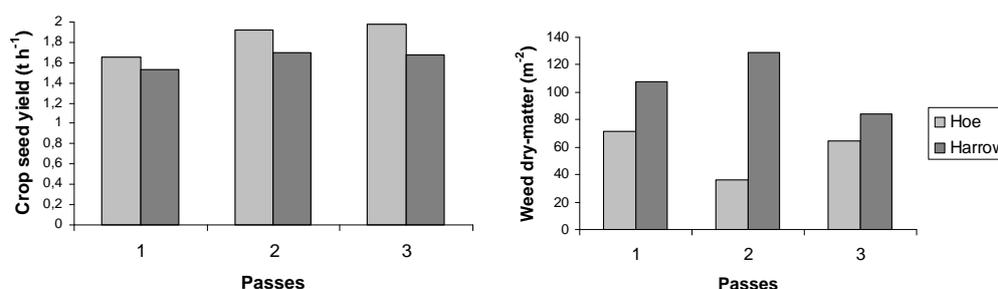


Fig. 1 Effects of increasing number of passes with the hoe and the weed harrow on yield (left) and weed dry-matter (right) (means of two years).

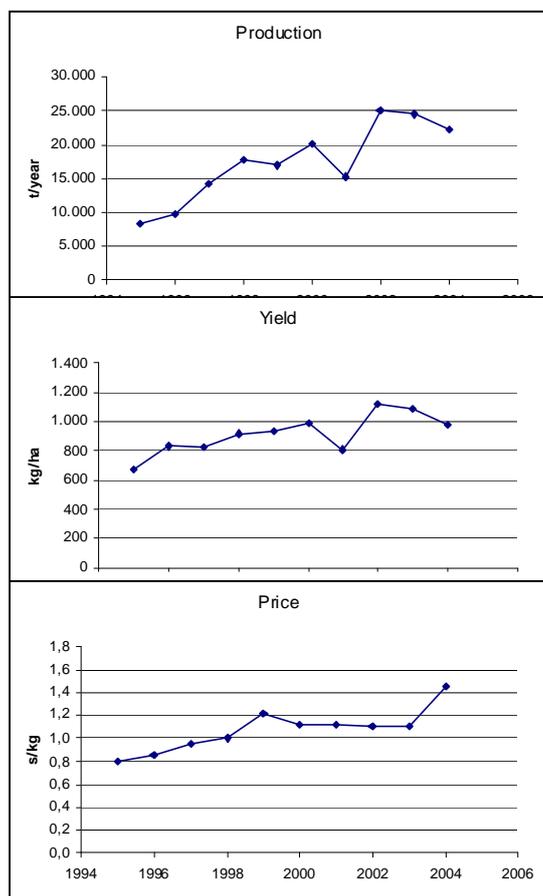
Peru

The objective was to optimize the farming system, and to perform a market study for identification of actual and potential markets for quinoa. To overcome the problems mentioned in the commercialization of quinoa we must secure the supply, that is volume, stability and quality. Production should be secured by improving soil fertility, optimizing the use of water for crop production, introducing natural pest control, utilizing the diversity of quinoa to obtain plants resistant to pests and adverse environmental conditions, and using seed of good quality. The philosophy was to establish work with farmers' leaders in

farmers' fields and at research stations of the national research institution of Peru, INIA, both serving to test new technologies and acting as training centers for the participating farmers and the nearby communities. The success would depend greatly on the interest shown by the local population and on the strategies used to incorporate all stakeholders from the initial stages.

Governmental entities involved in production of quinoa, such as the regional offices of the Ministry of Agriculture, responsible for the Production Chain of Quinoa in Puno, 3800

masl., were collaborating with the project. The Ministry was playing an important role in training, organization and generation of market information for the farmers involved in the production of quinoa, being present in farmers' communities. A collaboration was established with the international NGO CARE, with much experience in the organization of farmers, especially for production and marketing of quinoa, and with the National University of the Altiplano, Puno, with research experience in farming systems and uses of quinoa. The increase in production, yield and price, over the duration of the project, is demonstrated (Fig. 2).



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