

Bioversity International's series of Impact Assessment Briefs aims to inform readers about the major results of evaluations carried out by the centre. The Briefs summarize conclusions and methods of more formal papers published in peer-reviewed journals.

From 2002-2005, Bioversity International and partners carried out a project on medicinal and aromatic plants in Yemen to enhance the conservation and use of neglected and underutilized crops (NUS). Farmers from 13 communities in three different ecological zones took part in the project, which involved several different activities intended ultimately to raise incomes through the cultivation and marketing of henna, coriander, cumin and nigella. In 2008, three years after the end of the project, an *ex-post* impact assessment study found that the farmers had adopted the project interventions and integrated them into their practices, thus ensuring a sustainable outcome. The assessment showed that farmers who participated in the project benefited, compared to those who did not participate, and that the benefits were sufficient to induce farmers to continue to use the chosen species as important components in their livelihoods after the project ended.

BACKGROUND

Many different species and local landraces have been described as 'minor crops' or 'NUS' from the point of view of researchers and development workers, often because they have not been the subject of research for development efforts, or because their socio-economic potential is not

being exploited by scientists, development workers and policy makers. These crops, however, are far from minor or neglected in the lives of the rural poor, particularly for vulnerable groups such as children, women and the elderly. NUS and minor crops can be a key livelihood asset for the rural poor, and are often better adapted to fragile and marginal environments than the major commodity crops that are the focus of so much research.

Nevertheless, for a variety of reasons, many communities are not taking advantage of these crops. Bioversity, supported by the International Fund for Agricultural Development (IFAD) and working together with local partners, has been working on a series of efforts in a variety of strategically important countries. From 2002 to 2005 the project worked in Yemen, where the use of medicinal and aromatic species has a long history and forms an important part of the local culture.

Yemen, in the south of the Arabian Peninsula, is one of the poorest countries in the Arab world, with 45% of the population living below the poverty line and 80% of the poor in rural areas. The economy is heavily dependent on diminishing oil reserves, which have benefited town dwellers more than rural people. Furthermore, in many areas rural people face uncertain and variable water supplies, and investment in agricultural development has been minimal. Against that, Yemen has a rich diversity of almost 300 endemic plant species and a centuries-old tradition of using medicinal and aromatic plants.

The project focused on four of these: henna (*Lawsonia inermis*), nigella (*Nigella sativa*), coriander (*Coriandrum sativum*) and cumin (*Cuminum cyminum*). Henna is used as a cosmetic and the other three as spices, and at the start of the project they were not contributing to farm incomes. These species were chosen because of their good potential for increased use, the likelihood of genetic erosion, their potential to contribute to incomes and their cultural significance.



Researchers from the Yemeni Ministry of Agriculture at one of the yield trials organized by the IFAD NUS project. Photo: S. Padulosi/Bioversity.

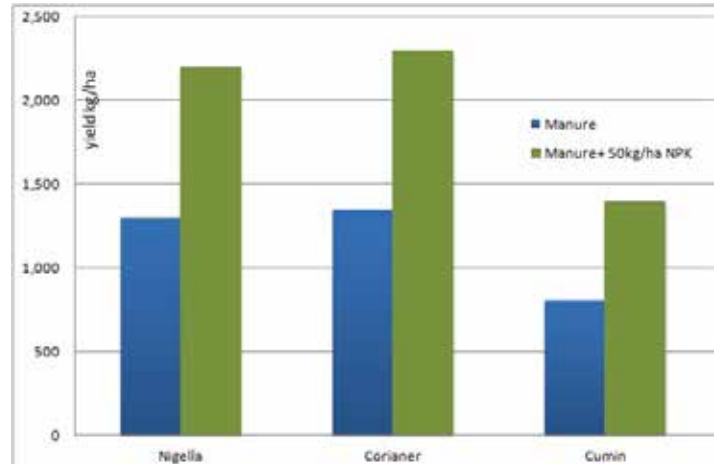
PROJECT GOALS AND ACTIVITIES

The project goal was to contribute to strengthening food security and raising the income of smallholder farmers by exploiting the full potential of the genetic diversity contained in the target species.

Working with the Ministry of Agriculture and the Yemeni Agricultural Research and Extension Authority and local communities, project staff identified constraints to the use of these species and developed a set of activities that were implemented at 13 sites spread across three different ecological zones. Difficulties of access, lack of infrastructure and security concerns resulted in fewer project activities taking place in the Coastal and Plateau areas than in the Highlands.

One constraint to greater use of the target species was the lack of germplasm and of traditional knowledge about opportunities for better use. The project therefore planned to introduce *ex-situ* and on-farm conservation to improve seed supply. Seeds were purified and stored in genebanks and then transferred to chosen farmers to multiply for bulk sales of clean seed through farmer cooperatives. Meetings, informative diversity fairs and national workshops, in combination with the improved seed supply, increased awareness of the opportunities associated with the target species. To enhance productivity, farmers in the Central Highlands carried out fertilizer trials, adding NPK to their standard manure regime. Fertilizer, along with other improvements in agronomic techniques, almost doubled the yields of the target crops (see graph 1 opposite). Local extension agents, worked with the project in the target sites to document traditional knowledge of the species in

“The target species remain minor in terms of land [...] but the number of farms growing them increased considerably over the duration of the project.”

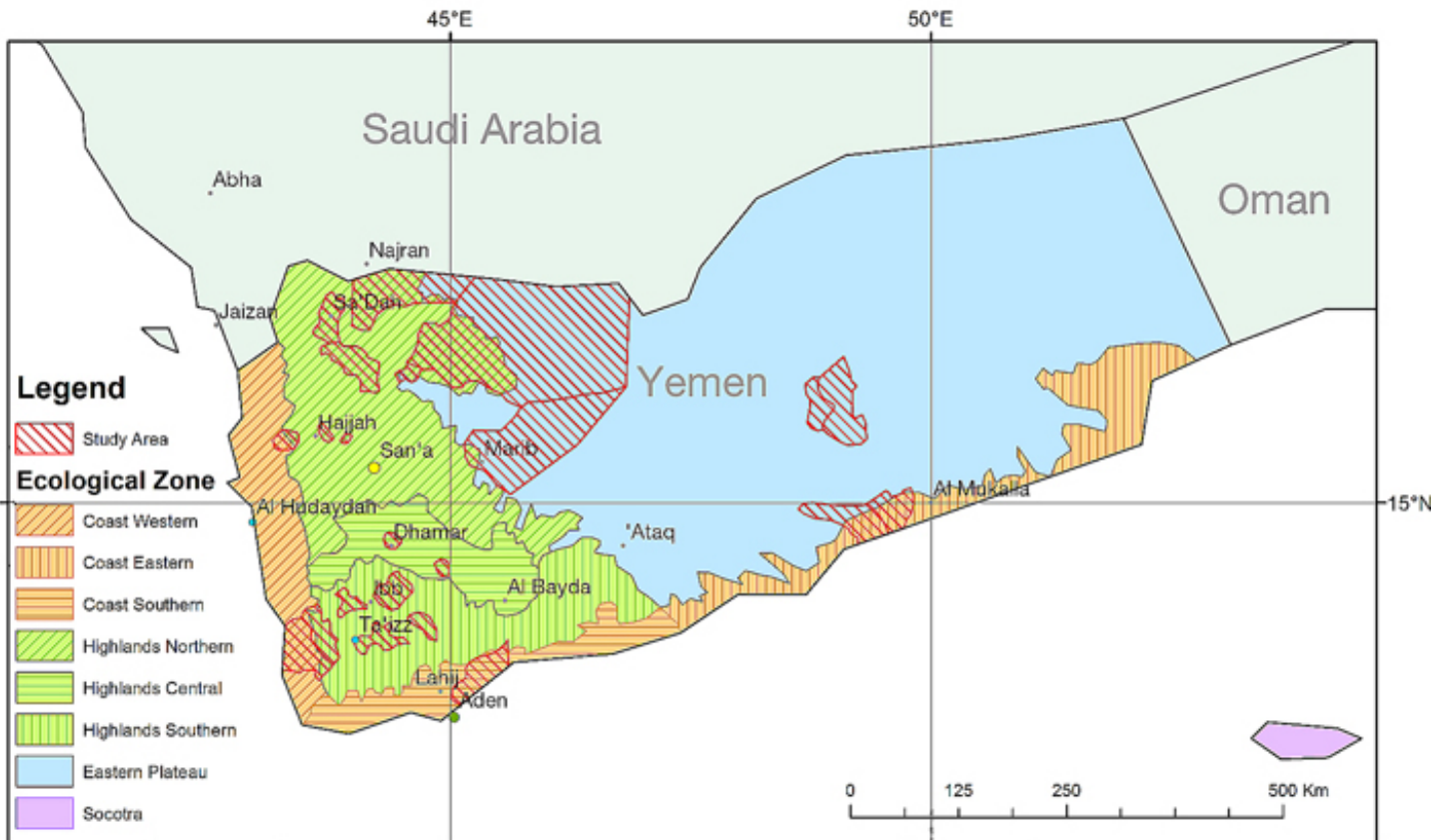


Graph 1. Crop yields under different fertilizer treatments.

terms of both agronomy and post-harvest processing, and to devise tailored training courses to improve all aspects of cultivation. All activities were intended ultimately to contribute to raising incomes.

STUDY METHODS

The impact assessment set out to ask whether participation in the project did indeed improve livelihoods. To do so, it used a quasi-experimental design, selecting a control group from a larger survey and matching it with the treatment



The location of the study areas in Yemen.

group. Researchers surveyed 148 randomly-selected households in the project sites, 61 of which had participated in the project (treatment group) while the remaining 87 had not. The questionnaire asked households about social and demographic factors, household wealth, agronomic activities, and gender issues, household decision making and social engagement. One limitation of the study was that the original project did not collect baseline data. Researchers thus had to rely on recall, a difficult task for some households.

An important element in the evaluation is the correct determination of causation. In particular, while we may observe correlations between participation in the programme and various outcomes, these may be the result of extraneous factors, such as omitted variables, sample selection and simultaneous causality, where both participation and outcome were influenced by a third factor. To get around these difficulties the evaluation adopted a simultaneous multivariate probit analysis (see full paper for details). In essence, the analysis asked whether the likelihood of a household perceiving an increase in yields in the target crops depends on participation in the project. It took into account a large range of variables, including livestock assets, age, education, geographic region, farm size, tractor ownership, prior production of medicinal and aromatic plants, production of other crops, availability of irrigation and capital assets.

PROJECT IMPACT

Looking at changes from 2002 to 2007, almost all farms showed an increase in the diversity of crops grown, not only for the target species, but for other species too. The target species remain minor in terms of land, occupying less than 20% of the cultivated area in aggregate in 2007, but the number of farms growing them increased considerably over the duration of the project, by 43% for coriander, 46% for henna, 83% for nigella and 120% for cumin. Yields of the target species increased too, more than trebling for cumin. Farmers grew these species for their own use and to market, and the income derived from market sales increased for coriander (+40%), nigella (+54%) and cumin (+80%). Income from henna declined (-13%) despite the increase in the number of farmers marketing it and higher yields. This drop relates to the sale of dry henna leaves, generally for export; the income from fresh leaves sold locally increased.

The probit model also yields interesting insights into the success of the project. For example, socio-economic status and farm size did not determine whether households would participate in the project. Rather, past experience growing medicinal and aromatic plants was a major determinant, as was the household's ownership of livestock. Furthermore, households that did participate in the project were more likely to increase yields both of the target species and of other crops than households that did not participate. Having an irrigation system increases the probability of growing the target species but not other crops, while having other agricultural assets, such as a tractor, influences the growing of other crops but not the target species.

“ Participation in the project directly increased perceived yields, indicating the overall success of the project in transferring knowledge ”

Overall, a household that participated in the project had a propensity of around 36% to increase the yield of target species and of other crops, compared to households that did not participate. The increase in perceived yield results in increased consumption within the family, which is likely to improve people's well-being. It also increased marketing opportunities, and income generated by marketing is also likely to improve well-being.



A boy in a field of flowering *Nigella sativa*. Photo: S.Padulosi/Bioversity

LESSONS LEARNED AND RISK FACTORS

The role of gender in the conservation and use of the target species is vitally important. The evaluation analysis confirmed that decisions about financial matters and expenditures are made mostly by men, who are the main cash earners. However, the survey revealed that while predominantly husbands take decisions on **whether** to grow the target species, their wives lead in **how** the species are actually produced, weeding, harvesting, cleaning, processing and selling in local markets. Conditions for women in Yemen are among the worst in the world, with a legal framework that restrains their access to resources and blocks entrepreneurship, leaving unpaid agricultural work as one of their few options. The crucial role of women in decisions about medicinal and aromatic plants, and the importance of these species for household incomes and, by extension, health and well-being, suggest a need for further research to understand gender roles and to empower women.

The decrease in income from the sale of dry henna leaves, which are mainly sold for export, while income from local sales of fresh leaves increased, suggests a need in this crop to focus on post-harvest handling and the entire value chain to improve competitiveness. Further research and development could improve the contribution dried henna might make to incomes among poor farmers in the Eastern Coast region, the main area of henna production.

This brief is based on Gotor E., Caracciolo F., Blundo Canto G.M. and Al Nassiri M. 2012. *Improving rural livelihoods through the conservation and use of underutilized crops: evidence from a community research project in Yemen*. Bioversity International.

Citation: Gotor E., Cherfas J. 2012. *Medicinal and aromatic plants improve livelihoods in Yemen*. Bioversity International Series of Impact Assessment Briefs, no. 9. Bioversity International, 4 p.

For further information please contact
Bioversity International Impact Assessment Specialist
Dr Elisabetta Gotor (e.gotor@cgiar.org)

DECEMBER 2012

CONCLUSIONS

Participation in the project directly increased perceived yields, indicating the overall success of the project in transferring knowledge and providing information on agronomic practices and market opportunities related to growing medicinal and aromatic plants. The benefits prompted farmers to make these practices part of their routine operations, indicating that the project outcomes were sustainable. The overall cost of the project was USD105,000 over three years. While we do not have final figures for the increase in incomes, it seems likely that the cost:benefit ratio is favourable.

One reason farmers do not conserve agricultural biodiversity is that they derive no private benefits from such conservation. Bioversity's approach, which develops value chains by reviving and improving traditional agricultural knowledge, along with marketing strategies, promises greater income for farmers from the use of agricultural biodiversity. This approach thus not only has great potential to improve rural livelihoods but also, by doing so, to enhance the conservation of agricultural biodiversity.



Bioversity International is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future. www.cgiar.org

Bioversity International
Via dei Tre Denari, 472/a,
00057 Maccarese, Rome, Italy
Tel.: (39) 0661181
bioversity@cgiar.org
www.bioversityinternational.org

This work by Bioversity International is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.