

NUTS – A HIGH-VALUE, NUTRITIONAL CROP FOR

INCOME GENERATION IN RURAL AREAS

A promising value chain in the context of climate change and labour migration – recommendations from the nut initiative in Nepal

WHY NUTS? Nuts are a cash crop that can support income generation and improve nutrition in rural areas. Different nut species grow in different climatic zones. Nut trees are grown as orchards, intercropped, and planted along fields or as individual trees. For some families, even one tree can give a whole month's paid labour. Once the trees are planted, the expected inputs are low. With the right variety and optimal orchard management, nut trees can become a long-term, sustainable source of income. Moreover, sun-dried nuts can be stored in shell for up to several months adding to nutrition and off-season income. Due to the small volume and high price, transportation costs per kilo are low. With regard to the market, global statistics show that nut consumption has been growing, especially in middle-income countries.



NUT CULTIVATION IN NEPAL

Nuts have a high nutritional and economical value, are a climate resilient crop and low in required labour, addressing three current major issues of concern in Nepal: income generation, climate change and labour availability. In Nepal, walnuts have a traditional value during the main national celebrations and are valued by producers as an additional source of income. Macadamia nut trees were established in 1970s and have gained popularity in the last decade. Other nuts are consumed in urban areas as a specialty, yet, apart from a small percentage of walnuts, they are imported from abroad.

Nut trees can be grown in agroforestry systems, which in the context of increased climate-induced water stress and hazards, are a promising option for agricultural diversification and increasing resilience. The small-scale production of nuts is perceived to be very suitable for women and older people as the required labour is low, and the potential income generation high. This is particularly desirable in the context of high labour out-migration by men. Globally, nut production has been increasing in the past decade (see statistics to the right), which is mostly due to growing demand in middle income countries and the research efforts on health benefits of nuts.

In this context, HELVETAS Swiss Intercooperation Nepal initiated a 3.5-year research and pilot implementation initiative in 2014. The aim of the initiative was to investigate and understand the following:

- 1. Current and future climatic suitability for nut trees
- 2. Livelihood analysis: why do farmers grow nuts?

3. Impact of climate change on land-use zones and forest management boundaries

4. Pilot interventions along the whole value chain were implemented based on the results of the livelihood analyses.



Global nut production 2006-2017. Source: INC 2017

NUTS

Nuts – is a general term used for almonds, brazil nuts, cashews, chestnuts, coconuts, hazel nuts, macadamia, pecans, peanuts, pine nuts, pistachios and walnuts. Technically speaking, almonds, cashew, coconuts, pecans and pistachio are stone fruits (also called drupe fruits). Brazil nuts are capsule fruits. Peanuts are groundnuts which means that seeds ripen underground, belonging to the pea family. Pine nuts are seeds. Only hazel nuts, chestnut, macadamia and walnuts belong to the "true nuts". Yet some botanists disagree arguing that walnuts belong to the stone fruits.



First macadamia grafting training for nursery entrepreneurs learning from an Australian farmer, Kavre, Nepal

METHODOLOGY AND RESULTS

1. Current and future climatic suitability for nut trees: temporal and geospatial modelling

Methodology: GPS measurement of trees, literature review, analysis of climate data at present and in future using ArcGIS

The results show that the climate in Nepal is suitable at present and in the future (2050) for growing both macadamia and walnuts across much of the country: the former in the lower and the latter in the higher elevation. However, suitable areas shift considerably in spatial and altitudinal terms. That is, some currently suitable, low elevation sites will become too hot by 2050, and other higher elevation, currently moderately suitable areas will become optimal. We conclude that the consideration of macro- and microclimatic changes in agricultural planning is essential to long-term agricultural success in Nepal as both trees are productive for at least 50 years.

2. Livelihood analysis to understand farmers' reasons for deciding whether or not to cultivate nut trees in the context of climate change

Methodology: interviews with nut growers and farmers not growing nuts, statistical analysis (using R-language)

Our results show that most farmers are aware of climate change. They apply a variety of adaptation measures such as the selection of new varieties, improved techniques, leaving the land barren, or migrating to urban areas. In this context, nut cultivation is seen as an agricultural innovation correlating significantly with the ethnicity, wealth and "years of experience with fruit trees" of a farmer. The most common reason given by farmers for planting nut trees was to make money, with some further observing that nuts can be sold all year round due to their non-perishability. Other important reasons mentioned were the low labour input, the interest in own consumption, and the perceived low level of pests and diseases.

FARMER'S VIEWS

"I'm getting old. Soon, I will not be able to work hard physically. With nut trees, I will only have to pick the nuts. Therefore, the nut trees will be my pension".

"Many young men have left our village to find work abroad. We are short in labour, which leads to more barren fields. Our community has bought 200 macadamia trees and planted them last year instead of finger millet. Once planted, there will be very little physical labour required".

Overall, we conclude that nut cultivation is an accepted and promising cash crop mostly grown by wealthier households. In order for poor, landless or women-headed households to benefit, alternative business models and new policies must be explored and developed.



Suitability of macadamia and walnut cultivation at present in Nepal Source: Barrueto 2017

3. Impact of climate change on land-use zones and forest management boundaries: example of nut trees in Melamchi, Sindhupalchowk, Nepal

Methodology: field measurements, satellite imaginary, climate data, ArcGIS

Our research shows that for the Melamchi watershed the 'optimal' range for macadamia growth will increase. The most favourable change regarding land-use zone will be in forest, agriculture and shrub zones. We recommend planting grafted macadamia saplings as an intercrop or aiming at commercialisation by planting them in sparse forests, shrub or barren lands. In contrast, the 'optimal' range for walnut trees is projected to shrink in the selected area as the temperature is expected to increase.

Informing policymakers to adjust agricultural extension advice based on probable changes in suitability for cultivating different crops will promote farmers' adaptation opportunities and increase their resilience to changes in climate.



Walnuts are challenging to graft: Dhan Buddha shows his successfully grafted walnut tree, Jumla, Nepal







Nuts are sold in shell: woman at the bazaar, Jumla, Nepal

4. Pilot interventions: These were designed according to the challenges observed and needs expressed by the farmers, governmental bodies and private sector entrepreneurs.

Intervention	Main achievements
Hazelnut	 4 hazelnut research plantation sites were established. Survival rate after plantation is 92%. Hazelnut entrepreneurs have been trained in orchard management in collaboration with Mountain Hazelnut Venture, Bhutan.
Macadamia	 Macadamia grafting training was organised in 3 districts, with 92 farmers trained. Very low grafting success rate, attributed to the currently low quality of locally available rootstocks. Plantation of 165kg macadamia variety H2 in 12 nurseries locating in 7 different districts. Elaboration of teaching materials (video and visuals) for best practices in nursery activities. Facilitation of two pilot exports in collaboration with international traders and local business entities.
Walnut	 Grafting training in Jumla using 4 varieties with a success rate of 70%. Research on self-medication against gastro-intestinal nematodes in goats in collaboration with FiBL. Investment into the development of a machine to improve the production of local walnut oil in collaboration with ETH. The Swiss prototype was further developed and produced in Nepal in collaboration with the fabrication company Yantrashala. A field promotion with business model is in progress.



Testing prototype to crush and separate hard-shell walnuts, Jumla, Nepal

CHALLENGES WITH NUTS

Quality rootstock: is rarely available for macadamia and difficult to guarantee for walnuts. For a competitive harvest, grafted rootstock of a productive variety is a basic requirement.

Knowledge and technology: there is a lack of knowledge about the best practices of caretaking, orchard management and post-harvest practices of nut trees. In order to have well-producing trees and optimal harvest, farmers have to learn about the best orchard management and post-harvest practices.

Gestation time: trees take time to begin fruiting. This is a major challenge for both the production side (especially for poor farmers who need a quick return on investment) and the financial side (it is difficult to find investors or donors as the results and return of investment only starts after six years [macadamia] or eight years [walnuts]).

Pro-Poor and women friendly: trees are mostly planted and owned by men, although they can also be planted and owned by women. In addition, disadvantaged farmers generally have little suitable or available land for tree planting, and less access to quality trees. This gap has to be bridged in order to benefit women and poor, but in Nepal there could be options to work in community forestry (large areas of forest, often close to settlements, being under this management regime).

Policy: nuts are not yet part of a government programme. Therefore, basic services along the nut value chains including financial support are not present.

HazeInuts: wild hazelnuts (rigo okhar) are found in mountainous areas. Yet, there are few cultivated hazelnut plants available and a large challenge will be the volume.

Macadamia: the volume of harvested macadamia is too small for any immediate action regarding processing facilities. Moreover, investment is needed at the beginning for increasing the production and ensuring the quality and later to facilitate high-quality processing units.

Walnut oil: traditionally, walnut oil has been made over the winter by women for own consumption. The biggest challenge is whether walnut oil can be established as a niche product in the (inter-) national market despite the high production costs.

Walnut: farmers do not follow pruning practises. Consequently, trees grow large and nut harvesting becomes difficult. Walnuts are expensive in Nepal and are sold in shell. One challenge is the economic viability and competitiveness with import from the neighbouring country. Furthermore, high quality storage has to be ensured to avoid fungal infestation.



Children love the taste of nuts, girl opening a walnut, Jumla, Nepal

KEY LEARNINGS & RECOMMENDATIONS

The climate in Nepal is suitable at present and in the future for nut cultivation. However, before establishing larger orchards, the micro climate must be considered carefully to ensure ideal temperature and precipitation or available water for irrigation. This is particularly important in buffer zones between suitable and none suitable agroclimatic areas.

Interviews with farmers have shown that macadamia and walnuts are integrated into the current livelihoods: farmers either have some trees around their house or as intercropped orchards (e.g. macadamia with coffee or walnut with beans). Moreover, nuts are perceived to be very suitable where labour is scarce due to migration and/or farmers are elderly ("the old farmers crop"). Yet, high-quality rootstock and technical knowledge are rarely available. In addition, women, poor and landless farmers do not have the financial means to bear risks with new crops.

HELVETAS Nepal therefore recommend the following:

- 1) Technical backstopping to nursery entrepreneurs
- Ensure the availability of high-quality, recognised varieties of saplings in nurseries
- Technical support for orchard management (e.g. pruning), and elaborate post-harvest technologies
- 4) Seek options to bridge gestation period: intercropping with spices, legumes or staple crops as an interesting solution
- 5) Promote linkages between the private sector and financial institutions for long-term loans to establish orchards and for the instalment of processing units
- 6) Encourage development partners and policy makers to explore inclusive business models paying heed to disadvantaged members of rural communities

ECONOMIC COMPARISON

The table below presents a rough comparison of the economic potentials of established crops in Nepal. In comparison to vegetables, coffee and spices, nuts need fewer labour inputs and are a good response to aging and missing labour force in rural Nepal. Comparing the cumulative cashflow, macadamia, banana and walnut take the lead. Intercropping ginger, banana and macadamia could be a powerful solution for immediate and longterm income in rural Nepal. Perennial crops like nuts, require higher initial investments and access to capital remains a limiting factor for mainstreaming.

Calculation per Ropani	Seed	Inputs	Lease	Other	Lab	our	Tot Cost	Cost Production				Annual Cashflow				Cumulative Cashflow		
100NPR=1USD	USD	USD	USD	USD	Day	USD	USD	kg	Rate USD	USD	Yr 1	Yr 2-6	Yr 7-11	Yr 12+	12 yrs	15 yrs	20 yrs	
Cabbage	3.1	10.4	3.3	9.1	11	55	80.9	1387	0.13	180.31	\$99	\$99	\$99	\$99	\$1,193	\$1,491	\$1,988	
Cauliflower	1.3	11	6	7.9	12	60	86.2	795	0.19	151.05	\$65	\$65	\$65	\$65	\$778	\$973	\$1,297	
Potato	44.4	9.6	6	8.8	8.8	44	112.7	1112	0.24	266.88	\$154	\$154	\$154	\$154	\$1,850	\$2,312	\$3,083	
Tomato	4.3	8.3	4.2	11	12.5	62.5	90.2	1214	0.245	297.43	\$207	\$207	\$207	\$207	\$2,487	\$3,108	\$4,145	
Rice	0.6	5.3	4.2	7.4	6.3	31.5	48.9	173	0.24	41.52	(\$7)	(\$7)	(\$7)	(\$7)	(\$89)	(\$111)	(\$148)	
Wheat	2.3	2.1	4.2	6.2	3.8	19	33.7	203	0.21	42.63	\$9	\$9	\$9	\$9	\$108	\$134	\$179	
Maize	0.3	2.1	4.2	7.1	4.7	23.3	37	220	0.18	39.6	\$3	\$3	\$3	\$3	\$32	\$40	\$53	
Millet	1.2	1.3	4.2	5.5	4.5	13.5	25.6	132	0.29	38.28	\$13	\$13	\$13	\$13	\$153	\$191	\$254	
Ginger	72.8	11.5	8.3	10.9	7	35	138.4	617	0.53	327.01	\$189	\$189	\$189	\$189	\$2,263	\$2,829	\$3,772	
Turmeric	53	2.5	8.3	9.2	7	35	108	516	0.255	131.58	\$24	\$24	\$24	\$24	\$283	\$354	\$471	
Apple yr 1	6.3	9.9	10	27.6	3.6	18	71.8	-	-	-	(\$72)	-	-	-	-	-	-	
Apple yr 2-6	-	15	10	24.8	2.4	12.2	61.9	150	0.38	57	-	(\$5)	-	-	-	-	-	
Apple yr 7-11	-	19.8	10	32.5	3.2	9.7	71.9	645	0.38	245.1	-	-	\$173	\$173	\$943	\$1,462	\$2,374	
Banana yr 1	6.6	7.1	10	24.8	4.5	22.5	71	-	-	-	(\$71)	-	-	-	-	-	-	
Banana yr 2-6	-	8.9	10	18.8	3	15	52.7	1023	0.3	306.9	-	\$254	-	-	-	-	-	
Banana yr 7-11	-	8.9	10	18.8	3	15	52.7	1155	0.3	346.5	-	-	\$294	\$294	\$2,963	\$3,844	\$5,577	
Coffee yr 1	15	35	10	-	9.6	48	108	-	0.83	-	(\$108)	-	-	-	-	-	-	
Coffee yr 2-6	-	18	10	2	13.4	67	97	170	0.83	141.1	-	\$44	-	-	-	-	-	
Coffee yr 7-11	-	25	10	-	17.6	88	123	300	0.83	249	-	-	\$126	\$126	\$868	\$1,246	\$2,491	
Macadamia yr 1	80	5.6	10	5	3.2	16	116.6	-	-	-	(\$117)	-	-	-	-	-	-	
Macadamia yr 2-6	-	4	10	10	2	10	34	11.2	4.2	47.04	-	\$13	-	-	-	-	-	
Macadamia yr 7-11	-	7.2	10	10	3.2	16	43.2	124.8	4.2	524.16	-	-	\$481	\$763	\$3,117	\$5,637	\$10,341	
Walnut yr 1	6	2.1	10	5	1.5	7.5	30.6	-	-	-	(\$31)	-	-	-	-	-	-	
Walnut yr 2-6	-	4.3	10	8	1	5	27.3	-	4	-	-	(\$27)	-	-	-	-	-	
Walnut yr 7-11	-	6.0	10	10	2.5	12.5	38.5	25.2	4	100.8	-	-	\$62	\$202	\$346	\$1,606	\$4,906	

1 Hectare = 20 Ropani Seed: roostock or seed Inputs: manure, chemicals Lease: 10USD/year for one ropani Other: machine incl. depreciation, water pump, bullocks Labour cost: 5USD/day (equal salary for men and women) Annual cashflow: for one season, (\$) is the negative income Cumulative cashflow: accumulated income Source: Government of Nepal 2017: www.mrsmp.gov.np/en/publications, CoPP Study and HELVETAS Nepal 2017

NUTS IN OTHER COUNTRIES

Each country has an optimal climate for nuts. Recommendations for climatically suitable nut value chains in other countries include: Bolivia: almond, brazil nut Ethiopia: cashew, macadamia Guatemala: macadamia Kyrgyzstan: almond, walnut Laos: macadamia intercropped with coffee Mozambique: cashew, macadamia, peanut Myanmar: macadamia Pakistan: almond, pine nut, walnut Peru: brazil nut, pecan Tajikistan: almond, pine nut, walnut Sri Lanka: cashew, maccadamia intercropped w. coffee Vietnam: cashew, macadamia intercropped w. coffee

REFERENCE

This research was financed by HELVETAS Swiss Intercooperation as a strategic fund project under the name: "Foster Climate Resilience of Horticulture Tree Crops and Value Chains".

Author:



Andrea Barrueto Market System Development Support: Alok Shrestha Ananda Parajuli Bhola Shrestha Hari Gurung Sandip Poudel Juerg Merz

HELVETAS Swiss Intercooperation

Weinbergstr. 22a, PO Box 3130, CH-8021 Zurich Maulbeerstr. 10, PO Box 6724, CH-3001 Bern rec@helvetas.org, www.helvetas.org

