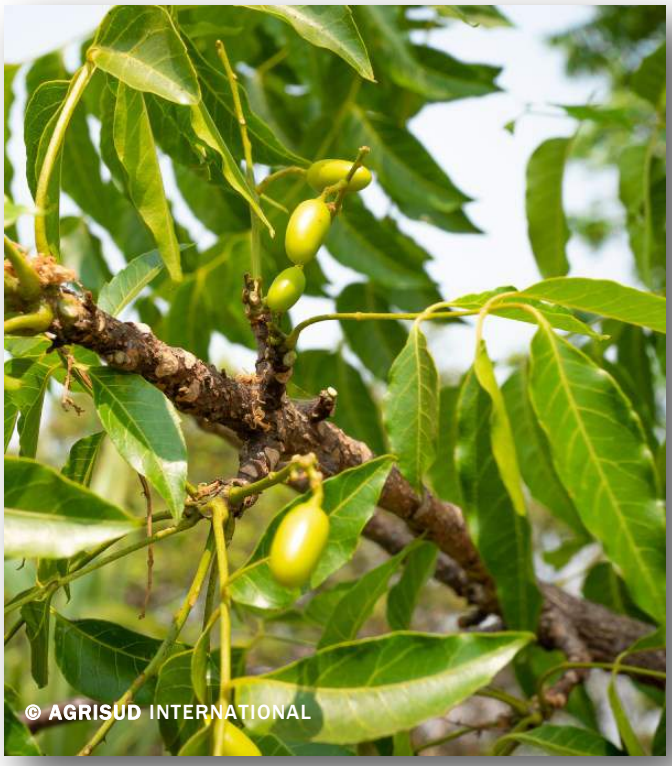
Capitalization sheet

Production of Neem-based bio-pesticide



- Harvest of ripe fruits and transport
- Drying and storage of neem fruit
- Grinding, packing and storing
- Use and preparation of Neem solution
- Results

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Capitalization sheets produced within the framework of the Agro-ecological Intensification and Diversification of Peri-urban Agriculture Project in Siem Reap Province, Cambodia (IADA phase 1)

Production of Neem-based bio-pesticides

Method sheet N°7

The development of bio-pesticide production activity is aimed for the local market and serves 4 main causes:

Firstly, allow the restoration and protection of Neem trees for their contribution to biodiversity and ecosystem services, by valuing them through their economic potential.

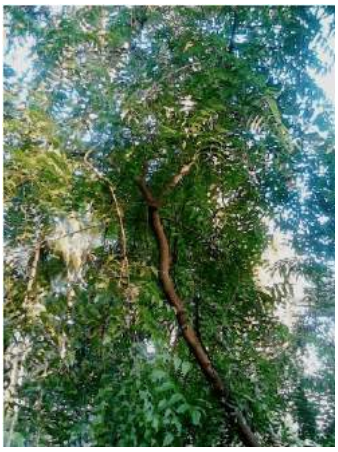
Secondly, extend the scope of activities (hitherto focused on vegetable and fruit production) in order to diversify the sources of income and thus ensuring economic security for producers.

Thirdly, strengthen knowledge and skills related to pesticide production within the producers group.

Fourthly, support Agrisud's agroecological practices by providing farmers with alternatives to costly pesticides on both financial and environmental terms.

In addition, Neem is commonly found in the Indian subcontinent and in the dry regions of South Asia, making it a good local resource for biopesticide production.

Description methods/tools



Azadirachta indica tree

Neem ripe fruits

The processing zone is located in the production area of Neem (Banteay Srey), in a building built on the site of one of the producing members.

The manufacture of biopesticide has 4 main steps:

⇒ Step 1: Harvest of ripe fruits and transport

⇒ Step 2: Drying and storage

⇒ Step 3: Grinding, packaging and storage

A team of 7 people is responsible for the entire process (steps 1 to 3) over the full production period.

Step 1 : Harvest of ripe fruits and transport

The harvest is done in April / May, before the rainy season (in Cambodia) and 4 months after flowering. Indeed, at this time, the fruits are ripe (yellow in color) and ready to be harvested on the trees of the plantation. During these 2 months, the team proceeds daily, according to the degree of maturity of the fruits, to their collect and transport. It is estimated between 20 and 30kg of fruits harvested per tree.

Several techniques can be used for harvesting:

⇒ It is possible to use a stick to bang on the branches and thus make the ripe fruits fall

Analysis elements

> The branches of Neem tree can be fragile, so be careful when climbing to avoid accidents.

> The drying time is to be adjusted according to the thermal capacity of the ground support materials (cement, soil, or other), the hygrometry, the duration of sunshine and the outside temperature. In fact, the drying times indicated are only approximate.

> Humidity control is critical for good fruit conservation. In the absence of scientific data, it is important to refer to experienced personnel and if possible, to be equiped with a portable tester.

> At the beginning of April/May the rainy season begins, so it is necessary to foresee the possibility to cover the fruits quickly by means of a tarpaulin and to be able to transport them towards a covered zone if the rain occurs.

> When storing, ensure that the containers are protected from water and moisture to prevent the growth of certain germs.

⇒ You can also climb on the tree with a ladder and shake the branches to bring the ripe fruits down.

The tarpaulins placed on the ground make it possible to collect the falling fruits.

The harvest is then placed in baskets or bags and transported by bicycle or motorbike (depending on the vehicles available) to the drying area.

Step 2 : Drying and storage of Neem fruits

After harvest, Neem fruits should be dried to be further grinded in Step 3. The fruits are dried on mats or tarps, by direct sun exposure, for a period of 20 to 35 days on average, according to hygrometry and drying conditions.

It is estimated that at a temperature close to 34°C, drying takes approximately 15 days if the ground support is made of cement, and 35 or even 45 days if the mat is directly laid on the ground.

To verify that the fruit has reached a satisfactory level of residual moisture, the team conducts a sensory analysis. The control is done by an experienced member who can define by touching the fruit if it is dry enough. It is therefore important that members are trained, otherwise they can also check residual moisture with a hand-held tester on a randomly defined sample. This step is crucial for the good conservation of fruits. It takes 5kg of fresh Neem to produce 1kg of dry Neem.

When drying is complete, the fruit should be stored immediately to prevent moisture from being absorbed. Closed containers should be used to prevent the entry of pests and moisture. Containers hermetic at best, or big bags in the alternative case, can be used for this purpose and stored, away from water (on a support), and in a ventilated area for a period of 1 year.

A summary table of the steps, their approximate durations, the material and human resources required is given at the end of the process.

Fruits drying in the sun

Storage of dry neem fruits

Analysis elements

> The powder loses in quality over time. It is therefore advisable to favor on-demand production to reduce storage time.

> It is important to condition the powder quickly after production to avoid moisture reuptake.

> The expiry date is not mentioned on the label because of the organization of production meant for short-term uses. However, in the opposite case, it would be wise to add it.

> Prolonged exposure to Neem particles can cause headaches, so it is important to work in a ventilated area and wear a mask.

Step 3 : Grinding, packing and storing

On demand, the dried Neem is grinded, then the powder obtained is packed in plastic bags after a few minutes to allow its cooling. A label indicating the name of the product, the conditions of use, the volume, and the logo is glued on each package. These pockets are then stored in a dry, cool and shade place.

The production area is ventilated (the mesh structure, mounted on a concrete slab is covered with protection nets, and protected by a sheet metal roof). Ventilation prevents workers from being intoxicated by Neem particles sprayed around during the grinding stage.

The team consists of a pair that has the capacity to produce 75kg of Neem powder over 8 hours of work per day.

Grinding

Storing

Summary table of each stage

Steps	Material	Human ressources	Time
⇒ Step 1: Harvest and transport	Wooden stick, tarpaulins, baskets or bags for transport, motorcycles / bicycles or other means of transport	7 people over 2 months of harvest for 300 trees	4h to harvest between 280 and 770kg per team depending on the region
⇒ Step 2: Drying and storage	Tarpaulins, airtight containers, or big bags	Same people than for harvest	See details
⇒ Step 3: Grinding, packing and storing	Grinder, generator (if no electric outlet), plastic pockets, labels, stainless steel spoon, masks	One pair	8h of work to grind and pack 75kg

Analysis elements

> The more fresh Neem's solution, the more effective it is.

> The solution is sprayed preferably in the evening after watering the plants, because its efficiency decreases with the sun. In addition, we should avoid watering the crops the day after the treatment so as not to "wash" the solution applied.

> The 5-days deadline period for stopping treatment before harvest is adjustable to 4 days according to the quality requirements followed.

> It is recommended to mix the preparation from time to time during the soaking phase to allow the powder to thoroughly infuse.

> The addition of soap is essential to allow the fixation of the solution on the leaves. The soap used is of the dishwashing liquid type.

Use and preparation of Neem solution

The solution, obtained from the dried Neem fruits, makes it possible to eliminate and to remove several kinds of flies, grasshoppers, beetles, larvae and caterpillars. According to the experience of Agrisud Cambodia, neem powder is particularly effective on insects such as caterpillars, leaf beetles, whiteflies, leafhoppers, aphids, worms and nematodes, thrips, rice moth, leafminers, armyworm, rice weevil, etc.

The preparation must be prepared the day before it is sprayed and beforehand it should be ensured that the seeds are free of mold.

Neem's solution can be kept for up to 4 days in the shadow, a period beyond which it deteriorates. In addition, the plants are treated at dusk after watering them, up to a maximum of 5 days before harvest.

Preventive (for 1kg of powder): The powder must soak at least 10h in 60-80 L of water. It is then filtered with a fine cloth or strainer to separate the residues from the rest of the solution. Care must be taken to extract all the residual liquid contained in the residues by squeezing the contents of the filter. Before spraying, a bit of soap is added in the solution to be sprayed. The solution is sprayed at a rate of 60-80 L per 800 to 1000m² of land, and every 5 to 7 days.

Curative (for 1kg of powder): The powder must soak at least 10h in 40L of water. It is then filtered and the contents of the filter pressed. The solution, after adding some soap, is sprayed every 3 to 5 days until pest eradication.

To remember...

An effective and ecological biopesticide to prevent the reproduction and growth of a broad pannel of insect pests.

A simple production process over a reduced period of the year (harvest phase of 2 months).

Special points of attention when harvesting if climbing the tree, drying and storage stages to prevent moisture reuptake of the product, and ventilation of the processing area where grinding to avoid poisoning.

Trained and experienced staff for the drying stage.

Two dosages and spraying frequencies according to the type of treatment desired (preventive or curative).

Results

	Neem powder (1kg pocket)
Key elements of demande	
Quantity sold	1kg pocket
Price	2 usd/kg
Quality requirements	Not mentionned
Technical results	
Yield (%)	20% (5kg of fresh fruits for 1kg of powder)
Volume produced/cycle	75kg produced per day (from dried Neem)
Economic results	
Production cost	1,02 usd/kg
	The costs of production vary according to input prices and machine consumption. The cost of production is calculated without taking into account the costs of investment in machinery and premises because they are covered by the project and are therefore not counted as depreciation. The cost of packaging is not included either
Profit	0,64 usd per kg
Volume sold/period	61 kg in 2 months (product has just been launched)

Input prices: Fresh Neem fruits = 0,875 usd per 5kg ; Labor (drying and grinding) = 0,125 usd/kg of final product ; Oil (grinding operation) = 0,0185 usd/kg of final product

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