

Nur *Bun* cultivation and soil health

An indigenous way of farming in hilly ecosystem of Meghalaya

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Meghalaya being a hilly and mountainous state with fragile and sloppy ecosystem, is considered as the most rain soaked region of India and the globe. Majority of inhabitants of the state belonging to different tribes rely primarily on agriculture for their livelihood (ca. 83%). The ethnic communities of state mostly follow two types of primitive agricultural practices viz., shifting cultivation and bun cultivation. Shifting cultivation (jhum) or slash/burn agriculture is practiced majorly in and around forests, is one of the most ancient systems of farming, believed to have originated in the Neolithic period around 7000 BC. This primitive form of cultivation practice is a transition between food gathering and hunting, to intense food production. Moreover, some of tree based farming practices are also prevalent among interior parts of the state. Bun cultivation is a modified system of the jhum cultivation which is practiced across the northeast states.

Key words: *Bun*, Hilly terrain, Indigenous, Soil health

BUN or terrace cultivation is a modified system of the *jhum* cultivation practiced in Meghalaya and other north eastern (NE) states which is usually adopted in valleys and foothills of Himalayan Mountains amidst plantation forests. The word *bun* literally means “materials for burning” in *Khasi* language of Meghalaya. The tribal farmers of Meghalaya select a fresh forest area, clear it from all vegetation including trees, shrubs, and that piece of land is used for cultivation of vegetables, cereals and spices for 2-3 years before they shift to another new area for cultivation. *Bun* is basically a type of ridge and furrow method, and when it is modified traditionally to suit the difficult mountainous hilly terrain and high rainfall condition, it is called *Nur Bun*.

Preparation and cultivation under Bun

Land preparation starts with clearing fresh forest area or fallow area by removing the grass, shrubs, fallen pine leaves twigs, branches, etc.

These residues along with sods are then spread on the raised beds or *nurs*. Some farmers also make heaps of these materials along the drainage channel between two *nurs*. *Nur* is the agricultural land unit in the *Khasi* language of Meghalaya and refers to one raised bed made along the slope with varying dimensions depending on the availability of land.

Raised beds of variable length (2-7 m long), and 1-1.25 m width with 0.20-0.25 m height are prepared along the hilly slopes. The distance between two beds is about 50-70 cm, which works as drainage channel to drain excess of rainwater. The vegetative cover of the area including forest cover such as needles of *Pinus* sp., *Lantana camera*, *Eupatorium odoratum*, *Sataria gluaca* etc. are collected, turned over with a spade and exposed to sun for some days to dry (Fig. 1a). These dried materials are then spread uniformly over the raised beds and covered with a thin layer (10-15 cm) of soil (Fig. 1b). After this, plant materials are burnt

during February (Fig. 1c-1e) as such before raising the crops in the *buns*. Soon after the soil cools down, the planting is done on the *nur* prepared of the burnt materials (Fig. 1f). All these operations are completed during the rainless dry winter season (December to March).

In the freshly prepared *buns*, farmers mostly grow ginger during first year and in the second year; they grow upland paddy, maize or vegetables like potatoes, beans, ladies finger, tomato etc. From 3rd year onwards, the field/*bun* is left fallow for regeneration of vegetation to restore soil fertility which is slated to be used again after some years. Despite large scale adoption of *bun* system by the farmers for growing major vegetable crops (like potato, radish, tomato, cabbage, cauliflower, carrot, ginger, turmeric etc.) in the hilly uplands of Meghalaya and other NE states, this system did not grab attention equal to *jhum* improvement programme, particularly, with respect to limitation of the existing system

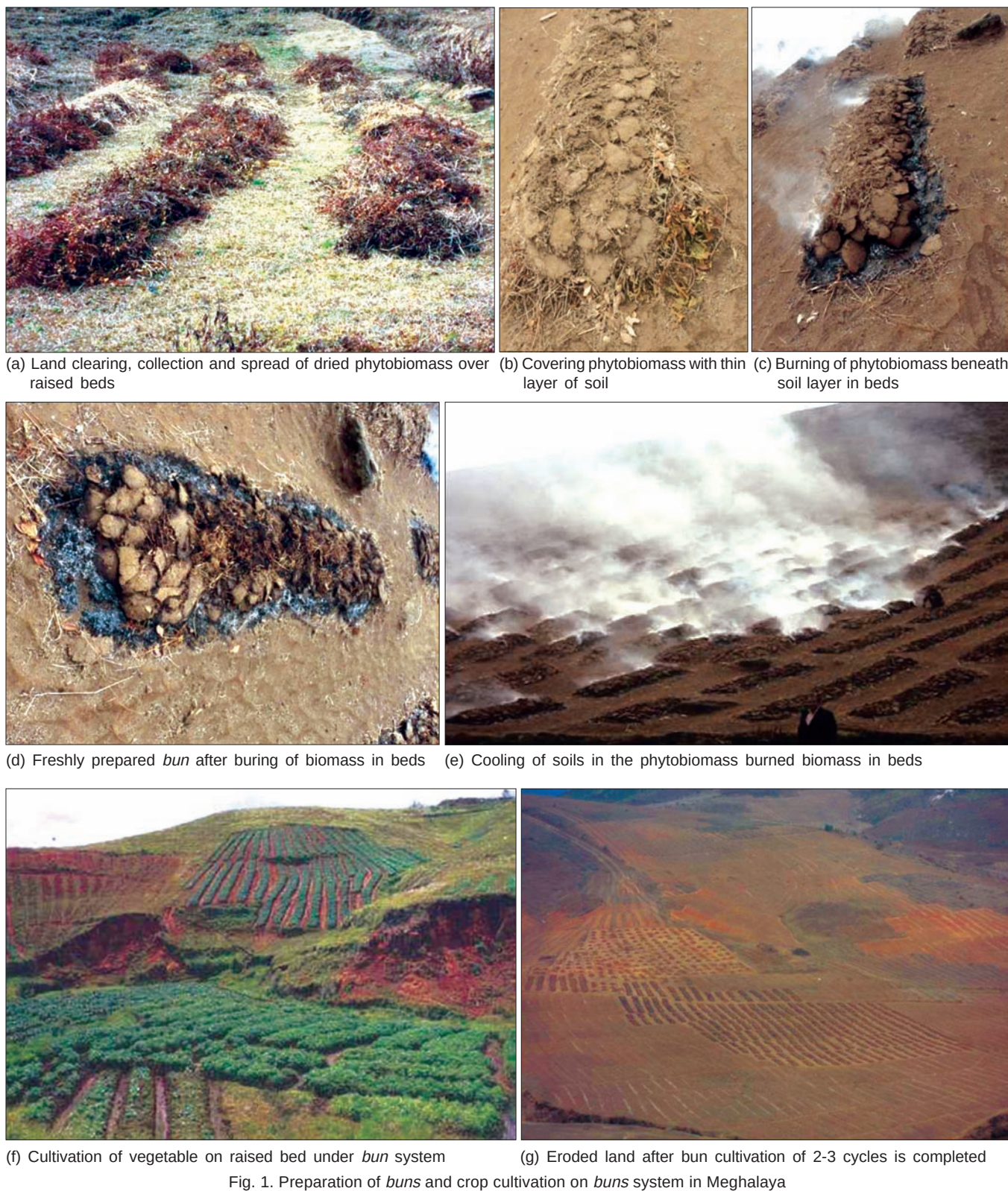


Fig. 1. Preparation of *buns* and crop cultivation on *buns* system in Meghalaya

and its improvement. Over the years, extensive research, extension and development of technologies have been undertaken on improving *jhum* cultivation. In contrast, information pertaining to the existing *bun* system on soil properties and water conservation, farmers' perception, length of fallow periods, adoption of

suitable cropping pattern and if any, technological intervention pivotal for improvement of runoff, and sediment loss management through modification of *bun* dimension etc. are still inconclusive and at nascent stage. The present article attempted to highlight important features of *bun* cultivation, perception of

farmers, and impact of *bun* method on soil properties for drawing attention from researchers, educationists, extension scientists and policy makers for addressing the challenges in sustaining this traditional system with scientific touch across North East Hill (NEH) region of India.

Impact of bun cultivation on soil properties

Burning of vegetation and fresh/virgin soils with very high organic carbon content (OCC) in *bun* system of cultivation immediately results in significant reduction in OCC. However, thereafter a marginal increase in OCC is observed during two years of subsequent cropping possibly due to left over crop residues and regeneration of weeds and microbial flora and fauna in the soil. Like *jhum* cultivation, available macro-nutrients (nitrogen-N, Phosphorous-P, Potash-K and Sulfur-S) and pH of the soil increased immediately after burning in *bun* cultivation and thereafter, nutrient contents decreases in subsequent years of cultivation. The increase in available N and P immediately after burning may be due to increased mineralization which might have been accelerated as a result of rise in pH and increase in soil temperature. Manifold increase in available K and S level in soil after burning the biomass, may be due to their rapid release from the burned organic matter. However, the level of available N, P, K and S decreased rapidly during the cropping seasons, mostly due to severe runoff, loss of top fertile soils and leaching loss along steep slopes since *buns* are prepared along the sloppy lands.

Perception of tribal farmers' about bun system of cultivation along the slope

Bun system for vegetable cultivation by burning the dried material along with the soil is perceived to be highly positive and beneficial by the tribal farmers of the Meghalaya state in many ways.

- Farmers hold strong opinion that preparation of *buns* across the slope is practically not viable because of three main reasons -
 - (i) Newly constructed *nurs* are washed away if heavy rains and storms occur.

- (ii) Majority of tribal farmers' grow tuber and spice crops (Radish, potato, turmeric, ginger etc.) under *bun* system. The economically important parts of these crops are very sensitive to water stagnation even for few hours. Since the region frequently experiences heavy rains of very high intensity, storms and occasional downpour; cultivation in the *buns* across the slope will be most vulnerable to water stagnation.

- (iii) Construction of *buns* across the slope is time consuming, laborious and costly. Thus, tribal farmers are willing to construct *buns* along with slope.

- There is strong belief that preparation of *bun* has a positive effect on improving the physical condition of the soil that makes the hard and compact forest soil cultivable.
- Soil at depth of up to 20-25 cm i.e. the height of the raised beds, is made available for cultivation in the traditional *Nur bun* method of land preparation, which otherwise would be troublesome to accomplish if forest earth is to be dug and used for cultivation.
- Farmers perceive that cultivation of potato and other vegetables on raised bed along the slope help them in preventing the washing off of the entire crop during heavy rains and storms, which the NEH region most frequently experiences.
- The drainage channels laid along with these beds (in between) help in draining away the excess rain water without affecting much of the crop raised on beds.
- Farmers' perceive that following *bun* cultivation, soil becomes light, friable and porous as the ash material of burning is added to soil. Soil burning in the *bun* method helps to improve the soil fertility and availability of essential nutrients

leading to higher productivity with minimum use of external inputs like chemical fertilizers.

- Tribal farmers experienced that burning of crop residues involved in the *bun* method of land preparation lessens the infestation of pests as well as weeds in vegetable cultivation especially potato, besides improvement in soil fertility status and low disease incidence.

Adverse effect of bun cultivation- scientific reality

Removal of vegetation, decrease in water stable aggregates and loss of soil organic matter in the process of the conversion of the forest into cultivable land have contributed to the increased susceptibility of soil to erosion along with runoff water along the slope. Cultivation of crops along the slopes on raised bed was found to cause heavy soil erosion, loss of top fertile soils with unprecedented leaching loss of plant nutrients, bases and other soil binding agents, which subsequently make the land unfit for cultivation in a short span of time (3 years).

SUMMARY

The existing (traditional) *bun* system needs attention for necessary improvement and modification in *bun* dimension including slope direction, soil enriching crops (sequence/pattern) selection, soil and water conservation measures etc. through more scientific and technological interventions. With these interventions, the system may sustain along the hilly, high rainfall, sloppy lands of NEH region for long term sustainable crop production and livelihood security.

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