Kalo

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Growing Systems

- Wetland (lo'i) – a water pass-through system where corms are submerged. Slower maturing.
- Upland (mala) – a forest planting system that's usually rain-fed and utilizes soil and mulch as growing media. Usually faster maturing.

Modified Upland System, Ho'olehua

Taro with Banana Windbreak

Identification Based On:

- Leaf shape
- Corm color
- Leaf edge color (lihi)
- Piko color
- Corm color
- Skin color
- Base color (kohina)

In the Beginning …

Polynesians have been developing cultivars for two thousand years. The creation of most new cultivars is based on mutations. All Hawaiian cultivars can be narrowed down to 4-5 original introductions, based on genetic mapping.

Leaf Shape – one of the characteristics used to identify a cultivar

Ele ele naioea

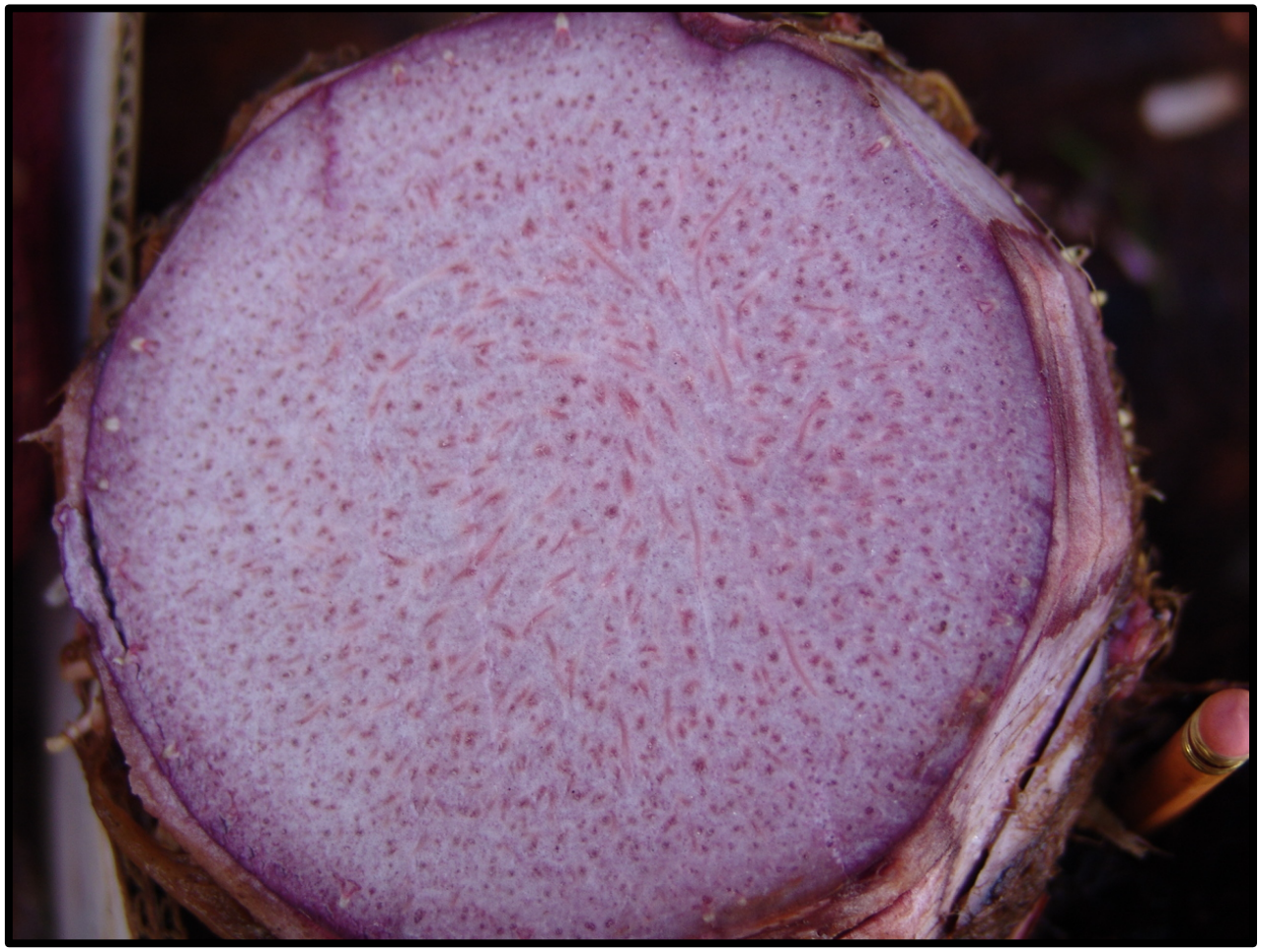
Mana ke’o ke’o

Hawaiian Cultivars

- It's estimated that probably 85-90 Hawaiian cultivars are left of the 150-200 cultivars selected by them. There is a need to preserve them for future generations. Many cultivars have been lost due to changing eating habits. After end of Kapu System, demand moved to purple or Lehua types. There are more white and off-white cultivars than purple ones.

Huli = Seed

Market Wants Purple Corms



Keiki = Seed

Technical term for banana planting material is a keiki. Its similar to huli.

Taro Families

- Mana (branching corms) – upland, drought tolerant, rubbery consistency, table or kulolo
- Piko (unique leaf shape) – late maturing, can be stored, once very popular
- Lauloa (large leaf) – upland, drought-tolerant, large corms, non-acrid, table or kulolo
- Lehua (red poi) – early maturing, dual-purpose, main poi varieties, cannot be stored

Lauloa eleele ula

Eleele makoko – Upland Poi

Preserving Huli

The key to preserving planting material is to prepare a new planting area before you harvest. This is critical. Another way is to grow huli for planting material.

Growing Huli (Center)

Uniform vs. Mixed Sizes

Sort huli by size. When using drip, plant smallest huli closest to water source then plant next largest and so on. Harvest largest at end of line, then tie up line to irrigate the remainder.

Planting Material

Only two ways to have planting material available year-round:

1. *Grow Your Own – Always set aside a few rows for planting material.*
2. *Develop a network of growers who share planting material.*

Planting

Wetland Poi Varieties

- **Maui Lehua** – purple poi, early maturing, poor storage in field, rots. (Hanalei)
- **Moi** – excellent taste, can be stored in field, whitish poi, medium maturity. (Maui, Oahu)
- **Piko uaua** – grey poi, susceptible to leaf blight, can be stored in field, dense corms. (Waipio)
- **Api'i** – dense, grey poi (Waipio)

Maui Lehua = Lehua maoli hybrid

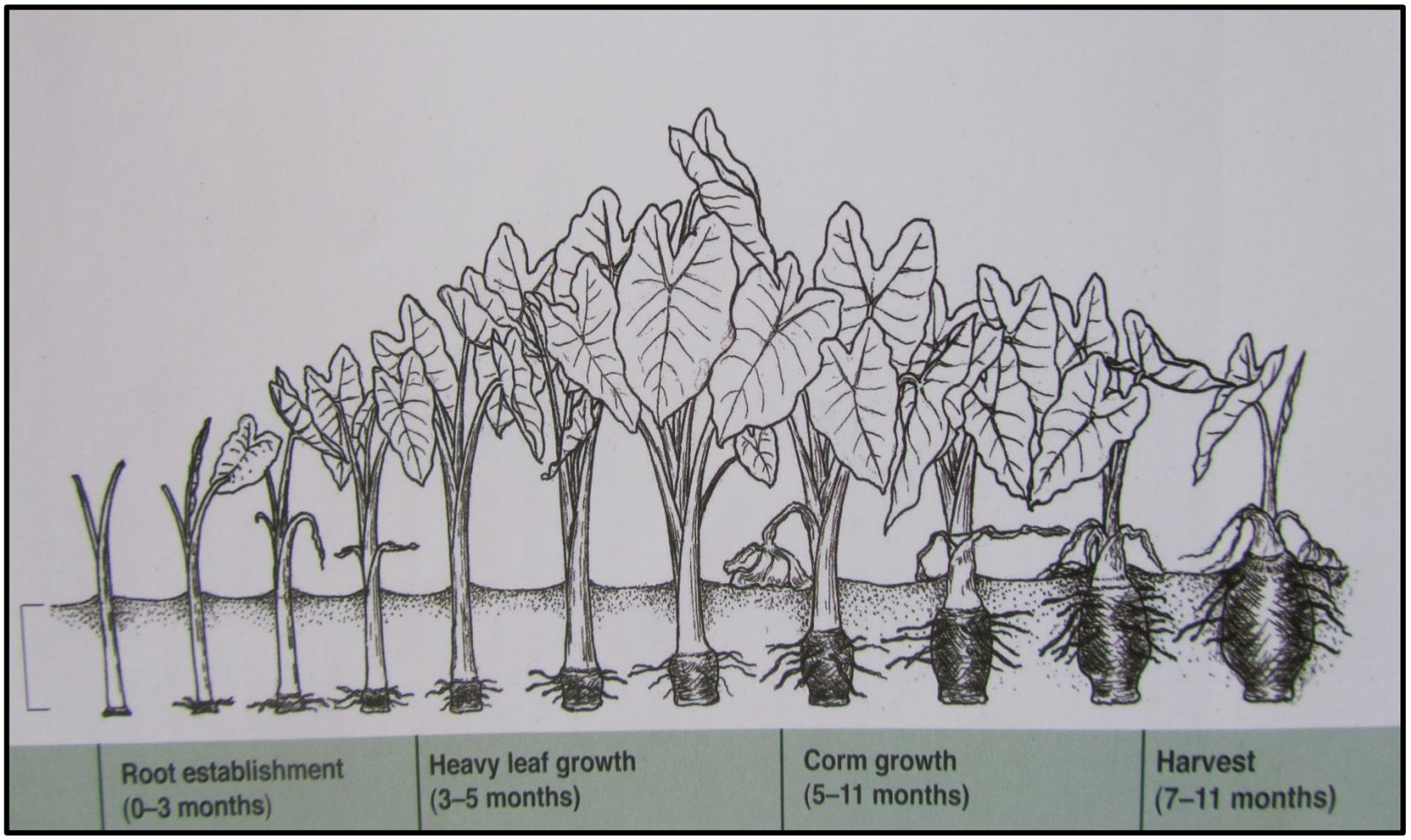
What Cultivars to Grow

Depends on:

- Growing conditions
- Use – poi, table, kululo, or leaf
- Luau – Bun long preferred, but any works
- Home use – any variety can fit
- Early and late varieties – can have taro over a longer period of time.
- Availability of planting material

Luau = leaf

Taro Cycle - Upland



Growth Cycle

Example – Mana ulu: 8 month cycle

- Month 1: Plant huli – weed control
- Month 2-5: Active vegetative growth - plant can grow to 6+ feet
- Month 6-8: Active corm growth - height decreases; swelling of corm.
- Harvest: Month 8 – height 2-3’

Mana ulu at Harvest

Determination of Harvest Time

- Plants will reach its maximum height in 6-7 months for those maturing in 12 months. For 8-9 month varieties, its about 4-5 months.
- Plants will start to drop in height and the neck of corm will start to constrict or close, forming a dome. Huli will be the diameter of a silver dollar where it attaches to the corm.
- Can be harvested earlier to allow for time to harvest large fields.

Months to Harvest

- Mana ulu 8 months
- Maui lehua 9+ months
- Moi 9-12 months
- Piko kea 12+ months
- Pi'i ali'i 8-12 months
- Lauloa eleele ula 9-12 months

This is approximate. Factors include season of planting, upland vs lo'i, and lowland vs upland.

Height Determines Yield

What Can Go Wrong?

Leaf Blight, Irrigation Clogging, Weeds, Nematodes, No Seed, Mealy Bugs, Ants, Mites, Slugs, Corm Rot, Storms, Injury, Sickness, Loss of Labor, Water Shortage, New Disease, Wrong Variety, Injury, New Insect, Marketing Problems, Equipment Breakdown, Contamination

Rain + Cold = Leaf Blight

Phytophthora colocasiae

Pros and Cons of Taro Hybrids

- Key to developing genetic resistance, especially leaf blight (Phytophthora)
- Hybrid vigor resulting in higher yields
- Possible loss in poi quality
- May gain one resistance and lose another
- Genetics not well understood in taro. Not straightforward.

Moi X Palau : Piko ulaula : Pauakea

Hybrid 99-4

Selecting Cultivars

- Lehua– maoli (Kauai), Maui (Pi'i Ali'I X maoli), palai'i, ke'oke'o, 'ele'ele
- Mana – ulu, ke'oke'o, lauloa
- Lauloa – ke'oke'o, 'ele'ele ula,
- Piko – kea, ke'oke'o, ulaula, uaua,
- Eleele – naioea, makoko
- Other – Moi, Bun long,
- New UH Hybrids – 99-7, 99-9, Pa'akala

Pa’akala 20 lbs each

Weed Control

Your Biggest Challenge!!!

<u>Strategies</u>

- **Mulches – natural and inorganic**
- **Sterile Seed Bed**
- **Tillage to decrease weed load**
- **Timing of planting**

Furrow & Hand-Weeding

Weed Control:
Plastic Mulch & Cultivating

Pest Control

- *The key to pest control is to grow a healthy plant.*
- *Understand pest biology and natural controls, as well as environmental conditions conducive and detrimental to certain pests.*
- *Identify at least a few control strategies for each.*

Aphids

Mealy Bugs

Aphids & Mealy Bugs

- Fatty soaps, including Safers and Impede
- Mix with Diatomaceous Earth for added punch
- Control Ants – need attractant + killer. Two types of ants, sugar and protein lovers. Boron is a good killer. Attractant for protein lovers is peanut butter, sugar for sugar lovers
- For Aphids, watch Nitrogen status. High N will attract them.

Snails & Slugs

Snails and Slugs

- Can be major problem on upland taro. Hunt them down at first rain, like the one that just passed a few weeks ago. Pound nail into tip of old tool handle, and sharpen. Copper is toxic to both; pennies made before 1982 are useful.

Root-Knot Nematodes

Pest Stress

- Root-Knot Nematode – control strategies include fallow, sunn hemp green manure, crop rotation, increase organic matter.
- Mites – good air circulation, wider spacing, resistant varieties, overhead irrigation
- Rose beetle – picking at night, neem/DE
- Mice/Rats – baiting, plant spacing, thick drip

Windbreaks

Windbreaks are critical to the protection of upland taro, especially in windy areas such as Kohala, Ho'olehua, Kahului, and many areas of the state. Temporary windbreaks such as sorghum-sudan hybrid grass are fast growing, planted by seed, and will protect taro for a year or more.

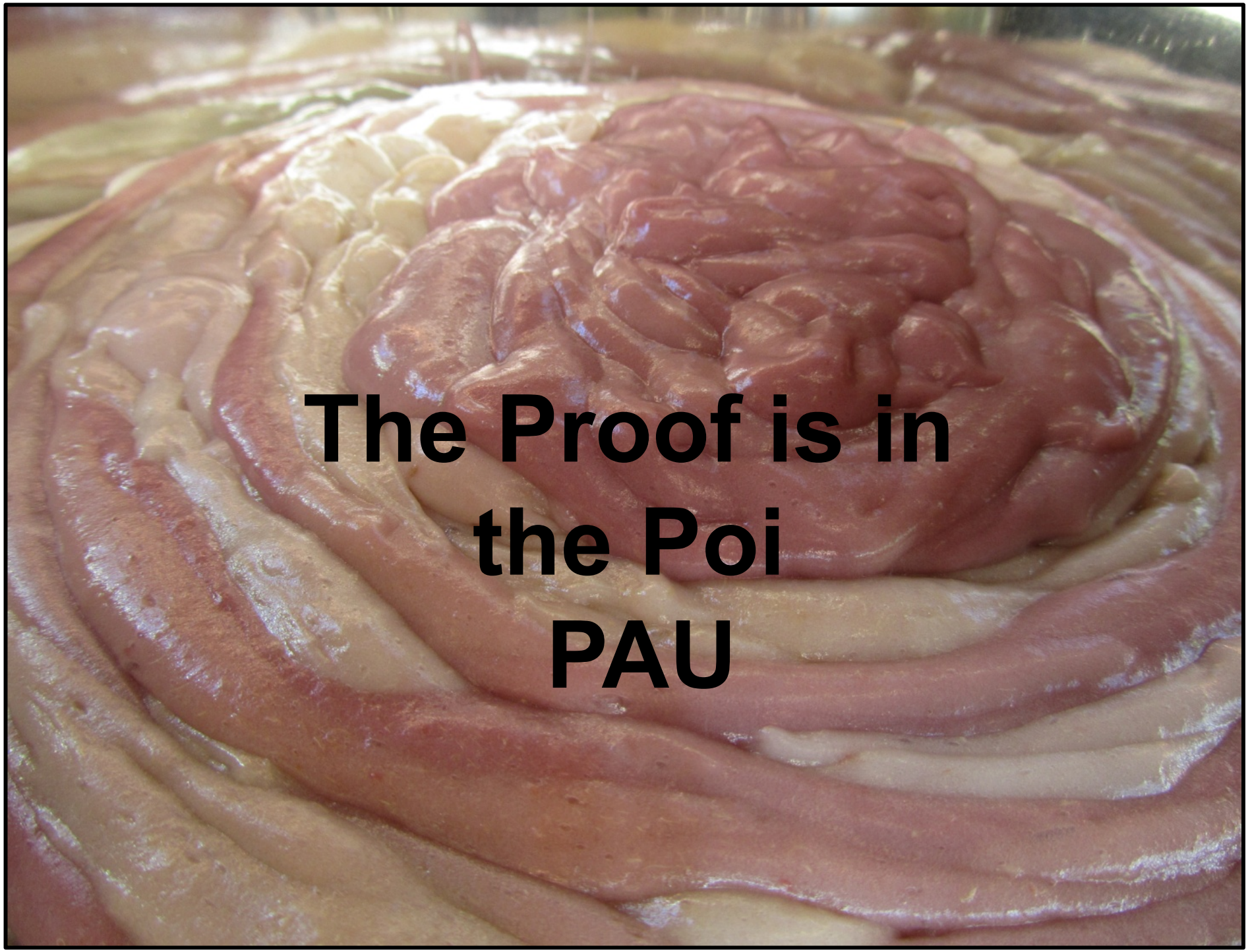
Sorghum-Sudan Grass Windbreak

Sorghum-Sudan Windbreak

Sow 2 months prior to planting huli. Use hand seed planter with radish seed plate. Can be cut and re-grown (ratoon). Can be used for animal feed or to build soil organic matter. Nematode-resistant

Incorporating Organic Matter

Post-Harvest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