DESIGN AND FABRICATION OF WEED REMOVING MACHINE

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A Project Report

Submitted by

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Of

Bachelor of Engineering

In

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DEPARTMENT OF MECHANICAL ENGINEERING

KUMARAGURU COLLEGE OF TECHNOLOGY

COIMBATORE – 641006

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The report of the project work submitted by the above students in partial fulfillment of the award of Bachelor of Engineering in Mechanical Engineering of Anna University were evaluated and confirmed to be report of the work done by them.

(INTERNAL EXAMINER)

(EXTERNAL EXAMINER)

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ABSTRACT

In today`s world every thing is getting modernized. Agricultural fields are slowly destroying and these lands are used for some other purpose. This is because the income from agriculture is less although the work involved is high. Most of the field work is done manually and so the farmers depend on the field workers for dong it. Because of the higher pay offered in other sectors like construction, workers prefer those jobs and so agricultural sector takes shortfall of manpower.

This being the scenario, workers are not available for the works such as plucking out the unwanted grass and weeds. It is very important to pluck out the grass and weeds in order to obtain fruitful results from the cultivation, as the grasses and weeds observe a part of nutrition given to plants.

Given the present situation, removing weeds becomes a costlier affair. In order to address this problem, this project proposes a simple, economical and efficient machine to remove the weed, which would be operated by a single person-savings of labour as well as time. The machine has been designed, fabricated and tested.

The performance of the machine reveals that is economically feasible and works with the appropriate efficiency. The evolution of the pro-e model gives us an idea to design the machine, The analysis of the weed remover (cutter) is done using ANSYS software and the stress developed is analyzed.

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WEED REMOVING MACHINE

1.1 INTRODUCTION

In most poor countries, agriculture is a major employer and source of national income and export earnings. Growth in agriculture tends to be pro-poor – it harnesses poor people's key assets of land and labour and creates a vibrant economy in rural areas where the majority of poor people live. Agriculture connects economic growth and the rural poor, increasing their productivity and incomes. Agricultural growth, particularly through increased agricultural sector productivity, also reduces poverty by lowering and stabilising food prices, improving employment for poor rural people, increasing demand for consumer goods and services, and stimulating growth in the nonfarm economy.

A weed in a general sense is a plant that is nuisance. More specifically, the term is often used to describe native or nonnative plants that grow and reproduce aggressively. The Ecological disturbances caused due to weeds are displacing native vegetation, thereby decreasing forage for wildlife, decreasing local plant biodiversity and increases erosion.

With agriculture facing a shortage of manpower, need for automating the various activities in the field arises or it is becoming the need of the day. With this in mind, a simple machine has been designed and fabricated for removal of weed and unwanted plants. As the machine is moving the weed is removed. This machine can be used effectively in the agricultural fields and helps in cleaning the barren lands.

This machine is of simple design without using any motor or engine. Only a chain and sprocket arrangement is used. This machine eliminates the need for many workers and makes the work easier, economical and efficient.

1.2 OBJECTIVE:

To remove the weeds **i.e, waste plants** without spending much energy and to provide a machine that is user friendly which will give you a clean environment by eliminating weeds.

1.3 WHY THIS IDEA?

- ✓ Mainly to do a project that is environment friendly.
- ✓ Many houses have beautiful lawn in the front part of their house whereas useless weeds will be growing in their backyard.
- ✓ Moreover weeds grow faster than many plants and are difficult to clean frequently.
- ✓ Also many weeds are harmful and cannot be cleaned with empty hands.

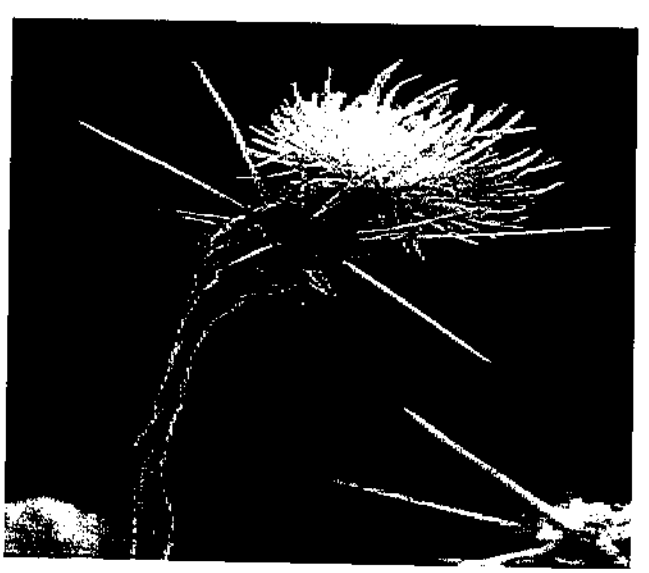
CHAPTER - 2

WEED

2.1 What is WEED?

A weed in a general sense is a plant that is considered by the user of the term to be a nuisance, and normally applied to unwanted plants in human-made settings such as gardens, lawns or agricultural areas, but also in parks, woods and other natural areas. More specifically, the term is often used to describe native or nonnative plants that grow and reproduce aggressively.

Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They also can harbor and spread plant pathogens that can infect and degrade the quality of crop or horticultural plants. Weeds may be a nuisance because they have thorns or prickles, cause skin irritation when contacted, or parts of the plants might come off and attach to fur or clothes.



2.2 TYPES OF WEED

2.2.1 TERRISTRIAL WEEDS

1. Goatgrasses
    - Barbed - *Aegilops triuncialis*
    - Ovate - *Aegilops ovate*
    - Saltmeadow - *Aegilops patens*
    - Smooth - *Aegilops alterniflora*

2. Hawkweeds
    - King-devil - *Hieracium piloselloides*
    - Meadow - *Hieracium pratense*
    - Mousear - *Hieracium pilosella*
    - Orange - *Hieracium aurantiacum*
    - Yellow - *Hieracium floribundum*

3. Thistles
    - Plumeless - *Carduus acanthoides*
    - Smooth distaff - *Carthamus baeticus*
    - Woolly distaff - *Carthamus lanatus*

4. Brooms
    - French - *Genista monspessulana*
    - Portuguese - *Cytisus striatus*
    - Scotch - *Cytisus scoparius*

- Spanish - *Spartium junceum*

5. Knapweeds
   - Diffuse - *Centaurea diffusa*
   - Meadow - *Centaurea pratensis*
   - Russian - *Acroptilon repens*
   - Short-fringed - *Centaurea nigrescens*
   - Spotted - *Centaurea maculosa*

6. Toadflax
   - Dalmation - *Linaria dalmatica*
   - Yellow - *Linaria vulgaris*

7. Whitetops
   - Hairy - *Lepidium pubescens*
   - Lens-podded - *Lepidium chalepensis*
   - Whitetop - *Lepidium draba*

2.2.2 AQUATIC WEEDS

2.2.2.1 FLOATING TYPE

1. Mediterranean sage - *Salvia aethiopis*
2. Medusahead rye - *Taeniatherum caput-medusae*
3. Old man's beard - *Clematis vitalba*
4. Perennial pepperweed - *Lepidium latifolium*
5. Poison hemlock - *Conium maculatum*
6. Policeman's helmet - *Impatiens glandulifera*

7. Puncturevine - *Tribulus terrestris*
8. Purple loosestrife - *Lythrum salicaria*
9. Quackgrass - *Agropyron repens*
10. Ragweed - *Ambrosia artemisiifolia*
11. Rush skeletonweed - *Chondrilla juncea*
12. Saltcedar - *Tamarix ramosissima*
13. Small broomrape - *Orobanche minor*
14. South American waterweed - *Egeria densa*
15. Wild proso millet - *Panicum miliaceum*
16. Yellow flag iris - *Iris pseudacorus*
17. Yellow nutsedge - *Cyperus esculentus*
18. Yellow starthistle - *Centaurea solstitialis*
19. Austrian peaweed - *Sphaerophysa salsula*
20. Bearded creeper - *Crupina vulgaris*
21. Biddy-biddy - *Acaena novae-zelandiae*
22. Buffalobur - *Solanum rostratum*

2.2.2.2 SUBMERGED TYPE

1. Butterfly bush - *Buddleja davidii*
2. Common bugloss - *Anchusa officinalis*
3. Creeping yellow cress - *Rorippa sylvestris*
4. Cutleaf teasel - *Dipsacus laciniatus*
5. Dodder - *Cuscuta spp*
6. Dyers woad - *Isatis tinctoria*
7. English ivy - *Hedera helix*
8. Eurasian watermilfoil - *Myriophyllum spicatum*
9. False brome - *Brachypodium sylvaticum*

10. Field bindweed - *Convolvulus arvensis*

11. Garlic Mustard - *Alliaria petiolata*

12. Giant horsetail - *Equisetum telmateia*

*13.*Gorse - *Ulex europaeus*

14. Halogeton - *Halogeton glomeratus*

CHAPTER - 3

WEED CONTROL TECHNIQUES

3.1 MANUAL & MECHANICAL CONTROL TECHNIQUES

Manual and mechanical techniques such as pulling, cutting, and otherwise damaging plants, may be used to control some invasive plants, particularly if the population is relatively small. These techniques can be extremely specific, minimizing damage to desirable plants, but they are generally labour and time intensive. Treatments must typically be administered several times to prevent the weed from re-establishing, and in the process, labourers and machines may severely trample vegetation and disturb soil, providing prime conditions for re-invasion by the same or other invasive species.

Manual and mechanical techniques are generally favored against small infestations and/or where a large pool of volunteer labour is available. They are often used in combination with other techniques, for example, when shrubs are pulled and cut, and re-sprouts and seedlings are treated with herbicides or fire several weeks or months later.

When using manual and mechanical methods, it is especially important to thoroughly clean and inspect all equipment and clothing before moving it off-site. This will lessen the probability of spreading the weed to the next worksite.

3.2.1 WEED PULLING

Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous and floating weeds. Annuals and tap-rooted plants are particularly susceptible to control by hand-pulling. Weed wrenches and other tools

are surprisingly powerful and can enable you to control large saplings and shrubs that are too big to be pulled by hand. It is not as effective against many perennial weeds with deep underground stems and roots that are often left behind to re-sprout.

How To:

Minimize soil disturbance by pulling out weeds slowly and carefully, and replace soil to disturbed areas where possible. Trampled and disturbed areas can provide optimal germination sites for many weeds. Minimize trampling by limiting the number of people in the site and the amount of time spent there. Whenever a manual technique is used, it is wise to wear gloves, a long-sleeved shirt, and long pants. Some plants can cause moderate to severe skin irritation, especially when their stems and leaves are crushed and broken. Even the flimsiest weeds can leave hands raw and bleeding after several hours of pulling.

The advantages of pulling include its small ecological impact, minimal damage to neighbouring plants, and low (or no) cost for equipment or supplies. Pulling is extremely labour intensive, however, and is effective only for relatively small areas, even when abundant volunteer labour is available.

3.2.2 **Hand Pulling**

Hand pulling is easy to plan and implement, and is often the best way to control small infestations, such as when a weed is first detected in an area. Hand pulling may be a good alternative in sites where herbicides or other methods cannot be used. The key to effective hand pulling is to remove as much of the root

as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots.

Hand pulling has been effective against a variety of invaders in natural areas. For example, hand pulling by volunteers has successfully controlled *Centaurea diffusa* (diffuse knapweed).

3.2.3 Pulling Using Tools

Most weed-pulling tools are designed to grip the weed stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the weed they can extract. The Root Talon is inexpensive and lightweight, but may not be as durable or effective as the all-steel Weed Wrench, which is available in a variety of sizes. Both tools can be cumbersome and difficult to carry to remote sites. Both work best on firm ground as opposed to soft, sandy, or muddy substrates.

3.2.4 Root Talon

The Root Talon is an inexpensive and lightweight tool shaped something like a pick-axe with a plastic handle and metal head. It has a specialized claw and gripping device that allow the user to grab the plant stem and provide leverage to pull-up and remove the plants. It is best used for pulling shallow rooted plants such as sapling trees and herbs with sturdy stems. Plants that have been pulled using the Root Talon include young treeof- heaven (*Ailanthus*), Scarlet wisteria (*Sesbania punicea*). The Root Talon is not effective against deep-rooted plants, because it

does not provide enough leverage. In addition, it is difficult to use the Root Talon to pull spiny plants because the plant stems (and spines) must be put into the gripping flange by hand. Advantages of the Root Talon are that it is lighter and less expensive than the Weed Wrench (see below), and provides easier and more effective control than hand pulling.

3.2.5 Weed Wrench

The Weed Wrench provides more leverage than the Root Talon. Its all-steel frame is capable of withstanding more strain than the plastic handle of the Root Talon. It comes in four sizes, from the "mini", which weighs 2.4 kg (5.25 lbs) and is capable of pulling weeds with stems up to 2.5 cm (1.0 in) in diameter, to the "heavy", which weighs 10.5 kg (24 lbs) and can handle weeds up to a diameter of 6.25 cm (2.5 in). Larger Weed Wrenches provide more leverage and pulling power. It is best to choose the smallest size needed, however, because larger Weed Wrenches are heavy and can be difficult to carry and use in remote sites.

3.3 MOWING, BRUSH-CUTTING, WEED EATING

Mowing and cutting can reduce seed production and restrict weed growth, especially in annuals cut before they flower and set seed. Some species however, resprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. For example, yellow starthistle (*Centaurea solstitialis*) can be controlled by mowing at the onset of flowering (when approximately 2 to 5% of the seed heads are flowering), but if mowed earlier, native species are negatively impacted and yellow starthistle is able to re-sprout. Be sure to consider the biology of the weed before cutting.

How To:

Mowing and cutting are often used as primary treatments to remove above ground biomass, in combination with prescribed burning or herbicide treatments. It is important to collect the cut fragments of species capable of re-sprouting from stem or root segments to prevent them from washing or blowing into uninfested areas.

3.3 STABBING

Some plants can be killed by severing or injuring (stabbing) the carbohydrate storage structure at the base of the plant. Depending on the species, this structure may be a root corm, storage rhizome (tuber), or taproot. These organs are generally located at the base of the stem and under the soil. Cutting off access to these storage structures can help "starve" or greatly weaken some species.

How To:

To sever a taproot, place a flat-nosed spade, pruning saw, or knife at the base of the plant and push it as far below ground as possible. To prevent re-sprouting, the taproot should be severed below the caudex or root crown (where the stem becomes the root).The stabbing technique has been used to control baby's breath (*Gypsophila paniculata*).

3.4 GIRDLING

Girdling is often used to control shrubs that have a single trunk. It involves cutting away a strip of bark several centimeters wide all the way around the trunk. The removed strip must be cut deep enough into the trunk to remove the vascular cambium, or inner bark, the thin layer of living tissue that moves sugars and other carbohydrates between areas of production (leaves), storage (roots), and growing points. This inner cambium layer also produces all new wood and bark.

How To:

To girdle a Weed, cut parallel lines approximately three inches or more apart around the circumference of the weed. The cuts can be made using a knife, axe, or saw, and should be slightly deeper than the cambium. Strike the trunk sharply between the cuts using the back of an axe or other blunt object. The bark should come off in large pieces and prevent the weed from any further growth. It is important not to cut too deeply into the trunk because this could cause the weed to snap and fall in high winds. To determine the depth of the cambium, make two short test cuts and strike the bark between the cuts.After several strikes the bark should come off intact, exposing the cambium and wood (xylem) below.

Girdling typically requires less labour than cutting and removal, is inexpensive, and kills only the targeted plant. It also leaves no residue except the standing trunks.

3.5 MULCHING

Mulching can be used on relatively small areas, but will often stunt or stop growth of desirable native species. Mulching cannot control some perennial weeds because their extensive food reserves allow them to continue to grow up through the mulch.

How To:

Cover the ground and/or seedlings with mulch (hay, grass clippings, wood chips, etc.) or other type of ground cover (newspaper clippings). This prevents weed seeds and seedlings from receiving sunlight necessary to survive and grow. Hay mulch was used in Idaho with some success to control the spread of Canada thistle (*Cirsium arvense*). This hay mulch was applied several feet deep to established plants, and even though these plants were not completely eliminated, flowering rates were much suppressed by the end of the growing season.

3.6 TILLING

Tilling, or the turning-over of soil, is often used for weed control in agricultural crops. Its use in wild land management is largely limited, however, to restoration sites where soils are already badly disturbed. Tilling is effective against annuals and shallow-rooted perennials, but small fragments of some species, particularly those perennials with rhizomes, can often resprout following tillage. Tilling should be completed before seeds develop and are shed onto the soil. The

best control is achieved when the soil remains dry, so that remaining plant fragments dry out. Moist soils help the fragments survive and re-grow.

How To:

"Primary" tillage equipment is initially used to turn over soil and cuts roots at depths of six inches to two feet to prepare the soil for planting. "Secondary" tillage equipment or equipment designed to work only the top six inches of soil, is used mainly to control weeds. Many types of secondary tillage equipment are available. Equipment ranges from small hand-pushed models, to tractor mounted power-driven tillers. The appropriate model depends on the size and type of the habitat.

3.7 SOIL SOLARIZATION

Soil solarization is the technique of placing a cover (usually black or clear plastic) over the soil surface to trap solar radiation and cause an increase in soil temperatures to levels that kill plants, seeds, plant pathogens, and insects. In addition, when black plastic or other opaque materials are used, sunlight is blocked which can kill existing plants. Soil solarization however, can cause significant biological, physical, and chemical changes in the soil that can last up to two years, and deter the growth of desirable native species.

How To:

Polyethylene plastic film is the most useful for soil solarization.Less expensive thin films (1-1.5 mil) are more effective than thick films (2, 4, and 6

mil). Clear and black films both trap infrared radiation that is re-radiated from the soil surface, therefore keeping the soil hot. Transparent film allows more radiation to reach the soil than black films, as it lets visible light in, causing even greater temperature increases. Because black films exclude visible light however, they stop photosynthesis, which can be enough to kill some young annuals and perennials given sufficient time. Double layers of film have been found to increase soil temperatures by three to ten degrees over single layers.

3.8 FLOODING

In situations where the water level of a wetland or riverine system can be manipulated, flooding can be used to control some plant species. Some species, however, have vegetative buds or underground storage organs that can survive several months or more under flooded conditions.

CHAPTER – 4

WEED MANAGEMENT SYSTEM

4.1 WEEDS:

Better adapted to thriving in disturbed environments, weeds compete with cultivated crops, often causing yield losses, if not total crop failure. Some species are also detrimental to wildlife since they provide poor habitat and out-compete native plants. Weeds also have some benefits, such as protecting soil from erosion. Certain species can indicate soil-nutrient status and structure (e.g., pH and moisture levels, the presence of a hard pan layer, or other areas of poor drainage). Weeds also increase plant diversity; some provide good wildlife habitat because many weed species are native and adapted to specific microclimates and local conditions. Beneficial insects, such as green lacewings and parasitic wasps, depend to a large extent on non-crop species for nectar and pollen particularly early in the season. Weeds can, therefore, increase opportunities for biological control of crop pests. Understanding why and how weeds grow, how farming practices affect them, and which species are present in a field is key to weed management.

4.2 PRINCIPLES OF WEED MANAGEMENT

4.2.1. WEED COMPETITION

Weeds are pests because they compete for nutrients, water, and light. However, the degree of competition is closely related to the life cycle of the crop. Keeping annual crops weed-free during the first third of their life cycle is critical, since that is the period when weed competition is the most damaging. Competition that occurs later in the crop life cycle usually results in minimal yield loss, although seeds from late-season weed infestations can become a problem in subsequent crops. Competition is keener when crops and weeds emerge about the same time. Therefore, practices that can give the crop a head start on the weeds can help to reduce competition.

4.2.2. WEED IDENTIFICATION

Weed identification and record keeping is essential in planning a successful control strategy. Each weed species has its own unique life cycle and competitive abilities. Knowing what type of weeds are in the field, and learning about their survival mechanisms enables the grower to select the most effective management strategy. It is important to identify whether or not the weed is a grass or a broadleaved plant, whether it is an annual, biennial or perennial, and during which seasons the weed seeds will germinate.(3) It is also important to know if the weeds present are classified as noxious by the state or federal government, since this classification may dictate control actions. *Appendix Weeds-1* provides state definitions of noxious weeds and the rating for common Refuge weed species. The *Growers Weed Identification Handbook* (4) and *Weeds of the West* (5) contain excellent life cycle information and photographs useful for weed seedling identification.

4.2.3. WEED SEED SURVIVAL AND GERMINATION

Soil contains millions of weed seeds per acre. Although many of these seeds germinate each year, others remain dormant. Survival of weed seeds varies greatly from species to species. Since annual weeds depend on the production of a large number of seeds to survive, preventing seed production reduces weed-seed density in the soil. To germinate, seeds require oxygen, moisture, and an appropriate temperature range. Most weed seedlings emerge from the top 2 inches of the soil—an area where conditions necessary for germination exist.(2) Depending on the species, other factors required to trigger germination may include further ripening, chilling, light, or the correct degree of alternation between daytime and night-time temperatures. Without these factors, seeds lie dormant, often surviving for long periods of time, until proper conditions occur. For example, dormant field bindweed seeds can live up to 30 years.(6) Proper identification of weeds in the field can indicate how long the seeds can survive in soil, and can help determine the best management strategy.

4.2.4. VEGETATIVE REGENERATION

Perennial weeds often have vegetative parts that can sprout and grow even if the parent plant is killed. These weeds survive by resprouting from underground roots, stems, bulbs, tubers and other plant tissues. Nutrient reserves in a vegetative part determine the ability to resprout and grow into a new plant. There is usually a period of days immediately following the spring growth flush when a perennial is most easily destroyed by tillage.(2) Therefore, tillage must be carefully timed to suppress perennial weeds at their most vulnerable stage. If tilled at the wrong time, weeds that are capable of resprouting can be moved around in the field, resulting in an even bigger problem than before the tillage.

4.2.5. CONTROLLING WEEDS BY MANAGING THEIR ENVIRONMENT

Cultural control practices make the environment less favorable to weeds. Cultural controls for weeds include exclusion, crop rotations, seedbed preparation and cover crops. To be successful, cultural controls require skillful management. They also require growers to consider prevention as well as control, and to optimally combine practices to achieve the best results.

4.2.6. EXCLUSION TO PREVENT WEEDS

The best, and sometimes the only economical method of weed control is revention. This includes avoidance of weed seed introduction. Machinery, seed-contaminated irrigation water, weedy field margins, or contaminated crop seed can all be sources of infestation. Weed infestations along the berms are of considerable concern. Until weeds are controlled along the berms, they will continue to serve as a seed source in the fields (see Berm Management Plan). Growers have noted a higher number of weeds near sprinklers, suggesting that seeds may be sucked from water in irrigation canals and introduced to the field via sprinklers. Growers and researchers may wish to investigate this further. If true, finer filtration of irrigation water may be desirable.

4.2.7. CROP ROTATIONS

Field history will influence weed problems. Intensive cultivation of annual crops favors short-life-cycle annual weeds, whereas maintaining land in perennial crops like alfalfa or grasslands tends to encourage perennial weed species. Rotations from one system to another—or example from a row crop to alfalfa—are useful because they reduce the weed species that were previously causing problems. Rotations also benefit soil fertility and reduce insect and disease problems. Some weed species (e.g., field bindweed) are well adapted to a wide range of conditions, and rotation is less useful for their control.

4.2.8. COVER CROPS AND GREEN MANURES

Cover crops compete with weeds for light, water, and nutrients and are useful in several ways for controlling weeds. For instance, when included in a crop rotation plan, cover crops serve to disrupt the life cycle of many weeds that are adapted to an annual production system. Cover crops also can be used to shade out, or "smother," hard-to-control perennials such as quack grass. Some cover crops, such as rye, actively suppress weeds through chemicals associated with living or dead plant parts. Maintaining a strip of cover crop (known as a "living mulch") between plant rows is another unique way of using cover crops to control weeds. In addition to controlling weeds, cover crops also reduce soil erosion and improve soil structure, biological activity, and fertility.

4.2.9. PRE-PLANT TILLAGE

Tillage operations can be timed to reduce the number of weed seeds in the soil. The strategy is to till, wait for the weed seeds to germinate, then till again. For this technique to work, it is important to allow enough time between successive cultivations for the weed seeds to germinate. The type of implement used for pre-plant tillage will influence the results. Cultivation with shallow implements, such as spring-tined cultivators, leaves weed seeds near the surface where they will germinate. This strategy is especially good for controlling species with long-lived seeds. The seeds are brought up to the surface and encouraged to germinate instead of staying deeply buried and remaining dormant. Deep tillage, such as plowing, buries weed seeds. This strategy helps to eliminate short-lived seeds, since they die while still deeply buried. Understanding the life cycle of the weed and using a range of cultivation techniques, both deep and shallow, can ensure that tillage does not selectively encourage individual weed species.

4.2.10. PRIORITY WEEDS ON REFUGE LEASED LANDS

The following weeds were identified as priority pests by crop by the growers. (Priority weed species were identified by a combination of how often the weed was identified as a problem and how frequently it was controlled, according to grower, agency, researcher and pest control advisor interviews.)

4.3 WEED CONTROL BY CROP

4.3.1 SUGARBEETS
(Overview, Seasonal Development)

Broadleaved weeds and grasses are important pests of sugarbeets since this crop is highly susceptible to yield reduction as a result of weed competition. Uncontrolled weeds can reduce sugarbeet yields by over 90 percent. **(10)** Annual broadleaved weeds and some grasses mentioned by Refuge growers as being the worst pests are Bassia, netseed lambsquarter, pigweed, redroot pigweed, wild mustard, Kochia, hairy nightshade, tumble mustard (Jim Hill mustard), and wild oats. Summer annual broadleaved weeds are problematic in sugarbeets because they are present when the crop is most vulnerable to competition. Summer annuals begin to germinate in the late spring (April to May) and continue through summer, whenever soil moisture is adequate.

Short- and Long-term Management Recommendations:

Biological control:

Biological control of weeds in berm areas is a possibility (see Berm Management Plan), and would have secondary benefits for row crops like sugarbeets since the number of weed seeds coming into the field would diminish. There are no effective biological weed control options to recommend for use within sugarbeet fields during the cropping season.

Herbicides:

Aerial and band applications of herbicides combined with between row cultivation are typical weed control methods used on the Refuge. Roundup is PUP-approved for use on direct seeded, pre-formed beds to kill weeds prior to crop emergence. Flaming the seedbed prior to sugarbeet seedling emergence is a potential alternative to Roundup, and is discussed in detail under the Field Trial recommendations. Post plant band applications of Betamix Progress are PUP-approved for broadleaved weed control. Poast is PUP-approved for grass control. Preplant-incorporated herbicides are not used since they are ineffective on the high-organic-matter soils of the Refuge lands.

4.3.2 ONIONS
(Overview, Seasonal Development)

Broadleaved weeds and grasses are important onion pests. Onions are poor competitors with weeds due to their slow growth, shallow, fibrous root systems, and lack of an aerial canopy to shade out other vegetation. Additionally, the long growing season allows for several "flushes" of weeds to arise. Because of these factors, and given a choice, onions should be planted in the most weed-free fields available. Onion growers on the Refuge report significant competition from a wide variety of annual broadleaved weeds. Among wild grasses, wild oats is the major problem. Perennial weed problems do not appear widespread, though some concerns about Canada thistle and quack grass have been raised.

Short- and Long-term Management Recommendations:

Monitoring:

Record crop growth stage and weed types and locations each week throughout the monitoring period. Such knowledge assists in determining optimum crop rotations, selection and timing of herbicides, and evaluating possible alternatives to herbicides.

Cultural:

Weed problems can be reduced in onions by means of a number of preventive measures. Till or use off-season cover crops (such as Sudangrass or rapeseed) to control weeds and prevent the production and dispersal of additional weed seed in the field. Avoid introducing weed rhizomes, stolons, and seeds into fields on farm equipment or in contaminated seed or irrigation water crop rotation (required in lease agreements) helps suppress weed species associated with onions. Mechanical and cultural weed control practices currently used for Refuge-grown onions include preirrigation to germinate weed seeds followed by spring tillage. This two-step technique germinates and kills a large number of weeds while minimizing the number of new seeds brought to the surface. Onions are provided with some competitive advantage through the use of nitrogenous fertilizers, such as ammonium nitrate, ammonium thiosulfate, or mixtures of urea and sulfuric acid. Applied when the onions reach one true leaf, the crop is stimulated while many broadleaved weeds are "burned back" by the fertilizer.

Biological:

Biological control of weeds in berm areas (see Berm Management Plan), would have secondary benefits for onions since the number of weed seeds coming into the field would diminish. There are no effective biological weed control options to recommend for use within onion fields during the cropping season.

Herbicides:

Following seedbed preparation, weeds in leased-land onion fields are controlled primarily by herbicides, and supplemented with between-row cultivation and limited hand hoeing. Roundup is PUP-approved for use on direct-seeded pre-formed beds to kill weeds prior to onion seedling emergence. Buctril (bromoxynil), a Postemergent broadleaved herbicide, sometimes used in conjunction with Goal, is not used on the Refuge due to its high toxicity to fish and wildlife. Preplant- incorporated herbicides like Dacthal (chlorthal dimethyl) are not used since they perform poorly on high-organic-matter soils.

4.3.3 SMALL GRAINS

Overview, Seasonal Development

As in most crops, weed control in small grains is especially important early in the cropping season. Weeds established prior to the mid-tillering phase of the crop cause the greatest yield reductions. Weeds emerging after mid-tillering usually have little effect on yield unless the stand is poor. Vigorous stands are the best protection against weed emergence and seed development after mid-tillering. Weed control in small grains prevents yield loss, weed reseeding, and reduces dockage in the crop. In Klamath Basin, the main weed competitors are quack grass, wild oats, and various mustard family weeds. Local growers identified Bassia and Kochia as important weeds and netseed lambsquarter, pigweed, and redroot pigweed as problem weeds. Weed control in small grains on the leased lands might fall into two categories because of the different climate and management of the Tule Lake and Lower Klamath Refuges. Crop rotations are required on the Tule Lake leased lands. The soils are generally better and the climate just a bit warmer than the Lower Klamath area. On Tule Lake, grains can be rotated with potatoes, alfalfa, sugarbeets and onions. Weed management can then be accomplished in an integrated, rotation-wide management scheme. However, crop rotation is not generally used on the Lower Klamath leased lands.

Short- and Long-term Management Recommendations:

Cultural:

Tule Lake leased lands: Cultural control of weeds is done by a combination of crop rotation and tillage. Fall irrigation by sprinklers and preirrigation by flooding may be used by some growers to germinate weeds, subsequently controlled by tillage or herbicides. Irrigation water may be a source of weed seeds if water is not sufficiently screened.

Lower Klamath leased lands: Cultural control of weeds is accomplished with a combination of flooding, plowing, and disking. In some fields, the stubble is burned in the late fall. Flooding floats many weed seeds off the soil, but may deposit them in another location within the same field, or carry them to a new field. Crop rotations to a broadleaved crop on this land would be especially helpful for control of grass weeds. Sanitation is important in preventing weed seeds from entering the field. Use of certified seed will prevent weed seeds from coming in with the grain seed. Use of non-certified seed can create weed problems for years to come. To prevent the spread of a particularly difficult-to control weed, growers need to be especially careful to clean equipment

Biological:

Biological control of weeds in berm areas (see Berm Management Plan) would have secondary benefits for potatoes since the number of weed seeds coming into the field would diminish. There are no effective biological weed control options to recommend for use within potato fields during the cropping season.

Herbicides:

To maintain profitability for small grains, herbicide applications should be kept to a minimum, well-timed for maximum effectiveness, and coordinated with cultivations for weed control. Most growers combine tillage and seed bed preparation (both of which control weeds) with one application of herbicides for weed control.

CHAPTER - 5

WEED REMOVING MACHINE

5.1 INTRODUCTION

In most poor countries, agriculture is a major employer and source of national income and export earnings. Growth in agriculture tends to be pro-poor – it harnesses poor people's key assets of land and labour and creates a vibrant economy in rural areas where the majority of poor people live. Agriculture connects economic growth and the rural poor, increasing their productivity and incomes. Agricultural growth, particularly through increased agricultural sector productivity, also reduces poverty by lowering and stabilising food prices, improving employment for poor rural people, increasing demand for consumer goods and services, and stimulating growth in the nonfarm economy.

A weed in a general sense is a plant that is nuisance. More specifically, the term is often used to describe native or nonnative plants that grow and reproduce aggressively. The Ecological disturbances caused due to weeds are displacing native vegetation, thereby decreasing forage for wildlife, decreasing local plant biodiversity and increases erosion.

With agriculture facing a shortage of manpower, need for automating the various activities in the field arises or it is becoming the need of the day. With this in mind, a simple machine has been designed and fabricated for removal of weed and unwanted plants. As the machine is moving the weed is removed. This machine can be used effectively in the agricultural fields and helps in cleaning the barren lands.

This machine is of simple design without using any motor or engine. Only a chain and sprocket arrangement is used. This machine eliminates the need for many workers and makes the work easier, economical and efficient.

5.2 EFFECTS CAUSED BY WEEDS:

1. Weeds may be unwanted because they are unsightly.

2. They limit the growth of other plants by blocking light or using up nutrients from the soil.

3. Weeds may be a nuisance because they have thorns or prickles, cause skin irritation when contacted

4. Parts of the plants might come off and attach to fur or clothes.

5.3 DIFFICULTY IN REMOVING WEEDS:

1. Most of the weeds have thorns or prickles which causes irritation when contacted.
2. They grow at a rapid rate.
3. They no need any manure as they adapt to different conditions.
4. They spread very easily.

Thus it is difficult to employ anyone to control the weeds so we decided to have the machine that will fix these problems....

AND HERE IT IS....

5.4 WEED REMOVING MACHINE:

CHAPTER - 6

DESCRIPTION OF PARTS

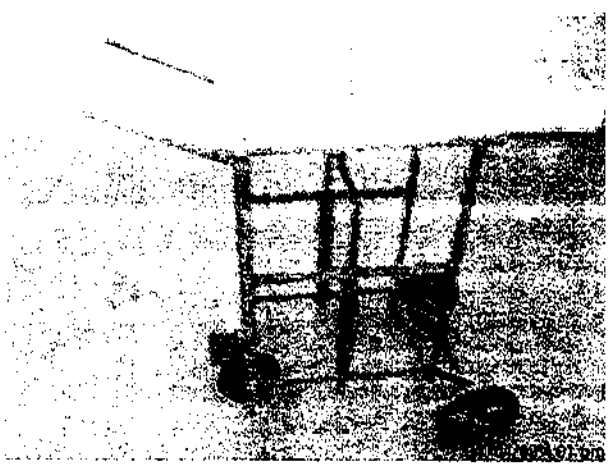
6.1 DETAILED EXPLANATION OF PARTS

The weed removing machine consists of various parts as shown in the fig.5.1. The following are the list of parts of the weed removing machine.

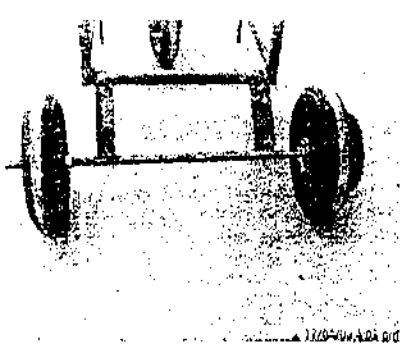
- Frame
- slider
- Bearing
- Spindle
- Handle
- Shaft
- Rear wheel
- Front wheel
- Weed remover(cutter)
- Small sprocket
- Big sprocket
- Nut
- Chain tensioner
- Ideal sprocket
- Steering
- Spring

6.1.1 Frame

The frame forms the base for mounting weed remover (cutter) and transmission systems. It is the rigid structure that forms a skeleton to hold all major parts together. The frame is supported by the wheel and tyre assembly. It is strong, light and designed in such a way that it may withstand the shock blows, twists, vibrations and other strains. The frame supports the various parts such as the weed remover (cutter), transmission elements and steering



6.1.2 REAR WHEELS:



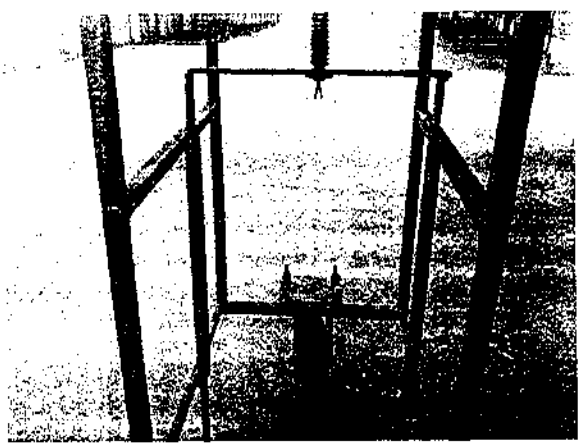
Rear wheel arrangement

Rear wheel diameter: 10 inches

Rear wheel shaft diameter: 1.25 inches

6.1.3 Slider

The slider is a rectangular plate which seats itself inside slot that is machined along the sides of frame. It is made of a less friction material so that no power is lost while transmitting motion.



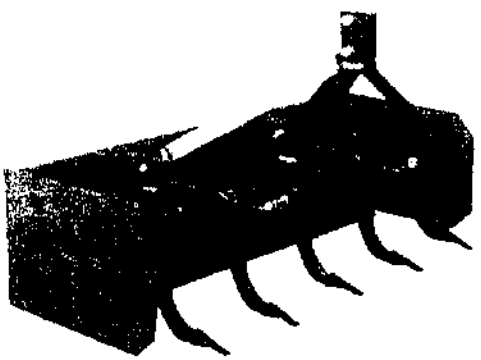
6.1.4 Shaft

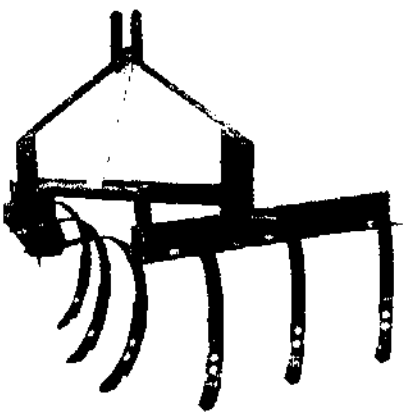
A shaft is a rotating machine element which is used to transmit power from one place to another. The shaft is used for the transmission of torque and bending moment. The shaft is cylindrical, but cross-shaped in section. The material used for shafts should have the following properties:

- It should have high strength
- It should have good machinability
- It should have low notch sensitivity factor
- It should have good heat treatment properties

So the material used for shaft is C45 steel selected.

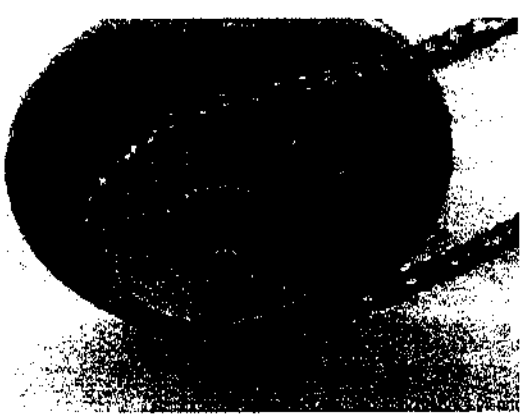
6.1.5 BLADE DESIGNS:



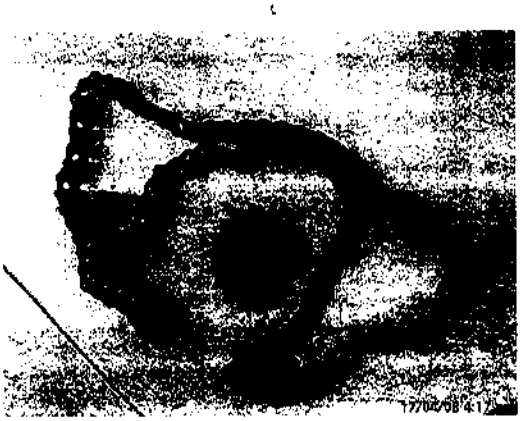


6.1.6 CHAINS:

Chains are used to transmit power from one shaft to another by means of a sprocket.

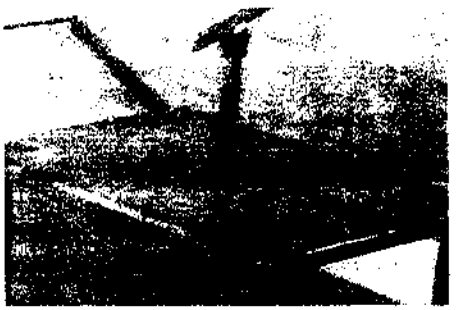


Wheel & sprocket arrangement



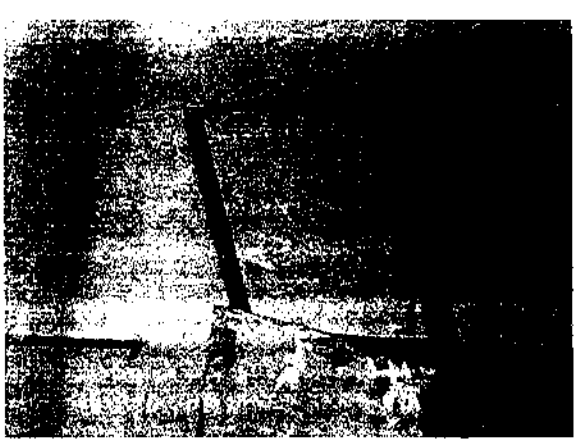
Chain & Sprocket used

6.1.7. SQUARE THREADED ROD:



6.1.8 FRONT WHEEL:

6.1.9 HANDLE:



CHAPTER - 7

DESIGN CALCULATION

7.1 SPECIFICATION OF THE MACHINE:

- Height of the machine : 1m
- Width of the machine : 0.55m
- Breadth of the machine : 0.75m
- Weight of the machine : 50kg
- Width of the weed removed
  By the cutter (cutter width) : 0.4m
- Average speed of weed remover : 150rpm
- Average travel speed of the machine : 50rpm
- For one revolution of the
  Handle the depth of cut : 6mm

7.2. DESIGN OF SHAFT

Material chosen for the shaft is mild steel (**C45**).

Shear stress for this material, f_s=360 N/mm^2 taken from the PSG data book.

Let d & L be the diameter and length of the shaft respectively.

We know, Torque $M_t = (\pi/16)*(f_s*d^3)$

$= (\pi/16)*(360*d^3)$ ----------(1)

The length of the shaft required is 500mm.

Since the angle of twist will be very small, let the angle of twist be $\theta = 0.2$.

We know, $\theta = (M_t * L) / (G * J)$ ----------(2)

Where $J = (\pi * d^4)/32$ ----------(3)

From (1), (2), (3)

$\theta = (M_t * L * 32) / (G * \pi * d)$

$d = (360 * 500 * 32) / (16 * 0.2 * 0.8 * 10^5)$

$d = 22.5$

Diameter of the shaft is **d~25 mm**

7.3. DESIGN OF CHAIN

1. **Number of teeth on the sprocket**

Smaller sprocket, $Z_1 = 12$

Larger sprocket, $Z_2 = 72$

2. **Calculation of length of chain**

Number of links, $L_p = a_p + (Z_1 + Z_2)/2 + [(Z_2 - Z_1)/2\pi]^2 / a_p$

Where $a_p = a_o/p$

= centre distance/pitch

/15.875

$L_p = a_p + (Z_1 + Z_2)/2 + [(Z_2 - Z_1)/2\pi]^2 / a_p$

~25 links

Actual length of chain, $L = L_p * p$

=

3. Calculation of exact centre distance

We know that $a = [(e+\sqrt{e^2-8m})/4]*p$

where $e = L_p - (Z_1 + Z_2)/2$

=

and $M = [(Z_2 - Z_1)/2\pi]^2$

$a = [(e+\sqrt{e^2-8m})/4]*p$

=

decrement in centre distance for an initial sag = 0.01*a =

exact centre distance =

CHAPTER - 8

COST ESTIMATION

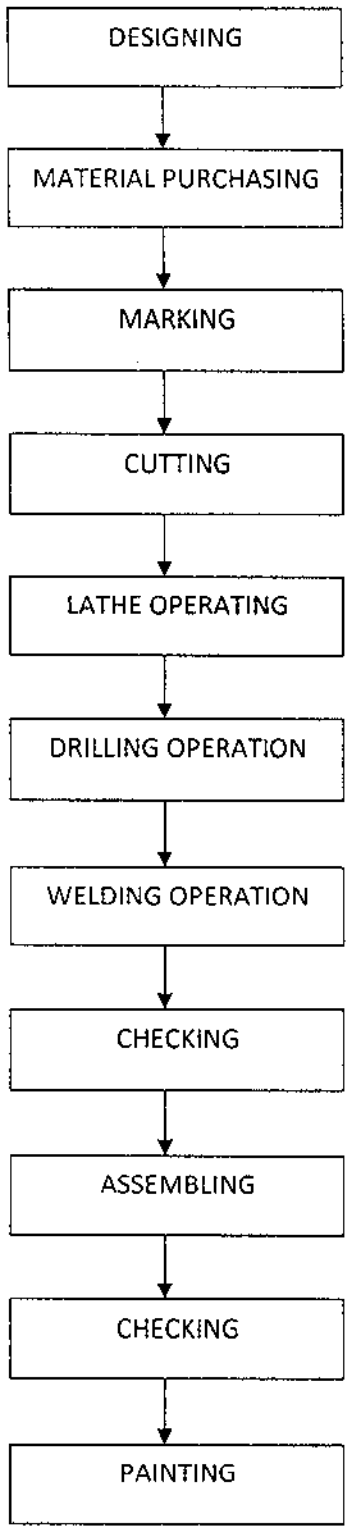
8.1 COST INCURRED:

COMPONENT NAME	PRICE IN Rs
Frame	1585
slider	250
Bearing	300
Spindle	200
Handle	100
Shaft	300
Rear wheel	400
Front wheel	200
Welding work	750
Painting	350
Weed remover(cutter)	800
Small sprocket	35
Big sprocket	65
Nut	110
Chain Tensioner	30
Ideal sprocket	35
Steering	175
Spring	15
Lathe work	500
Transport	150
TOTAL	**6350**

CHAPTER - 9

DISCUSSION

9.1PROCESS CHART FOR FABRICATION:



9.2 OPERATION PLANNING TABLE:

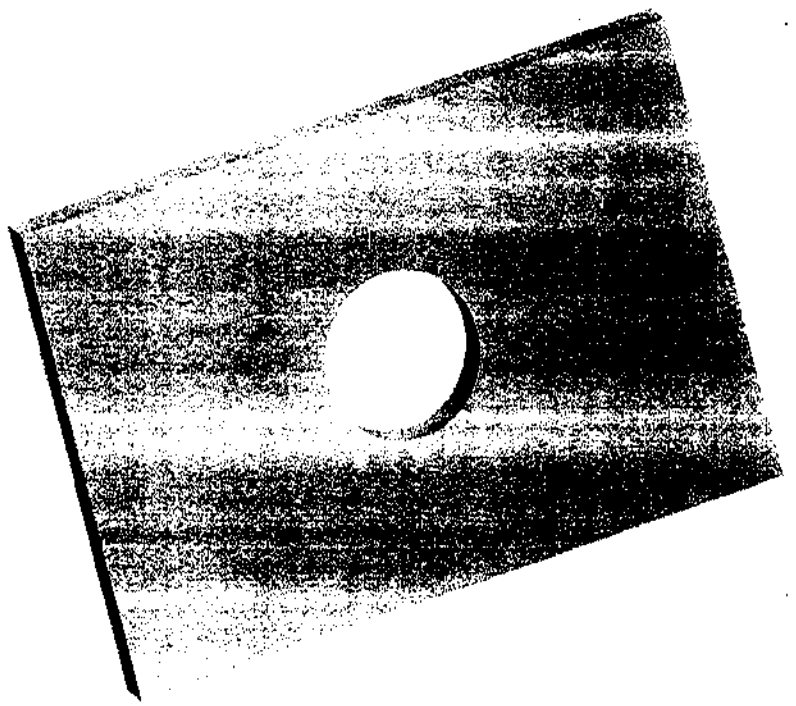
S.NO.	PARTS	OPERATION	MACHINE	TOOL
1.	Frame	Cutting, Drilling, Welding	Gas cutting equipment, Drilling & Welding machine	O_2 + LPG gas Twist drill, electrode
2.	Shaft	Machining, Cutting, Drilling	Lathe, Gas Cutting	Single point cutting tool, Twist drill, electrode
3.	Weed Remover	Cutting, Welding	Gas Cutting equipment, Welding machine	O_2 +LPG gas, electrode
4.	Spindle	Square threading	Lathe	Threading tool
5.	Nut	Square threading	Lathe	Threading tool

9.3 MEN Vs MACHINE:

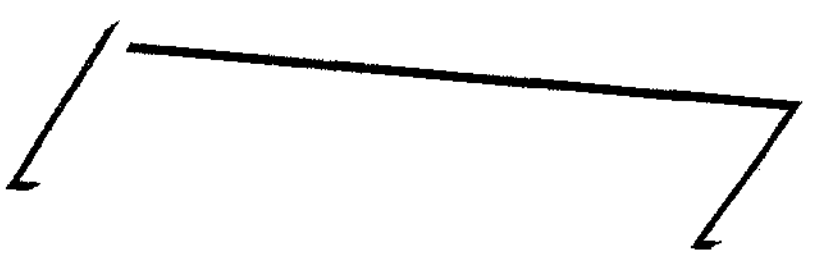
Manual	**Machine**
➢ Labour charges per worker per day = Rs.60. ➢ For 1 acre 10 labourers = 60*10 = Rs.600. ➢ For three times per crop per acre = 600*3 = Rs.1800. ➢ For three acre = 3*1800 = Rs.5400. ➢ In a year if two crops cultivated, then = 5400*2 = **Rs.10800**. ➢ Time taken to remove weed in one acre with 10 labourers = one day.	➢ Labour charges per worker per day = Rs.60. ➢ For 1 acre 10 labourers = 60*10 = Rs.600. ➢ For three times per crop per acre = 600*3 = Rs.1800. ➢ For three acre = 3*1800 = Rs.5400. ➢ In a year if two crops cultivated, then = 5400*2 = **Rs.10800**. ➢ Time taken to remove weed in one acre with 10 labourers = one day.

10. PRO-E MODELS:

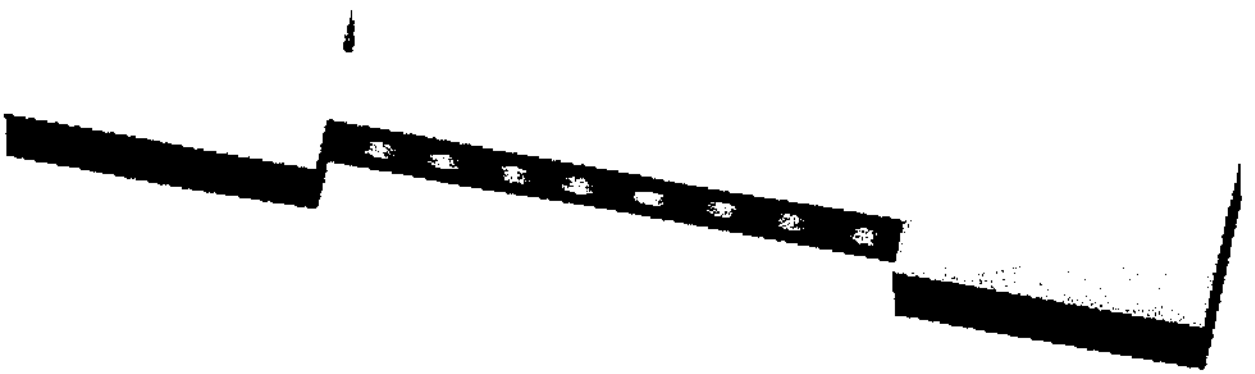
a. UPPER PLATE:



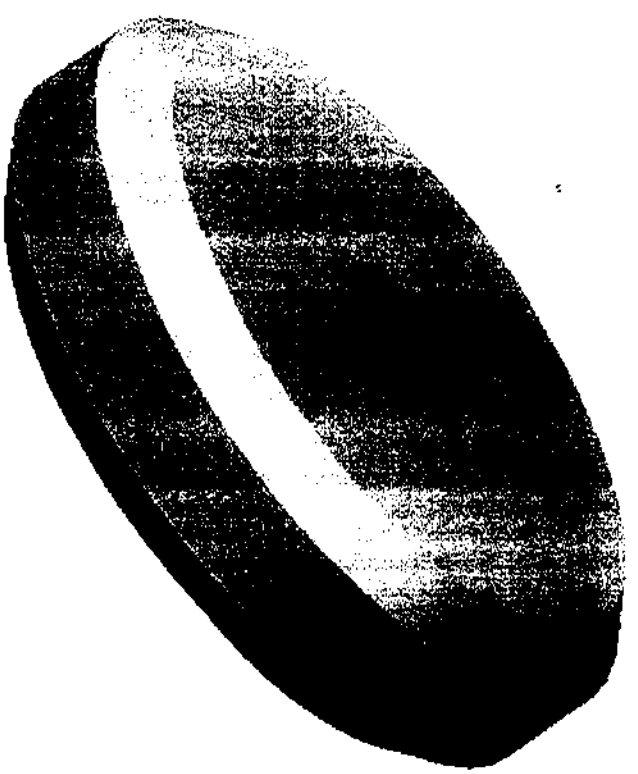
B.HANDLE:



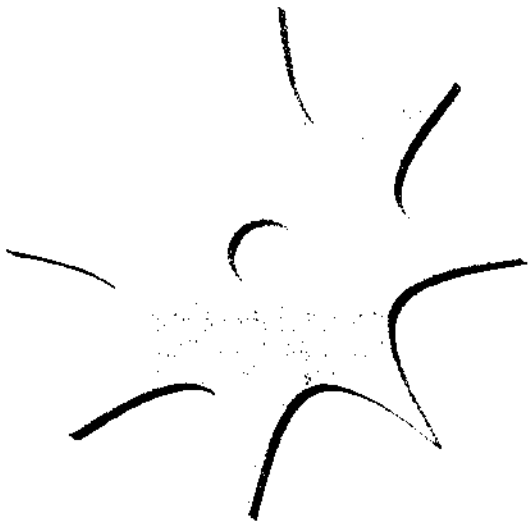
C. LOCKING NUT:



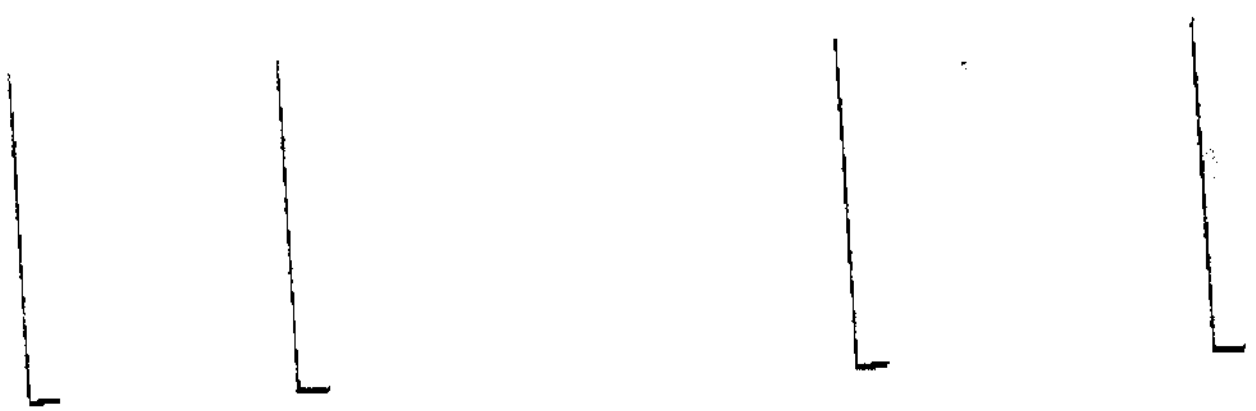
D. TYRE:



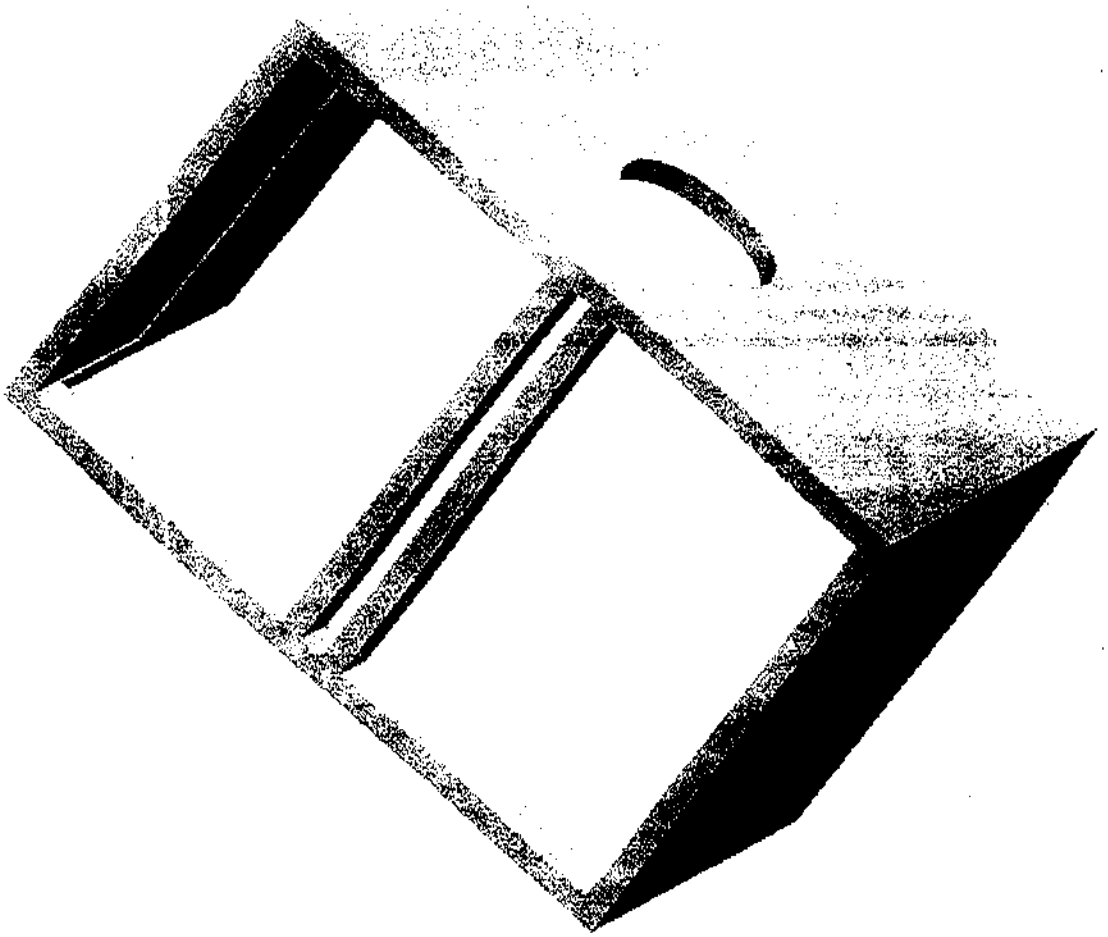
E. SPROCKET:



F. FOUR SUPPORTING RODS:



G. CENTRE COVVER BOX:



CHAPTER - 12

CONCLUSION AND SCOPE FOR FUTURE WORK

This machine adds to the modernization of the agriculture. A machine like this will make the farmer to be independent and not rely on the labourers for removing weed. Since the break even can be achieved in the first year itself, the savings would be enormous in the consecutive years. This machine would be further tested in the fields and based on the feed back from the farmers, the design would be optimized and improvements made. Although the machine cost seems to be high, once mass produced, the cost can be drastically reduced.

The calculation reveals that the process is economically feasible and works with the appropriate efficiency. The evolution of the pro-e model gives us an idea of how to proceed with future works in this field. The ANSYS model explains the stress developed and the feasibility of pursuing with future enhancements.

This project work has provided us an excellent opportunity and experience, to use our resources and faculty. We have gained a good amount of practical knowledge regarding planning, purchasing, assembling and machining during this project work. We feel that our project work is a good solution to bridge the gaps between institution and industries.

The "**WEED REMOVING MACHINE**" concept model is working with satisfactory conditions. It provides with the knowledge of understanding the difficulties and limitations of this project. We have done to our ability and skill making use of available facilities.

13. REFERENCES

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2. Khurmi R.S., Gupta J.K. "Machine Design", S.Chand & Company Limited, 2006.

3. Prabhu T.J., "Design of Transmission Elements", Mani offset Chennai, 2000.

4. PSG Design Data Book.

(==========add more ==========websites)