



## DESIGN AND FABRICATION OF MULTI PURPOSE AGRICULTURAL EQUIPMENT

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**Abstract—** A Study has been carried out to develop multi purpose agricultural equipment, for performing major agricultural operations like goods carrying, pesticide spraying, laddering, inter-cultivating and digging operations of sandy loam deep soils, to increase the efficiency and reduce the production and handling cost. Modifications were carried out, and the modification includes fabricating a vehicle which is small, compact in size which can move easily across the fields. This vehicle was named as NCET kissan all in one .which consists of various agricultural implements like inter-cultivator, ladder, pesticides sprayer, goods carrying container, plough, which can be easily assembled and Dis –assembled by a single person, the cost of equipment is less by 83% compared to a tractor. And 40% compared to a tiller (price in India).

***NCET kissan all in one-agricultural equipment name***

### I. INTRODUCTION

Metal fabrication is the building of metal structures by cutting, bending, and assembling processes

- Cutting is done by sawing, shearing, or chiseling (all with manual and powered
- variants); torching with hand-held torches (such as oxy-fuel torches or

plasma torches); and via numerical control (CNC) cutters (using a laser, mill bits, torch, or water jet).

- Bending is done by hammering (manual or powered) or via press brakes and similar tools. Modern metal fabricators utilize press brakes to either coin or air-bend metal sheet into form. CNC-controlled back gauges utilize hard stops to position cut parts in order to place bend lines in the correct position. Off-line programming software now makes programming the CNC-controlled press brakes seamless and very efficient.
- Assembling (joining of the pieces) is done by welding, binding with adhesives, riveting, threaded fasteners, or even yet more bending in the form of a crimped seam. Structural steel and sheet metal are the usual starting materials for fabrication, along with the welding wire, flux, and fasteners that will join the cut pieces. As with other manufacturing processes, both human labor and automation are commonly used. The product resulting from fabrication may be called a fabrication. Shops that specialize in this type of metal work are called fab shops. The end products of other common types of metalworking, such as machining, metal stamping, forging, and casting, may be

similar in shape and function, but those processes are not classified as fabrication.

- Blacksmithing has always involved fabrication, although it was not always called by that name.
- The products produced by welders, which are often referred to as weldments, are an example of fabrication.

Similarly, millwrights originally specialized in setting up grain mills and saw mills, but today they may be called upon for a broad range of fabrication work.

- Ironworkers, also known as steel erectors, also engage in fabrication. Often the fabrications for structural work begin as prefabricated segments in a fab shop, then are moved to the site by truck, rail, or barge, and finally are installed by erectors.

**II. Technical Specification of NCET kisan all in one**

TECHNICAL SPECIFICATION	
<b>ENGINE</b>	
TYPE	4 STROKES 150CC WATER-COOLED
DISPLACEMENT RATIO	149CC
COMPRESSION RATIO	11:01
MAX. POWER	8.5KW / 8000R / MIN
MAX. TORQUE	10N.M / 7500R / MIN
<b>CLUTCH</b>	
TYPE	MULTI-PLATE WET TYPE
LUBRICATION METHOD	
PRESSURE SPLASH	
<b>TRANSMISSION</b>	
TYPE	CONSTANT MESH TYPE
NO. OF GEARS	5 FORWARD + 1 REVERSE

**Table 1 back engine used in NCET kisan all in one**

Table 1 shows the details of rear engine used in NECT kisan all in one and multi-purpose agricultural equipment, the engine used was built by Bajaj Company and model was given by auto rickshaw re

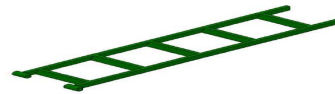
**III. Table 2 technical specification of NCET kissan all in one**

<b>ENGINE</b>	
TYPE	2 STROKE
COOLING TYPE	FORCED AIR COOLED
DISPLACEMENT	145.45 CC
MAX POWER	7 BHP( 5.15 kW) 5000 RPM
MAX TORQUE	12.1 NM @ 3500 RPM
IGNITION TYPE	CDI
TRANSMISSION TYPE	4 FORWARD AND ONE REVERSE
CLUTCH TYPE	WET MULTIDISC TYPE
<b>ELECTRICAL SYSTEM</b>	
SYSTEM	12V AC + DC
HEAD LIGHT	35/35W
HORN	12 V AC
<b>SUSPENSION</b>	
FRONT SUSPENSION	HELICAL SPRING AND HYDRAULIC SHOCK ABSORBER WITH ANTIDIVE LINK
REAR SUSPENSION	INDEPENDENT SUSPENSION WITH SPRING AND HYDRAULIC SHOCK ABSORBER
<b>TYRES</b>	
FRONT TYRE SIZE	4.00-8, 4PR
REAR TYRE SIZE	4.00-8, 4PR 2 Nos.
FRONT BRAKES	DRUM HYDRAULIC
REAR BRAKES	DRUM HYDRAULIC

**Table 2 technical specification of NCET kissan all in one**

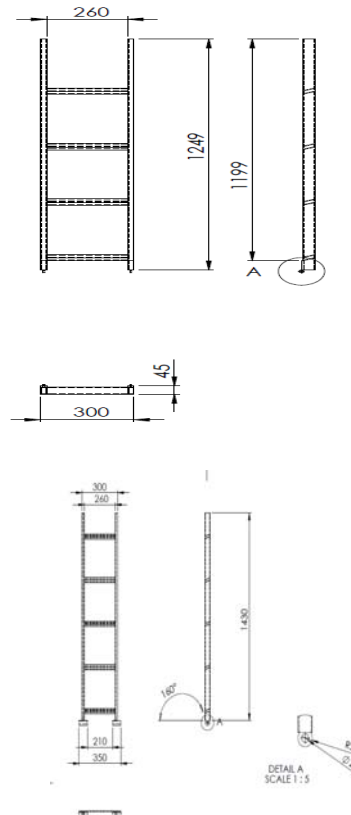
Table 2 shows the details of front engine used in NECT kiss an all in one a multi-purpose agricultural equipment, the engine used was built by Bajaj auto rickshaw Re Company and model was given by electronic start. It also gives a detailed description of over all length, type of electrical system used, type of transmission system used etc; the resemblance of NCET kissan all in one is all most similar to the Bajaj two stroke front engine auto rickshaws.

**Iv.Ladder**



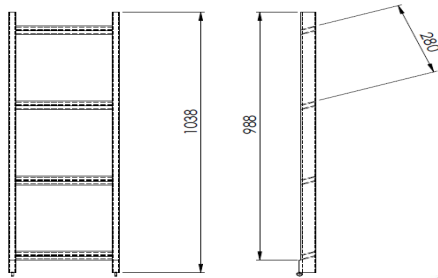
**Fig 1 first part of ladder**

The ladder has been divided in to three parts, and hence named as 1,2,3 parts where in which the first part is been fixed to vehicle chassis with the help of 14 mm bolts and nuts the one end of the ladder is been welded by the help bush so that the it can be easily tilted from 90° to 180° the dimensions has been shown in the figure 5.5 .



**Fig 2 second part of ladder**

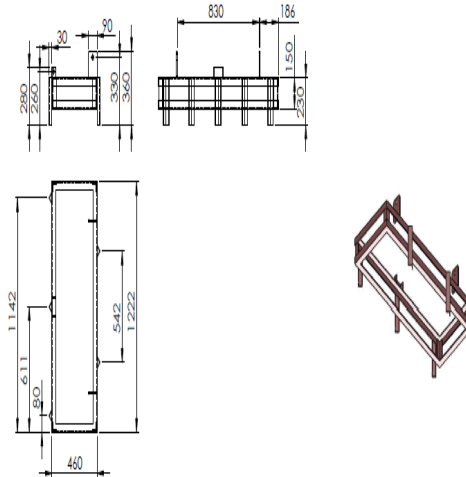
The second part of the ladder rests on the main frame of good carrying container this part of ladder is attached to the first part of ladder by means of Lowry inches so that it can be tilted easily and proper clamping mechanism is also been used to lock it when it is placed one on the other the required dimensions is shown in the figure 2



**Fig 3 third part of ladder**

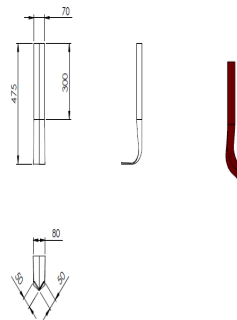
The third part of the ladder is free to rests on the main frame of good carrying container this part of ladder is attached to the second part of ladder by means of Lowry inches so that it can be tilted easily and proper clamping mechanism is also been used to lock it when it is placed one on the other the required dimensions is shown in the figure 3

**V.Ploughing assembly.**



**Fig 4 main frame of ploughing assembly**

Fig shows the main frame of ploughing assembly where the blades can be accommodated, the total numbers of blades that can accommodate are 5 blades which are in zigzag form, and it is placed so that when they perform their job they dig the soil in straight line format. It is also been attached by to plates consisting of holes so that they can be easily attached to the vehicle by means of shaft and lock them by using clipping mechanism.

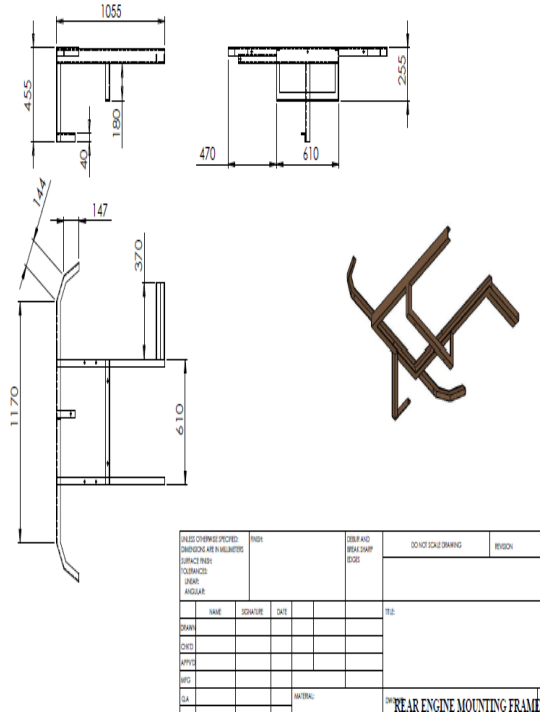


**Fig 5 blades used in ploughing assembly**

Figure shows the blades which are used in ploughing assembly these are manufactured by using cast iron and process of manufacturing is by forging. for analysis purpose the load coming on to the plates is difficult to assume it is totally dependent on type of soil, hence the soil changes from one part of land over the other part hence it is assumed and 90 kg's of

load was putted on each blades and it is proved to safe when tested in fem analysis.

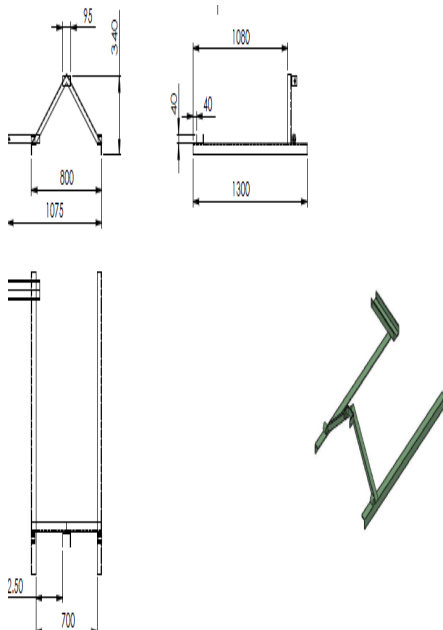
**VI. Engine mounting**



**Fig 6 rear engine mounting frame**

Figure shows the rear engine mounting frame which has welded at the rear part NCET kissan all in one agricultural equipment the fuel tank and exhaust manifolds are also been placed at appropriate positions.

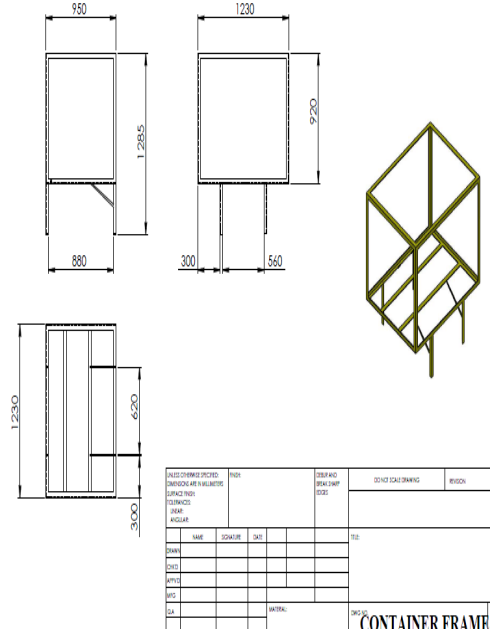
**VIII. Extended chassis**



**Fig 7 extension chassis frame**

The above figure shows the extension part of the chassis which is drawn from main part of the chassis this is provided to mount the goods carrying container ,pesticides spraying pump, ladder and rear engine

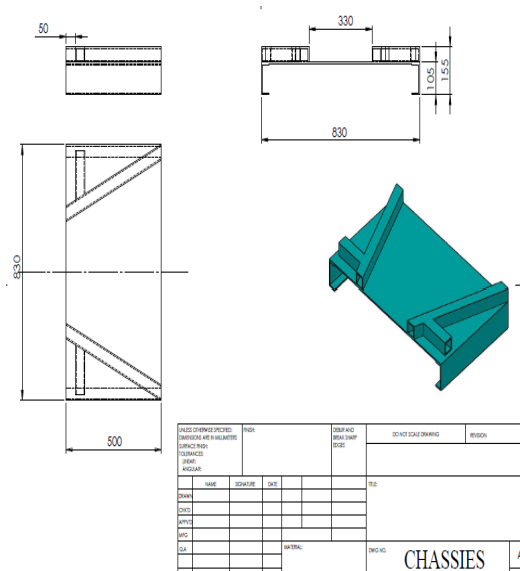
**VII. Goods carrying container**



**Fig 8 goods carrying container frame**

The goods carrying container is attached to the rear part of the NCET kissan all in one the it consists of two doors on its front part, the entire container can be tilted and rotated from 900 to 1800 .and there is a provision of remove entire assembly by means of bolts and nuts.

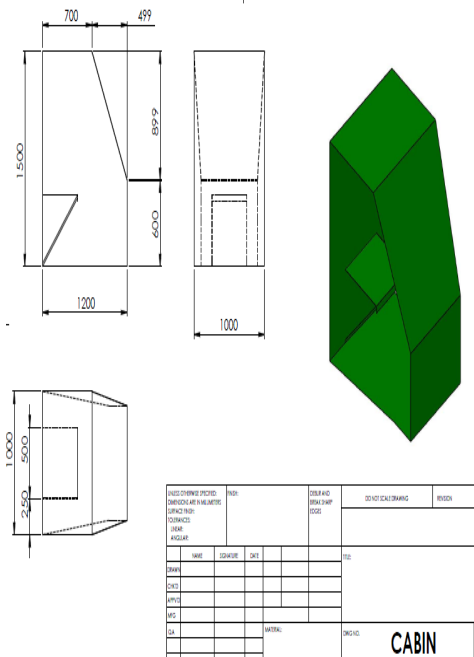
**IX. Goods carrying container mounting**



**Fig 9, goods carrying container mounting frame**

The goods carrying container is attached to chassis by means of mounting frame, this frame also covers the front engine and this is responsible for connecting and takes the loads from shock absorber.

**X. Cabin**

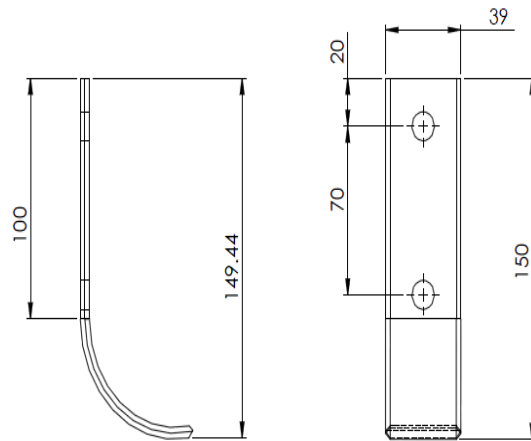


**Fig 10 Cabin frame**

This is used to safe guard the driver it is made up of mild steel sheet and it is the place where are

controls of vehicle which guide the stability of vehicle is placed.

**XI. Inter cultivator blades**



**Fig 11 Inter cultivator blades**

These blades are also called as tins, the total number of blades used are in two ways 16 blades and 8 blades depending on the type of soils the user can select among these two any one .the drive to this blades are given by an rear engine which can be controlled from driver cabin it self, 4 gears are provided to vary the speed and load carrying capacity.

**XII.Pesticide spraying pump**



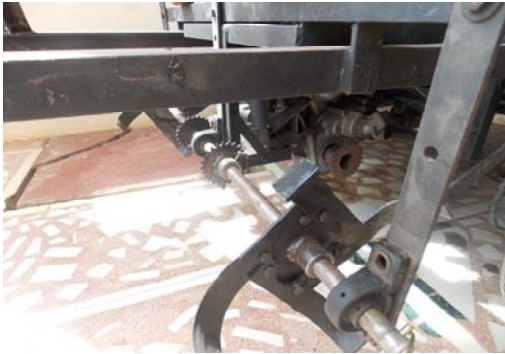
**Fig 11 pesticides spraying pump used in NCET kissan all in one.**

**Specifications**

PLUNGER NO.*DIA*STROKE	2 PLUNGERS* $\Phi$ 30MM*20
PRESSURE	21-45KG/CM <sup>2</sup>
OUTPUT	35-45L/MIN
SPEED	800-1200 R.P.M
DIMENSION	420MM $\times$ 320MM $\times$ 340MM
POWER	5-6.5 PS

**Table 3 shows the technical specification of pesticides spraying pump NCET kissan all in one**

### XIII.Photos



### XIV.Conclusion

NCET kissan all in one, multipurpose agricultural equipment, can be successfully used for farming due to following reasons

1. Faster operations
2. Low cost of operations and low investments
3. Light in weight, low cost durable with minimum repairs which saves time during operations
4. All cultural operations (inter-cultivating, ploughing, laddering goods carrying etc)for year round cultivation done with the help of NCET kissan all in one
5. Slipping of tires was very common problem when moisture content was more, Hence farming is recommended to be done in 10-15 percent moisture content lands.
6. Ladder can be tilted from 90<sup>0</sup> to 200<sup>0</sup> ,but best load withstanding range was noticed at 120<sup>0</sup>.position of ladder
7. Ploughing was difficult to be done in newly cultivating farms. But it is recommended to use once after cultivating it from the tractor.
8. Maximum of 800 kg's load can be pulled, but it is recommended for carrying 500 kg's of load for better life span of engine
9. From the survey , farmers told that they use tractor minimum of 4 times and maximum of 7 times for one crop rotations, for which they were paying 700rs /hector (for one time) hence if farmer goes for one time with tractor is sufficient, else all other work he can do from NCET kissan all in one.
10. The cost of equipment was 120000,which can be still reduced when produced in mass production
11. The maximum speed ranges 40 km/hrs, this is build to take more load rather than speed hence it is adequate to run the vehicle at 25 km/hr to commutate both time and durability.

### XV. REFERENCES

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