IAgrE Student Awards

NOMINATION SUMMARY

Student Project Award*
Safety Award*
***please delete as appropriate:**

PROPOSER: (usually Course Director/Head of Department)

Name: Rhys James

Position: Level 3 Course Director

University/College: ColegSirGar, Gelli Aur Camps, Home Farm, Golden Grove, Camarthen SA32 8NJ

Contact details:	**Tel:01554748583**	**Email: rhys.james@colegsirgar.ac.uk**

DETAILS OF NOMINATION:

Name of Student/Group of Students: Tomos Thomas

Personal contact details (i.e not college) to enable us to contact the student(s) once their course has ended:

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Email:Thomosthomas414@gmail.com

Name of course studied: Level 3 City and Guilds Extended Diploma in Land based Technology

Period studied	**From: September 2024**	**To: July 2026**

Qualification to be gained:
180 Credit extended diploma

Project Title: Muck Stop- Dual spreader hydraulic lid to prevent muck depositing on the road.

Details of material submitted with nomination: (Project/Exec Summary/videos etc)

PowerPoint presentation

SIGNED BY PROPOSER: DR James	**DATE SUBMITTED:** 18/09/26

If you wish to provide any additional information to support this nomination, please do so in a covering letter. When complete, return this form, together with the supporting documents, to

The Secretariat, IAgrE, The Bullock Building (Bldg 53), University Way, Cranfield, Bedford MK43 0GH
secretary@iagre.org

NB All work submitted is treated with complete Confidentiality; no part of the paper will be published by IAgrE except for the Title and Name of the winner in each category.

Tomos Thomas

Final project presentation land based technology 2025/2026

My name is Tom Thomas an I live in Pontargothi located just outside Carmarthen, I’ve been brought up around farming and have been driving for my uncle as a contractor for around 2 and a half years. Before I went to gelli aur I sadly attended QE high school in Carmarthen. When i'm not in college I either go to work or work on my car. As part of my first year in geli aur I needed to attend a place of work for 330 hours, I did this in Brodyr Evans in cross hands, I did the 300 over the from November to February.








Aims/objectives

The aims of all the projects is to make something new/ improved something that exists and make it safer and/more practical. This can be done by altering the use of the product, for example modifying it to allow it to be multi use.

My objectives was to design and manufacture a project that would have a commercial value, and something that would help protect the environment. I would also design it to improve help health and safety while work is being carried out

Research

During my time in Gelli Aur I have visited various dealerships and manufacturers, along with shows. Such as the Krone factory in Spelle, Germany. We also visited Agritechnica wich was full of new products that would be coming to the agricultural market in the near future. Along with this we visited Lamma show which was also full of new inventions and improvements on old existing machinery

Previous concepts

Concept 1

My first concept is a guard for a buckrake, however to make it more unique and safer it will be equipped with lights, a tool box, carrier for dual wheels and possible a container for hydraulic oil and a compressor. The lights would be powered by a 7 pin trailer plug that can be plugged in when the buckrake is attached to the loader, the guard will be attached with a gate hinge style latch so that it it locks itself into place when attached. I could also make the unlocking system hydraulic as the 414 has a 3rd and 4th service available to use.



Concept 2



My next concept is a grid style lid for a dual spreader, the design and function is similar to a gritter lorry as it would be used to stop big foreign objects from going into the spreader, as dual spreaders are often used to spread slop and sand it would be a big help to prevent unnecessary damage. Along with slop and sand dual spreaders are also used to spread solid muck, to compensate this the lid would be fitted with heavy duty rams that would be able to lift the lid out of the way, this would give it a more multi purpose use, the lid would be made to fit each spreader depending on the buyers needs

Concept 3

My third concept is a set of ramps for umbilical slurry that are attached via a A frame onto the front or back of the tractor, for the contractor I work for this wouldn't be a issue as out spread bar tractor has a loader, however some outfits only dont have that luxury. Having a set of ramps that can be used on the front linkage of a tractor would reduce the need to borrow the farmer tractor or taking a separate loader to set the ramps. My idea is that the rmaps would be fitted with a hydraulic ram imbedded in the frame of the ramps to aid lowering and raising them. It would be embedded in the ramps to stop passing cars from catching the bottom of the car. The A frame would be on a set of hinges at the bottom 2 points, these would act as the pivoting points for it, the point of the a frame would be supported by a piece of steel that reaches from the far side of the ramps to the a frame, once the bar is in place then the a frame would be locked in place making it safe. The a frame and bar would also fit into cut out slots in the base of the ramps so that the can fold away tidy

Concept 4

My 4th concept is making a cattle crush easier to maneuver around, my idea is to fit a female A frame to the crush, possible 1 on each side to improve how useful it is. This would enable the farmer to move the crush either using a tractor, or in my case the a frame adapter for the telehandler. This makes moving the crush much more safer and less hassle. Moving a crush with pallet forks can often lead to the crush sliding about and sometimes falling off. With the crush being secured on an A frame it would also mean moving it down the road or down a track would be much safer and easier. One disadvantage of this is that the A frame on the crush would stick out a couple of inches which would take a bit of getting used to but over time it wouldn't be an issue.

Proposed concept

My proposed concept is the lid for the dual spreader. I have picked this as I couldn't find anyone online who was advertising the construction of a purpose built lid for a dual spreader. The design that I will be carrying out is unique as far as i'm aware, I've have asked online and people in person and none of them have ever heard of a lid for any sort of muck spreader other than a barrel spreader

Weighting

Dual spreader lid

	Score
Cost	6
Commercial value	8
Ease of making	7
Safety	9
Profitability	8

Average- 7.5

Buckrake guard

	Score
Cost	7
Commercial value	5
Ease of making	6
Safety	9
Profitability	6

Average- 6.4

3 point umbilical ramps

	Score
Cost	5
Commercial value	7
Ease of making	5
Safety	7
Profitability	8

Average- 6.2

A frame on cattle crush

	Score
Cost	7
Commercial value	7
Ease of making	7
Safety	8
Profitability	8

Average- 7.2

Issue to overcome/ Justification of the idea

My justification for my idea is that the contractor I work for, deals with alot of sloppy muck and sand, a common problem when dealing with the stuff is that if you need to hit the brakes hard then muck comes over the front of the spreader and covers the tractor, the muck can also go over the sides if you fill it to full and go around a corner to fast or if you go around a corner on a track which has a camber to it lots of potholes, a clean track will lead to much less muck being dragged onto the road from the tires. a lid would mean that you could put wet muck level to the top of the spreader and still drive around and no muck would fall out.



What's on the market

After carrying out some research online and during various shows and i am pretty confident that there is nothing on the active market that is similar to mine

Target market

data indicates that around 55% of UK farm holdings (out of 209,000) spread manure or slurry, suggesting tens of thousands of units, ranging from small-scale to large-capacity commercial contractor machines. This means there is a huge market for making aftermarket items for muck spreaders. A big customer would be contractors as it is common for a contractor to have multiple muck spreaders. More capacity and less mess would massively increase the efficiently for the farmer and the contractor.

In 2023, 81% of holdings spread manure or slurry on their grass and arable land. For years 2019 to 2023 there was little variation in spreading methods, and in 2023 the largest proportion of holdings (43%) said the manure/slurry was spread solely by the farmer, 22% solely by contractor and 16% by farmer and also contractor. Consideration within the latest legislation for example the NVZ scheme is that muck needs to go out faster and more efficient before and after the ban

Different designs

My intal design was to have a lid the exact same as a trailed fert spinner lid that flips to the side and is made from mesh, however after some thought i decide that a sheeted lid split to open front and back, this allows the spreader to be loaded from either side of the machine, the mesh design would have been a good idea for stopping foreign objects going in however it wouldn't of been the best for stopping sloshing muck from coming out, so because of this i opted for the sheeted lid.

Calculations

standard geometric formula for the shortest distance from a point to a line

(d= $\frac{|Ax_0+By_0+C|}{\sqrt{A^2+B^2}}$)

map the straight line between the cylinder mounts (*L* and *T*) and calculate how far away the pivot (*P*) sits from that line:

$$\text{Leverage Arm}_{\text{cylinder}} = \mathbf{25.9}\ \text{cm} = \mathbf{0.259}\ \text{m}$$

Calculations-Cylinder power (Pascal law)

PressureX Effective Area

Piston area **(A_{ext}): $\frac{\pi XD^2}{4} = \frac{\pi X(0.09m)^2}{4} = 0.00636m^2$**

Push force :(200bar)/ **20,000,000PaX0.00363m² = 127,200N or 127.2kN**

= 127,200/9.81=12966Kg

Pull (retract) force: **(A_{ret}): $\frac{\pi XD^2-d^2)}{4} = \frac{\pi X(0.09^2-0.05^2)}{4} = 0.00440m^2$**

Pull Force: 20,000,000PaX0.00440m²= 88,000N (**88.0kN) /9.81=8970 Kg**

Mapping the Coordinate Geometry

Frame Pivot (P):25mm behind the edge and 25mm above it

P=(-2.5,2.5)

Cylinder Lower Mount (L): 245mm in front of the edge and 500mm lower

L=(24.5,-50)

Cylinder Top Mount (T): In line horizontally with the pivot (*x*=-25) and 410 above the frame (y=41)

T= (-2.5,41)

Calculating the Cylinder's Leverage (Moment Arm)

$$\text{Length} = \sqrt{(-27)^2 + 91^2} = \sqrt{729 + 8281} = \sqrt{9010} \approx 94.92 \text{ cm}$$

Perpendicular Leverage Distance (d_{cyl}):

Using the standard geometric formula for the distance from a point (*P*) to a line (*LT*), the perpendicular distance from the pivot to the cylinder's line of thrust works out to: $d_{cyl} \approx 259. = 0.259m$

Calculating the Weight Leverage

Frame should weigh 70kg sheeted

Force gravity=70kgx9.81=686.7N

$$\text{Distance} = \left(\frac{237.5\ \text{cm}}{2}\right) + 2.5\ \text{cm} = 118.75 + 2.5 = 121.25\ \text{cm}$$

Torque $_{\text{weight}}$=Force $_{\text{gravity}}$ X Distance $_{\text{to CG}}$

Torque $_{\text{weight}}$=686.7N X 1.2125m=832.62Nm

The cylinder pushes at an angle, we can't just use its physical length. We have to find the **perpendicular distance** from the pivot point to the cylinder's line of push.

Pivot (P): $(-2.5, 2.5)$

Cylinder Lower Mount (L): $(24.5, -50)$

Cylinder Top Mount (T): $(-2.5, 41)$

Final Effort Required to crack open the frame

$$\text{Force}_{\text{cylinder}} \times \text{Leverage Arm}_{\text{cylinder}} = \text{Torque}_{\text{weight}}$$

$$\text{Force}_{\text{cylinder}} \times 0.259\text{m} = 832.62$$

$$\text{Force}_{\text{cylinder}} = \frac{832.62\text{Nm}}{0.259\text{m}} =$$

3,214.75 /9.81=327.7 kg of force required

Risk assessment

	Risk		Likelihood	Severity	Total	Low	measures required.
fires and burns	myself and others	wear all appropriate PPE for example fire resistant overalls	2	2	4	med	remove all flammable objects in surrounding area before welding
Explosions	myself and others	be aware of the object you are welding/ cutting that may contain or have contained flammable objects check regulators for any leaks gas cylinders to be stored in locked cadge when not in use	2	2	4		
Dust & Fumes	myself and others	ensure local exhaust ventilation (LEV) is in place before starting to weld., try to weld in a well ventilated area. if in enclosed area, wear an air ventilated mask and apply to time exposure limits	2	2	4		
Slips, Trips & Falls	myself and knocks	ensure that there are no objects in the way when welding, be aware of where your cables and hoses are.	2	2	4		

Timeline

- After coming back from germany in November I began to start carrying my initial research for ideas
- In January I carried out my first presentation to my peers about my initial ideas
- In February I ordered the steel and began to plan how i was going to construct the design
- In March/April I began construction of the lid, this was often interrupted by farm tours and other college experiences, hence why manufacturing was carried out until june

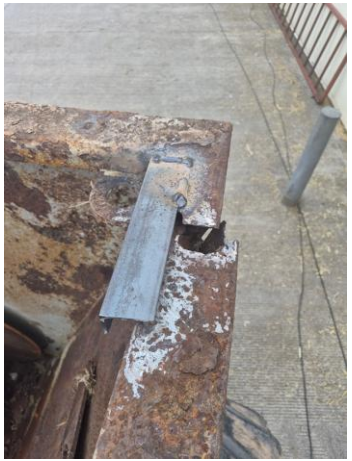
Methodology

The first step of manufacturing was to draw up some initial ideas, once I had settled on a design that i was happy with and suited my products needs i ordered the steel i would need. Once the steel had come i first made the frames out of box section making sure that the welds were high quality and that i mitered the corners for max strength. I then made the arm/frame that the ram would be pulling on to lift the lid, I then made the brackets that come off of the spreader for the hinge point for the ram. Once the manufactured I could test the product and make sure it worked as it should.

Fabrication and Manufacturing

Before I could being making the lid I had to strengthen the spreader to make sure that it could take the weight of the ram, I then had to cut and weld the steel to the correct length and strengthness





As soon as i was able to i test the opening and closing of the lid of ensure that the geometry was correct and everything worked







Costs

30x30x3mm box section= £25 per length (used 4 lengths so £100 total)

3x galv 8x4 2mm sheets= £65 (£195)

Hydraulic pipes and fitting= roughly £200

Hydraulic rams= (estimate £300 for the 2)

Total material cost = £795

labour = 20hrs @ £15 p/h = £300

Total product cost £1095

Justification for market price

- Under the Highways Act 1980, it is an offence to deposit mud or other materials onto the road that could cause an accident. Farmers and landowners are responsible for
- Regional Impact: In a 2014 report, Devon and Cornwall Police recorded 18 collisions caused by mud and debris in just over seven weeks (January to February).
- Insurer Claims: NFU Mutual has previously reported that incidents involving mud left on roads resulted in personal injury and death claims totaling £11.5m over a three-year period.
- Harvest Surge: Road accidents involving farm machinery increase by about 60% at harvest time, with many of these caused by mud left on the road
- up to £1,000 per offence for depositing mud or muck on the road that causes a danger or nuisance, under the Highways Act 1980. Local authorities can also recover cleanup costs and hold farmers liable for damages, including personal injury or property damage.

Possible improvements

The main way to improve it the product is to add a piece of mesh which rests between the lid and the spreader with a mechanism which allows the mesh to lift up with the lid when dry muck is being loaded

Skills learnt

I have learnt many valuable skills along the way such as how to make a product as strong as possible while keeping it relatively neat and tidy such as unique fabrication strategies. I have also learnt that the best way to see if something works is to carry out the trial and error strategy.

Testimonial

After showing the product to my peers and work colleagues they have all said that it looks to be working well and that the finished product is presentable and professional.

Whats next for me

After completing my course in Gelli Aur to my highest standard i have plans to travel to Australia this winter, if the opportunity arises when I have returned from my travels I wouldn't be opposed to taking my product to the commercial market and selling it locally.

Vote of thanks

I would like to thank all of my peers for helping me along the process of manufacturing the product, along with this a massive thank you to my lectures, Rhys, Geraint, jordan, and a special thanks to the workshop manager, Julian

Questions

Thanks for listening

