# The Grease Revolution: Testing Machines for Underprivileged Farmers in India

## A report on user research, testing and evaluation of small scale agriculture machinery in South India

SELCO Foundation has been conducting research and design work into agricultural machinery for small and marginal farmers in South India since 2010. Much of this work has required the testing of machinery and as a result, SELCO Foundation has developed a significant amount of experience in this area which will be discussed in this report, in the hope it will be useful for other organisations engaging in similar activities.
While this report is based on experiences in rural South India, we hope that much of it will be transferable to other parts of India and other countries which have a similar agricultural situation.

There is a lot of agricultural research being conducted in Karnataka by organisations such as Krishi Vigyan Kendras, the University of Agricultural Sciences and others. The majority of this work seems to be concerned with researching new farming practices and crop varieties, in which there is considerable progress being made. While there is some research being conducted on agricultural machinery, little of it culminates in the emergence of new tools or machinery into the market. One criticism is that a lot of the research lacks significant farmer participation and as a result, solutions are not always appropriate for the farmers they are aiming to help [1].

There is currently a dire labour shortage in rural India as many people migrate from the villages to the cities. This places a large strain on farmers in India, and as a result there is beginning to be a shifting focus towards labour-saving devices, including agricultural machinery. India's 12th five year plan reflects this, with a large focus being placed on farm mechanisation [2].

It is often assumed that product development should be undertaken by commercial entities, and most of the machinery currently available in the market has arrived through this route. The majority of companies, such as Oleo-Mac and Agrimate, which are currently designing and manufacturing agricultural machinery however are targeting their products at medium and large farmers (5 acres plus) as they see this as a larger and more easily accessible market.

As a result, there is very little machinery currently available in the market which is suitable for small and marginal farmers (sub-5 acres). If this is to change, either these commercial entities must realise the potential market for small-scale agricultural machinery and begin designing for it, or other, non-commercial entities must engage in more intensive design and development work. As part of this work, whoever it is undertaken by, farmer testing with small and marginal farmers will be essential for the development of effective, appropriate machinery.

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"The large investment required to purchase agricultural machinery also acts as a strong disincentive. Farmers, especially the poorest ones, are very averse to taking risks. This is not surprising given that, with no crop insurance or other sustainable sources of income, a failed crop or a poor investment could be potentially catastrophic."

Gathering user inputs is an essential part of any design process. The overall popularity and success of a product depends on how well it fits the needs of the customers, and the only way to understand those needs is to involve the users in the design process. This holds even truer in situations such as this, where the customers come from a very different background to the designers, as nothing can be assumed about the way they will respond to a particular design decision.

When compared to demonstrating or testing many other agricultural innovations, such as a new crop variety or fertilisers, agricultural machinery does have some advantages. Its implementation generally yields instantaneous results which are clear to see, whereas other innovations can take the lifetime of the crop to yield results, and it can be difficult to prove that any benefits were down to the intervention and not some other external factors. There are however many difficulties associated with this kind of machinery testing and other factors, such as the durability and longevity of the machinery are more difficult to demonstrate to farmers and remain one of the largest deterrents for farmers purchasing new machinery.

Farmers are much more willing to invest in small items, such as perhaps an insect trap, which do not hold such large potential gains but will produce a much more manageable blow should they prove ineffective. Many other improved farming techniques which do require a larger outlay from the farmer, such as using fertilisers or a using a different seed variety, are easier for a farmer to test on just a small patch of land, before he develops enough confidence to use it for his entire holding. This makes reliable demonstrations of agricultural machinery a crucial activity if they are going to be adopted by farmers.

## Difficulties with Testing

There are many issues associated with testing machinery for this market, which is perhaps part of the reason there is so little conducted. There are several reasons we have identified why our tests have often not been as successful as we had hoped.

- *Aesthetic considerations*
  When we started, we had some ideas for new products and wanted to see what the farmers thought so developed some prototypes to test. We naively began our testing without much consideration of how the farmers would see the products differently to us, and so when we brought these prototypes out into the field, we were disappointed to find farmers were almost unanimously underwhelmed by them. They were initially put off by the rough and unfinished look of the machines. They were not familiar with the idea of a prototype and were expecting a finished product, so once farmers had decided they were not interested in owning what we were demonstrating it was often difficult to get them to engage in the tests.

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- ***Visualising finished product***
  Many of the prototypes we tested were designed to demonstrate one particular process from a procedure which would ultimately require many processes. One example is a prototype which demonstrates a mechanism for threshing, but has no facility for winnowing, which a finished product would need. Farmers would often tend to decide instantly that they were not interested in a machine that could not winnow and so were less enthusiastic about testing just the threshing part.

- ***High expectations of performance***
  Our main goal has been to design machines that will reduce labour requirements and increase profitability for the farmers. Not all of the machines necessarily improve on the performance of the human they are replacing, but instead perform the task faster, or requiring fewer labourers and hence more cheaply. Many farmers, when they test the new machines, expect them to improve on the existing method in every way and so easily lose interest when the machine does not meet their high expectations. We hope that once the machines are on the market, farmers will realise the financial benefits more readily and be prepared to sacrifice quality for the sake of greater savings on labour, but in our early tests this was not an aspect we thought to explain to the farmers.
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- ***Concerns about damage to crops***
  Some farmers were sceptical to try the new machines on their own crops, as they were afraid they may damage them or reduce yields. This was especially the case with machines such as a rice transplanter, where farmers were afraid the small, delicate seedlings would be damaged and were unwilling to test the machine on large patches of land.

- ***Unwillingness to spare labour***
  We tried to test the machines on days when farmers were already carrying out the activities we were trying to mechanise. This meant that the farmers had generally hired labourers for that day and were, understandably, unwilling to let them spend much of their time testing our machines if they saw it as a less productive use of their time, and occasionally got frustrated when the labourers would spend their time just watching the machine rather than doing the work the farmers had paid them for.

- ***Specifying necessary conditions***
  Some of the machines require specific conditions to operate properly. Even after communicating these to the farmer, we initially often found ourselves turning up at a farm to find out the conditions were not suitable. In the case of the transplanter, the length of the seedlings was crucial in order for the rice transplanter to work optimally and we encountered a lot of difficulty coordinating with the farmers to ensure this.

- ***Workers feeling threatened by the machines***
  Some of the hired farm labourers can feel threatened by the machinery, as they recognise that it would reduce the requirement of labour and reduce the available work. They also realise that they may be asked to operate the machinery



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if the farmer purchases it and can feel intimidated at the prospect of having to learn how to; preferring to stick with the traditional methods they are familiar with. Although we have not often encountered this, this can cause the workers to be uncooperative, and to give over-critical feedback.

## Planning a Test

As we started learning what to expect from our machinery testing, we began to tailor our tests and demonstrations to ensure we gained more useful feedback. We realised the importance of determining exactly what it was that we wanted to achieve from a test and planning appropriately. There are several different purposes for farmer testing and each one of them requires a different approach.

- *Understanding the need and probable popularity of a new product*
  It is obviously very important to understand how much of a need there is for a particular machine, to understand how useful farmers feel it would be and how much they would be willing to pay for it. In the early stages of our testing, we would often try to find this out through conversations with farmers while testing basic prototypes. We found however that we generally got relatively unenthusiastic responses as farmers found it difficult to visualise how the final product would look when they were faced with a semi-working, inelegant prototype. There was also a lot of variation in answers, which was more down to a farmer's understanding of a prototype and how the final product could look. We found that a much better way to gauge general interest is actually when there is not a machine present at all. We decided to conduct questionnaires with pictures of what a finished product may look like and with descriptions of how a finished product would function. This provided some much more consistent and reliable findings.
  Once a machine is finished (or very close to it), more reliable information can be gathered from on-farm demonstrations. In order to get a better understanding of farmers' seriousness and their willingness to pay, we have also sometimes charged for the use of certain machines.

- *Initial understanding of desirable features*
  It is important to tailor the product to meet the farmers' requirements. The initial questionnaires can shed a lot of light on what particular features farmers see as essential or desirable, but this is one area where testing can prove useful. There are many ideas that farmers only come up with while they are testing a machine. Once we had a prototype that was mostly working, farmers seemed able to make suggestions for improvements even when they weren't impressed by the aesthetics of the machine. We found these were normally in the form of very specific suggestions for design changes, which were often impractical. These suggestions were however very useful indicators of what issues needed to be addressed and once these issues had been identified, the designers could investigate various methods to overcome them.

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- *Functionality of a product or feature*

  Initially, we tried to test the functionality of a design feature in tests with farmers, at the same time as trying to determine their response to the feature. This meant that we were trying out prototypes for the first time in front of the farmers, and so the farmers' opinions were based on the prototype not working at its full capability. It also allows for potential embarrassment if the new prototype does not work as the designer had expected and the farmer may feel like you are wasting their time and potentially their produce too. In the worst cases, we have had farmers ask us to stop testing. Even if farmers do continue to test using their produce, they may be unlikely to allow you back for future tests.

  If possible therefore, it is much better to test new prototypes in a controlled environment where you have flexibility to experiment and there are no repercussions if the machine does not work as intended. If access to a field or crop for the testing is not easily available, there may be agricultural universities or NGOs that can offer access to space allotted for such testing.

- *Farmers' feedback on performance of a particular feature*

  It is still essential however to gain the farmers' feedback on individual features throughout the design process. Once the functionality of a prototype has been tested satisfactorily in controlled conditions, it can be taken to a working farm to find out what farmers think.

  Often farmers will be eager to have a go with the machine before they have been properly shown how to use it. This can lead to it not working as it should and the farmer getting a bad impression. In the worst cases, it can also lead to the farmer using it in a potentially unsafe way. It is important to fully demonstrate the prototype to the farmer first, and then explain fully how to use it before letting them try it. They should be fully supervised while they are trying it for the first time.

  As mentioned above, farmers are often unfamiliar with the concept of a prototype and find it difficult to just focus on the one feature being tested without the other necessary functions being present. Some farmers are much better at understanding this concept and provide much better feedback from this kind of tests than others. It is useful to identify a number of farmers who respond particularly well to this kind of test and who can be used for other similar tests in the future. It is often the case that the more a farmer is exposed to different prototypes, the better they understand how isolated features can fit into a more complete machine and are able to provide better feedback.

- *Longer-term testing*

  It often takes longer than just one session for a farmer to become fully accustomed to a machine and to perfect the technique for using it. It is sometimes therefore necessary to leave machinery with farmers for longer periods of several days or more. Unless there is a financial incentive, farmers are unlikely to want to spend this amount of time using a machine which they do not think is beneficial and so this is much more feasible with prototypes which are further along in development and resemble something similar to the finished product. The farmer will still need the same intensive demonstration and teaching on how to use the machine at the start, but once they have begun to develop the technique it may be possible to leave them to continue using the machine unsupervised.

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- ***Advertising the machine for sale***
  As mentioned previously, demonstrations to farmers are incredibly important in encouraging them to purchase a machine. Farmers are used to seeing such machinery demonstrations at agricultural shows and so these are an excellent place for this kind of demonstration. As farmers are often sceptical of the long-term performance and durability of new machinery, it is very helpful to have an organisation they trust endorse the machine, and often, if the demonstrations can be carried out through such an organisation, their impact will be greatly increased.
  Demonstrations at individual farms are also useful, but they can prove less cost effective as fewer farmers are likely to see the demonstrations; however this can be useful if you want to introduce a machine into a very specific locality.

## Other considerations

There are also other considerations that should be taken into account when planning any type of testing.

- ***Staff present during the testing***
  It is important to have someone at the test who can easily communicate with the farmers in order to explain the machinery and gather feedback. It is very useful if this person has a thorough understanding of the farming process in which the machine is involved, as this will enable them to communicate more effectively and the farmer will often feel freer to talk with someone from a similar background.
  If the machine is likely to need adjustments on site, make sure there is someone at the tests who can make appropriate changes.

  It is often useful to have the designer present at the tests so they can ask more probing questions to better understand what changes or improvements may be necessary. They can plan design changes on site and ask the farmers for feedback then and there.

- ***Communication***
  Spend time explaining the machine and the concept of a prototype to farmers before you start testing (and ideally before you arrive at their farm) so that they will not have unreasonably high expectations of what the machine is likely to achieve.
  Communicate with the farmers extensively before the test, especially if certain conditions are required for the test to be successful. For the rice transplanter example mentioned earlier, we found that in order to ensure the length of the seedlings was correct, we had to send someone to the farm a few days prior to the test to inspect them. Make sure the farmer has access to anything you may require during the test, such as electricity.
  There will often be a variety of farmers and labourers at a farm during testing. It is useful to try to get as many people as possible, from different backgrounds, to try the machine and offer feedback. Not all of them will be potential customers, but generally they will all have different comments and suggestions which are useful to capture.
  The success or failure of a test is often largely dependent on the relationship you have with the farmer, so make sure to be friendly and respectful and try to nurture a healthy relationship. Try to be sensitive to the farmers' concerns and, for example, don't distract the labourers if the farmer wants them to work.

- *Timing*

  It is worth thinking about the time of day when planning testing. Many processes will be carried out only during particular times in the day. In some cases the lunch break may make it impossible to test the machine, but in others it may be the best time to demonstrate the machine to many people at once.

  Plan for how long you want the testing to take and inform the farmer beforehand. This will depend largely on what you want to achieve through the testing but it is important to ensure logistics work out and so the farmer knows what to expect.

  As previously mentioned, the different activities in agriculture are very seasonal. If you need to do on-site testing at a working farm, make sure you find out the agricultural calendar for your region long in advance so you can plan to test in periods which will be suitable.

- *Payment*

  We decided not to pay farmers for any of the testing, but did offer to reimburse them for any losses caused by it. This ensures that they are interested in the machine itself and not just the money, while insuring the farmers against the risks of testing new machinery. This has sometimes meant it was more difficult to find people willing to test, but generally we have found that farmers are interested enough to see new machines that they are willing to let us test free of charge.

  As mentioned above, once the machine is functioning well enough to provide a useful service, it can shed light on the market demand to conduct experiments where the machine is rented to farmers, or they pay some of the costs associated with the testing such as for the transport of the machine.

- *Aesthetics*

  The way a machine looks can actually be very important to farmers, and a small amount of effort to make prototypes look attractive and properly finished will lead to a much better response from farmers.

## Summary

***Difficulties with Testing:***

- Aesthetics are important to give the right impression to farmers
- Farmers can find it difficult to imagine what a finished product would be like
- Farmers often have an unrealistically high expectation of performance
- Farmers are sometimes worried about the machines damaging their crops
- Some farmers are unwilling to spare labourers they are paying to work
- Sometimes the testing requires specific conditions that can be difficult to arrange
- Some farm workers feel intimidated by machinery and are uncooperative

***Reasons for Testing:***

- To understand the need for a product
- To learn what features are important
- To test performance of features
- To gain farmer feedback on features
- To understand long-term adoption
- To advertise machines for sales

***Other Considerations While Testing:***

- Staff present during testing
- Communication with the farmer
- Timing of tests
- Payment to the farmer
- The aesthetics of the machine

## References


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[2]. The Hindu, Bangalore. http://www.thehindu.com/news/national/karnataka/focus-on-farm-machinery-equipment-at-uasb-exhibition/article4307835.ece. [Online]




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