

The Production of Increased Labour Efficiency Models in Horticulture (Field Vegetables)

FV 298

Final Report

Report Produced By:

Chris Rose
Kathy Strong

Chris Rose Associates Ltd

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Key Workers: Chris Rose and Kathy Strong (Chris Rose & Associates Ltd)

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Project Co-ordinators: Louis Jansen van Rensburg, Nathan Dellicot, Stephen Betts and Philip Effingham

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The results and conclusions in this report are based on a series of experiments, surveys and assessments conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

I declare that this work was done under my supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Chris Rose
Chris Rose & Associates Ltd

Signature Date

CONTENTS

	Page
1. Grower Summary	
Headlines	1
Background and expected deliverables	1
Summary of the project and main conclusions	1
Financial benefits	7
Action points for growers	8
2. Science Section	
Introduction	9
Materials and Methods	10
Results and Discussion	25
Conclusions	28
3. Appendix 1: Background Research	29

Grower Summary

Headline

Growers have the potential to increase labour efficiency, amongst individuals or teams, by 10 – 20% (whilst maintaining or improving quality) through the adoption of a number of generic and specific traits.

The need for good supervision and harvest organisation is demonstrated and proven to be most effective when the whole business (including the owner) sees the potential that can be gained.

Background and Expected Deliverables

The financial margins being made by vegetable producers in the United Kingdom are currently being squeezed as production costs rise and returns fall. The number of growers in the industry has significantly reduced over the last decade and efficiencies are increasingly harder to find. Those remaining need every advantage they can gain to stay profitable.

In commercial practice, there is a wide spectrum of picking speeds and no work has been conducted to increase the average speed.

The major aim of this project is:

To assess the differences between the best (fast and good quality) and slow pickers or harvesting teams in the chosen crops and to develop models to enable the industry to train all harvest workers to approach the performance level of those who are currently best.

A key part of this work is to understand the role of the supervisor and where appropriate the machinery and team dynamics in producing desired results.

The results of this project will directly lead to cost savings for growers. It is expected that DVDs will be produced to help communicate the results and subsequent training courses will be available.

Summary of the Project and Main Conclusions

The work undertaken

To reduce costs it is important to increase average picking speeds, however this must be achieved without any loss of quality. All growers that were asked placed quality above quantity, although in some cases the use of piecework and the prices paid compromised this and gave a mixed message.

Thus the aim of 'increasing labour efficiency' in this report means to do so without negatively affecting quality of produce or the potential total marketable yield.

In total 12 grower sites were visited across 9 businesses of varying sizes. Using available farm data, guidance from supervisors and our own observations, the best and contrasting pickers, cutters and packers were identified. Observations were made to find patterns present in the fastest workers that were absent in the slower workers.

The runner bean sites had a significant variation in output within each gang. The difference between fastest and slowest typically exceeded 100%. Some of this was due to the greater speed of more experienced pickers (returnees from the previous season) when compared with new pickers. As the season progressed this difference reduced but was still significant.

The variations in output in iceberg lettuce and cauliflower were typically less within each business, but were in excess of 60% between businesses. There were a number of variables including crop, design and standard of the rig and level and quality of supervision.

It quickly became clear that supervisory staff were predominantly focussed on quality and felt that quantity was up to the workers, who were paid piecework. There was often a belief that the fastest teams / pickers must be cutting corners in some way and couldn't be trusted to pick to the required standard. A slower picker / team whose quality was excellent was always preferable to faster pickers / teams who 'needed watching'.

For each crop we sought and found champion pickers, cutters and packers as appropriate;

Definition of a champion worker:

One who consistently works extremely quickly whilst always maintaining the required quality.

We observed and filmed discretely and interviewed a number of the best workers. From this we were able to draw out the key features of the champions to create the respective models of excellence for each crop. We subsequently found other champions from workers and from experienced supervisors who had been top performers. For all 3 crops we received universal feedback that the models fitted their experience and they were not able to add anything to them.

The hitherto unique aspect of this work is the use of techniques to draw out the non-observable or mental qualities of champion performers. The same traits apply across each of the crops and there are some specific to team work. We refer to these as *generic traits*.

Note of Caution: Most workers will need the best circumstances to allow these traits to fully develop. Interference such as aggressive supervision, unfairness or very poor working conditions will in time affect the performance of any worker, champions included.

The generic traits of a champion. Champion workers:

1. Have an unshakeably positive attitude. This is the key driver behind all the following traits.
2. Are fully focussed, fully engaged and fully present in the moment; they shut off from both internal distractions (e.g. emotions, negative self-talk) and external distractions (e.g. weather, crop, other people).
3. Are driven, determined and persistent. They have a strong desire and motivation to achieve their goal(s) such as earning enough to buy an apartment or to pay for university.
4. Are very competitive both with themselves and others. They take pride in being the best or amongst the best.
5. Are reliable and consistent – all the time, every day.
6. Are self-disciplined and take responsibility for themselves and their work, seeking to understand how their role fits into the bigger picture.

7. Are fast learners, often through modelling other champions and are constantly seeking to improve.
8. Have enough intelligence to understand delayed gratification and alter what they do until they achieve desired results.
9. Have great self-belief. They do not need external encouragement, praise or recognition
10. Are flexible; they deal with changes to the job or conditions very effectively. Most would succeed at almost anything they put their mind to.
11. Look after themselves – they have a healthy diet, keep fit and get enough sleep. They do not let their social life compromise their work.

Generic traits of champion team players

Champions generally would prefer to be paid for their own efforts rather than collectively however, in addition to the above, when working in a team, champions:

1. Are drivers; they keep their output high and seek to lift others rather than slow to the pace of others.
2. See themselves as part of a team and accept the give and take involved.
3. Care about others and are willing to help slower and newer team members.

Champion teams are:

1. Self-organizing and self-regulating – they need minimal external help, guidance or control.
2. Proud of their status and achievements.
3. Competitive against themselves and others (though some may not be individually competitive, they support the aims of the team).
4. Focussed – they do not engage in idle chatter and have a strong work ethic.
5. Cohesive – they work together and support each other well.

Crop specific traits of a champion runner bean picker

1. They know instantly which beans to pick into the container, which to pick and drop and which to leave. They waste no time deciding.
2. They have a thorough structured and consistent search pattern.
3. They move quickly and efficiently through the rows with purposeful movements. There is no wasted effort.
4. They pick rubbish very thoroughly because they know that old beans left on reduce crop and thus their future earnings. They always pick with 2 hands – they hold the plant with one hand and pull the bean with the other to avoid plant damage.
5. They take ownership of and care about their lines and their plants. "If you care about you, you care about the plant". The tripods were referred to as "money trees."

Crop specific traits of a champion iceberg lettuce cutter

1. Fit – Have the energy and stamina to keep working for 10 hours + and look to maximise conservation of energy by having a good consistent system
2. Flexible – Need to be able to bend over repeatedly without stiffness or pain. The best listen to their body and have a system to cope with this (e.g. One leg on bed – the other in the row and periodically rest the forearm on the raised leg to relieve stress on the back).
3. Sense of rhythm – the sequence of bend, cut, bag, twist, seal, place in cup, turn, should be rhythmic and should become automatic with practice
4. Good hand eye co-ordination – able to consistently cut accurately.
5. Spatial awareness – safe with a sharp knife close to others.
6. Dextrous – able to consistently bag the lettuce smoothly and quickly.

Task specific traits of a champion iceberg lettuce / cauliflower packer

1. Team player – see themselves as part of a team and accepts the give and take involved.
2. Able to work well under pressure.
3. Sense of rhythm – the sequence of pick up 2 lettuces, place in box, repeat x6, lift box, turn, stack box, take fresh box, place down, should be rhythmic.
OR - the sequence of pick up cauliflower, place in bag, repeat until full, lift box, turn, stack box, take fresh box, place down, should be rhythmic.

Crop specific traits of a champion cauliflower cutter

1. Fit – have the energy and stamina to keep working for 10 hours + and look to maximise conservation of energy by having good consistent system.
2. Flexible – Need to be able to bend over repeatedly without stiffness or pain and the best listen to their body and have a system to cope with this. Some use a bear like movement (lumber) from side to side which may relieve back stiffness and may aid calibration (eyes closer to the crop).
3. The sequence should be rhythmic – bend, cut, turn, cut, place in cup or on belt. It should become automatic with practice.
4. The nature of the cut should be a slicing movement rather than a hacking movement. The cauliflower plant should be pushed away from the blade to reduce effort by opening up the cut as you are cutting it.
5. Consistently cuts to an agreed acceptable standard (own QC).
6. Good hand eye co-ordination – able to consistently cut accurately. They are able to gauge correct size – whether by sight (open curds) or feel (closed curds). The knife is used to move the odd leaf when the curds are open. When the curds are closed, the movement is feel (calibrate for size), cut.
7. Spatial awareness – are safe with a sharp knife close to others.

The supervisor or team leader is key to the development of champion teams and we were able to model top performers in these roles.

Traits of a champion team supervisor

1. Excellent trainer and coach. Uses a system of show, practice and feedback.
2. Motivator.
3. Firm, Fair and Fun – uses appropriate disciplinary and feedback techniques, to maintain both standards and morale. Problems are nipped in the bud quickly and efficiently whilst being fair (no favourites). Recognises the importance of team bonding and may use humour to raise morale and keep spirits high especially in difficult conditions.
4. Champion (or close to) cutter and packer.
5. Excellent observational skills – sees any problem quickly and gives regular feedback and encouragement.
6. Leadership - works in with the team and leads from the front when needed
7. Coach – Spots individual shortcomings and helps the individual overcome them.
8. Encourages each person to grow and do well and recognizes their success which gives them a sense of achievement.

In some cases, teams were lead by a member of the team, rather than a supervisor.

Traits of a Natural Team Leader

1. Very Focussed but always aware of the team and when required to support them whether it be helping to pack or cut, is flexible enough to change what he (or she) is doing. For example, he knows if he gets too far ahead, that may mean that it is time to help somebody else. If the baskets remain full for a while, he knows it is time to help the packer on the rig
2. Champion (or close to) cutter and packer.

3. Excellent observational skills – sees any problem quickly and gives regular feedback and encouragement.
4. Leadership - works in with the team and leads from the front when needed
5. Monitors quality (QC)

Rigs: organisational requirements for optimum production

1. Keep all cutters in a line very close to the rig – maximum one step away.
2. Help your neighbour to help maintain that line near the rig without crossing into the path of a working cutter if possible which causes chaos.
3. Maintain the optimum ratio of cutters to packers through close monitoring depending on system being used.
4. Need at least one pacemaker in the cutting gang – i.e. someone who will keep the pace high.
5. Logistics – ensure enough trailers and packaging so there are no delays.
6. Have challenging targets for the team to aim for.
7. Ideally teams should choose each other. If this is not workable, teams should be chosen with a high % of potential champions taking nationalities into account in the mix.

Rigs: system requirements for optimum production

1. Smooth running with no breakdowns.
2. A vari-speed gear-box allowing minute adjustments to speed.
3. Sufficient cups so cutters never have to wait – a double track if necessary.
4. Sellotape and cutters (1 per cutter) on the front of the rig, right in front of the cutters. (We found greatest efficiency where the cutters also bag iceberg lettuce).
5. The ability to angle the tape cutters when there is a cross-wind.
6. Large enough trailers to take a sufficient quantity of pallets to avoid delays.
7. Dedicated and motivated drivers.
8. Supply the best (easy to use) bags and good sharp knives (sharp on end so a pushing action can be used). Knives must be sharpened daily. Some cutters tie the knives on the wrists to avoid losing them but the best tend to keep knives in their hand.

Transferring the models and results

The next stage was to transfer the models to other pickers/ harvest teams. This stage was deliberately kept relatively brief as on commercial holdings, time is a major limiting factor.

Runner bean model transfer

On the chosen sites we spent @ 45minutes each with two supervisors, explaining the model and suggesting the best approach to transferring it. Both agreed the model was a full representation of the very best pickers. The supervisors each chose 4 pickers to transfer aspects of the model to.

We recommended not to attempt to transfer every aspect of the model, rather just the traits which were most obviously missing. Supervisors were encouraged to monitor the selected pickers and teach other traits as appropriate.

Both supervisors were paid hourly and had no vested interest in increased performance. The first supervisor did not seem very motivated and was 'going through the motions'. The second was motivated and interested in both the model and improving her pickers' performance.

Runner bean results

The results were an overall increase in picking speed of 1.2% on the first site and 18.7% on the second site. The best individual improvement was 30%. The improvements were measured against the rest of the gang as a control. They were based on a period of twenty days before the model was transferred and twenty days respectively after.

The very small increase of 1.2% on the first site was, in our opinion, due to the supervisor failing to commit to transferring the model. The result on the second site was more in line with trial and commercial results in the soft fruit sector. We believe that even more could be achieved with greater training of the supervisor.

Iceberg lettuce model transfer

The chosen site had 2 rigs working in the same crop. Although neither team were 'champions', the slower team was only performing at 62% of the speed of the faster team. We spent @ 40 minutes with the leader of the slower team explaining the model and how to apply it.

Iceberg lettuce results

The grower had written this team off as non-motivated. They were from an agency and were paid an hourly rate. It became clear that they were keen to work better and did not know how. After the transfer of the model the speed of the team increased by 34%, which was sustained for the duration of the season. The improvement was due to a combination of better individual techniques and better organisation and a low existing performance.

Cauliflower model transfer

The chosen site had two rigs working on similar crops. Both teams were very experienced and the faster team was one of the best we have seen. The slower team was performing at 78% of the speed of the faster team. The slower team had been told they were the best by the manager and initially refused to believe they could improve. We showed them a video of a champion team and this convinced them it was possible.

Cauliflower results

The initial observed change was dramatic with a 24% improvement and much better technique and teamwork. We told the fieldsman that we believed they could sustain a 20% improvement. He was worried (without evidence) about quality falling and said he would "be happier with 10%". The sustained improvement was 11.2%. It is likely that this result was affected by the fieldsman's concerns regarding speed and quality.

Conclusions

- The model can be used to train harvest workers to improve harvesting speeds without loss of quality.
- Good techniques will make an above average picker / worker; mental traits such as strong motivation and positive attitude make a great picker / worker.
- Both physical and mental traits can be taught.
- The machinery and organisation must not compromise efficiency.
- Managers and supervisors need a positive attitude and an open mind for the potential of this endeavour to be realized.

Financial Benefits

Runner beans

The table below based on real farm data for 50 pickers in one gang illustrates the improvement in picking speed that can be achieved by applying the model to pickers in different groupings in a gang of pickers. It assumes that a small 'elite' of very fast pickers will not improve as they already have the techniques in place.

10 kg Crates per 8 hour day	Pre- Model	Post -model	Gain
Top 10%	24	24	0%
Mid 70%	16.6	19.7	18.7%
Bottom 20%	10.4	12.3	18.7%
Average	16.1	18.65	15.8%

A 15.8 % increase in picking speeds equates to a potential saving of £51.35 per tonne (based on @ £411/tonne necessary to comply with minimum wage legislation). A grower producing 500 tonnes could reduce harvesting costs by £25,675 every year.

Iceberg lettuce

An iceberg lettuce rig with 10 cutters, 4 packers / stackers and supervision can cost £800 for an 8 hour day in labour. A 20% increase in productivity would allow potential savings of £160 / day and / or greater productivity per rig. Harvest costs of £80 / tonne could be reduced by £16. A grower producing 1,000 tonnes could reduce harvesting costs by £16,000 each year.

Action Points for Growers

- Adopt 'top down' enthusiasm for improving output by good management and supervision.
- Challenge preconceptions about performance capabilities (bad teams, unmotivated staff, etc) on your business as they can often be turned around for the benefit of your business.
- Send your staff on the appropriate HDC event in your area to learn more about how to implement these techniques.
- Re-assess the role of your supervisors to include ongoing teaching of champion traits.
- Review harvest team roles to ensure there is time, ability and desire to implement the measures highlighted in this project.
- Consider methods of pre-selecting your labour to screen out the non-motivated members of a workforce.
- Since harvesting is a seasonal undertaking, often with key staff changing from year to year, it is strongly recommended that all grower businesses have a comprehensive written harvest plan that is reviewed annually.
- In reviewing your harvesting operation, list and attempt to cost out the weaknesses.

SCIENCE SECTION

Introduction

The financial margins being made by field vegetable producers in the United Kingdom are currently being squeezed as production costs rise and returns fall. The number of growers in the industry has significantly reduced over the last decade. Those remaining need every advantage they can gain to stay profitable.

Growers are obliged to pay at least a minimum wage of £5.35 per hour to their workers to harvest the crop. The true minimum cost of harvest labour, whether directly employed or through gangmasters is in excess of £6.50 per hour in 2007 after employment costs, including additional holiday pay, overtime, NIC and administration are accounted for. Given that the true cost of employing harvest labour has risen over 50% during a period of static and at times declining returns for vegetables sold in the UK, growers must find new ways of reducing their production and harvesting costs to survive in their business.

Several ergonomic studies have been conducted in the past to assess ways of improving harvest efficiency. These have focused on the collection and movement of produce after the point of picking and the use of rigs. To date, no work has been conducted on the specific harvest tasks of picking, cutting and packing.

In commercial practice, there is a wide spectrum of speeds. Whilst rigs may have some levelling effect, an inexperienced team will often be less than half the speed of a local gang with years of experience. Local labour is becoming increasingly scarce.

The major objective of this project is: To assess the differences between the best (fast and good quality) and slow harvest workers and to develop models to enable the industry to train all workers to approach the performance level of those who are currently best.

Where appropriate this includes studying harvest machinery and systems, to the extent they may help or hinder the effectiveness of labour.

The efficacy of the models will be tested by transferring them to slower workers / teams. Measurements of the improvements in performance will be recorded against a control.

The results of this project will directly lead to cost savings for growers. It is expected that DVDs will be produced to help communicate the results and that subsequent training courses will be available.

Developing models of harvesting excellence

Materials and methods

The runner bean section of the project was conducted on a number of sites in the following grower businesses:

- Barfoots of Botley, Sefter Farm, Pagham, West Sussex.
- Bomfords Ltd, Manor Farm, Luddington, Stratford-upon-Avon, Warks.
- Freshgro, Inkersall Grange Cottage, Bilsthorpe, Newark, Notts.

The iceberg lettuce section of the project was conducted on a number of sites in the following grower businesses:

- Laurence J Betts Ltd, Church Farm, Offham, West Malling, Kent.
- Freshgro, Inkersall Grange Cottage, Bilsthorpe, Newark, Notts.
- JJ Barker, Hook Place Farm, Southfleet, Gravesend, Kent.

The cauliflower section of the project was conducted on a number of sites in the following grower businesses:

- Robert Montgomery Ltd, Monkton Rd Farm, Birchington, Kent.
- P. E. Simmons, Higher Trevaskis Farm, Gwinear Road, Connor Downs, Hayle, Cornwall.
- Marshalls Bros (Butterwick) Ltd, The Mill, Mill Lane, Butterwick, Boston, Lincolnshire

The project involved modelling the fastest pickers from these businesses using Advanced Behavioural Modelling techniques including NLP to create what was termed the 'Champion Models'.

Definitions

Neuro-Linguistic Programming (NLP):

A methodology that allows one to break old non-effective patterns and generate new behaviours using posture, breathing, specific exercises, awareness and communication skills. NLP studies what is implicit (in the mind) and makes it explicit for learning and sharing.

NLP in a knowledge era helps to make the process of creating models of human excellence achievable. Measuring performance and knowledge management are important tools for the 21st century. .

Model:

Model describes the essential distinctions of an experience or ability.

Modelling:

The process of studying living examples of human excellence and the differences that make the difference in order to make the implicit explicit for learning and sharing.

The Production of Champion Picker and Harvesting Models

Using available farm data and guidance from supervisory staff, both the fastest and slower pickers / harvest teams were identified. We observed, filmed and interviewed pickers from each of the farms that demonstrated the following patterns/characteristics:

1. Extremely fast
2. Consistently working to an acceptable standard
3. Able to speak English (At least one in the case of teams)

The best of these individuals / teams were referred to as 'champions' and from studying them using advanced behavioural modelling, NLP techniques and applied psychology, the champion models were created. There were instances of champion teams and instances of champion individuals within a less than ideal team. The resulting models identify the traits of both champion individual roles and where appropriate, champion teams. Each model was produced using a four stage process:

- A. *Preparation*– This was undertaken to learn about the process of each task (e.g. picking, cutting, packing) and to define the questions to ask workers and supervisors. A list of factors that may affect picker performance was drawn up from initial observations of harvesting and current knowledge. These factors were used to create a questionnaire for use in part 2 (information gathering).
- B. *Information gathering*- The champion performers were observed whilst working and were filmed. They were then interviewed using the factors drawn up in part 1 as a guide. A number of other very fast pickers and many slower pickers were also observed.
- C. *Model building*– From the information gathered in part 2, the behaviours and qualities present in the champions that were largely or totally absent in slower workers, were isolated. The result produced a model. The robustness of the model was tested by observing and interviewing further workers and supervisors who had been top performers. This stage enabled us to make minor refinements and to validate the model.
- D. *Transferring*– This process involved transferring relevant aspects of the model to slower performing individuals / teams. This was either done through the supervisor (runner beans) or directly with the teams (iceberg lettuce and cauliflower), depending on the availability and willingness of supervisors.

A. Preparation

The following list was created from initial observations of harvesting and current knowledge. It is divided it into two parts:

Extrinsic Factors (Definition: Lying outside, not belonging, operating or originating from without). These are global factors applied to all workers in a team or gang. They may be applied equally (e.g. hot temperature) or unequally (e.g. an unpleasant supervisor may have favourites and pick on others). Individuals will be affected in different ways and to different degrees by extrinsic factors.

Intrinsic Factors (Definition: Belonging naturally, inherent, essential).

These are elements that are part of an individual's make up. The differences that make the difference are likely to come from intrinsic factors. They include aspects of a person that will dictate how they react to extrinsic factors.

Extrinsic Factors

- Living conditions

- Quality of accommodation, quality of bed / mattress, cooking and washing facilities
- Leisure facilities / activities
 - Noise levels at night, timekeeping (e.g. late to bed on an early shift)
- Emotional support while on camp
- Working conditions
 - Weather conditions- cold, hot, rainy, windy
 - Height of fruit above ground
 - Ground – e.g. wet and muddy, dry and dusty
 - Topography- steep slopes and banks or flatter
 - Provision, proximity and state of toilets (clean, locking, serviced)
 - Provision of water/food
- Length of work
 - Hours per day, time of day, days per week, total hours worked if other work provided
 - Lack of sufficient breaks at appropriate intervals
- Training
 - Quality of induction; attitudes of trainers doing induction
 - Level and quality of teaching techniques
 - Focus on how to pick fast as well as quality (clarity of objectives)
 - On-going training, help, support
- Quality of fruit
 - Abundance of crop, consistency of plantation (all rows equally good), size of fruit
 - Level of sorting (adequate training on search patterns)
 - .
 - Ease of finding beans (size, density and height of plants)
OR ease of finding correct sized curds (amount of outer leaf cover)
 - Ease of detachment (pick or cut)
 - Level of weeds – nettles and thistles etc.
- Organisation
 - Row length in beans
 - Cutter / packer balance on rigs
 - Downtime through lack of crates, change of trailer etc
 - Time spent travelling and waiting for transport
- Management
 - Attitude of supervisors
 - Level of pastoral care
 - Amount of help with motivation provided
 - Level of pay
 - Use of incentives
 - Keeping pickers free from distractions
 - Noticing problems as they arise
 - Voice tonality – especially where language is a problem
- Physical Placement
 - Best body posture (stand/sit/bend)

- Type of picking container for beans (e.g. bag around waist, crate & stand)
- Amount and condition of cups on rigs

Intrinsic Factors

- Physical attributes
 - Fine motor skills
 - Deftness of movement
 - Hand/eye co-ordination
 - Flexibility
 - Height
 - Sex – female or male advantage?
 - Different physical postures and the advantages/disadvantages of these
 - Pain threshold
 - Aptitude at selecting and sorting
 - Robustness- consistent in varying conditions
 - Resistance to illness
 - General level of health (mental and physical) and fitness
 - Emotional wellbeing
 - Natural energy levels
 - Fitness levels and their importance
- Physical Care
 - Understanding and implementation of good diet
 - Sufficient hydration
 - Sufficient sleep
 - Listen to and act on signals from body
 - Level of alcohol and other drugs usage (performance enhancing drugs?)
- Focus
 - Total immersion
 - Maximum time in immersion
 - Supervision intervention
- Thinking Process
 - Attitude
 - Goals
 - Beliefs
 - Values
 - Motivation
 - Internal Conversation
- Mind matters
 - Positive attitude and enthusiasm
 - Optimist
 - Internal motivation
 - Need/desire to excel/be the best
 - Perfectionist and able to work to standards
 - Flexibility to embrace change
 - Curiosity to seek better methods
 - Able to switch off and disassociate
 - Unaffected by the collective mood
 - Positive internal dialogue
 - Mental toughness/resilience
 - Self-critical to the extent it improves performance

- Training
 - Responsiveness to training
 - Ability to listen and observe
 - Quick learner (ability to model)
 - Prepared to seek out and learn from the best
 - Able to sift information and extract key points
 - Believe in continual improvement
- Social
 - Avoid 'going with the flow' – late nights, alcohol etc;
 - Keep personal goals paramount
 - Avoid major distractions (e.g. falling in love)
 - Identify and mix with other top performers
- Socio-political
 - Nationality – work ethic varies from country to country
 - Level of poverty / affluence
 - Background - rural, farming vs. urban
 - Family – hard-working vs. lazy parents
 - Status – non-EU with Visas are more likely to stay
 - EU citizens can move from farm to farm
 - Asylum seekers may have a different agenda

B. Information gathering

The following is a list of questions that were typical of the questions asked during each interview. They were not necessarily all used, or used in any specific order. This list was only referred to if needed during interviews. They are conversational questions that were used with extreme caution and at all times, an interrogation style was avoided.

General background

- What is your nationality?
- What are you studying (if student)?

Help and supervision

- Were you welcomed and shown around when you arrived
 - If so, what do you think of the welcome you got?
- What do you think of the training you get?
- What do you think of the supervision you get?

Picking and motivation

- Why did you decide to do this work (beans, lettuce, etc)?
- What makes you want to do this work?
- How did you learn to pick / cut / pack?
- When you are working, what are you thinking about?
- How do you know you have done a good job?
- Do you have a goal / purpose you are working towards?
 - What is your goal?
 - Do you think that you will achieve it?
- How long did it take you to learn how to pick / cut / pack fast?
 - How did you do that?
- As you pick / cut / pack, what do you focus on?
- What goes through your head (What do you think about)?
- What motivates you to pick / cut / pack beans / lettuce / cauliflowers?
(If a fast picker add 'so quickly')
- How do you think you became so fast?

- If slow ask 'what would motivate you to be faster?' or 'what stops you from being faster?'

Picking techniques

- What side do you prefer to pick from, left or right?
How many apples do you hold in your hand before putting them in the bucket?

Attitude and relations with other people

- What do you think of the pay?
- What do you think of the supervisors?
- Are you an optimist or pessimist – positive or negative person?
- Are you a competitive person?
- Would you say you were a happy or a moody person?
- Are you affected by other people's moods?
- Do you get on with people on the campsite?
- Do you like people?
- Do you compare yourself to any of the other workers?
- Do you have a lot of friends or just one or two?
 - Are they close friends?
 - Are they from your homeland or not?
- Do you have a girlfriend / boyfriend?
 - Is she / he from the campsite?
- Who do you mix and socialise with?
 - Are they also fast pickers? (If slow ask 'are they also slow pickers?')

Personal qualities

- Are you a determined person?
- Would you say you were focussed or disorganised?
- Are you a tidy, neat person?
- Are you self-disciplined or do you prefer to be told what to do?
- Are you a good listener?
 - How do you know?
- How do you respond to change?

Social activity and rest

- Do you go out in the evening?
- What time do you go to bed before a picking day?
- How many hours sleep do you typically get?
- Is your caravan / site noisy at night?
- How does that affect your sleep?
- Is your mattress / bed comfortable?

Facilities

- What do you think of being in the UK?
- What do you think of your living conditions?
 - If negative response, how does that affect you?
- What do you think of the facilities?
- What do you do if there are any problems on the campsite?
 - How do you cope with your own problems?
- What do you think of the field toilet facilities?

Picking weather and working conditions

- Does the weather affect your picking performance?

- What are the most ideal conditions for you (e.g. weather, living, stage of crop, height of crop, supervisors, support)?
- Do you prefer to work in hot or cold conditions?
- Do you love your work?
- Do you prefer working alone or in a team?

Working breaks and sustenance

- Have you been told to drink lots of water throughout the day? Do you? How much / often?
- Do you take water with you?
- Do you take regular breaks?
 - How do you know when to take a break?

Likes/dislikes about the job

- What do you like about the job?
- What do you dislike about the job?

Improving your job

- What do you think can be done to improve working speeds and quality?
- What key things would make your job easier for you?

Task qualities

- What qualities do you need to be a good picker / cutter / packer?

Fatigue and exercise

- Do you ever get so tired that it slows you down? If so, how often do you get this?
- What do you do to relieve backache?
- Do you do any physical exercise and if so, how often?
- What sort of exercise do you do?

Health and diet

- What do you eat on an average day?
- Do you eat fruit and if so, how much?
- How good is your health? How often are you ill?
- Do you smoke? If so, how many a day?
- Do you drink alcohol? If so, how much and how often?

C. Model building

1. Generic traits

The hitherto unique aspect of this work is the use of techniques to draw out the non-observable or mental qualities of champion performers. Through the study of the crops in this project and strawberries (SF 71) and apples (TF 171) we have come to the conclusion that many of the same traits apply across each of the crops. We refer to these as *generic traits*. This list cannot be described as definitive; it is entirely possible that more traits will be found in subsequent modelling work.

Note of Caution: Most workers will need the best circumstances to allow these traits to fully develop. Interference such as aggressive supervision, unfairness or very poor working conditions will in time affect the performance of any worker, champions included.

The generic traits of a champion. Champion workers :

1. Have an unshakeably positive attitude. This is the key driver behind all the following traits.

2. Are fully focussed, fully engaged and fully present in the moment; they shut off from both internal distractions (e.g. emotions, negative self-talk) and external distractions (e.g. weather, crop, other people).
3. Are driven, determined and persistent. They have a strong desire and motivation to achieve their goal(s) such as earning enough to buy an apartment or to pay for university.
4. Are very competitive both with themselves and others. They take pride in being the best or amongst the best.
5. Are reliable and consistent – all the time, every day.
6. Are self-disciplined and take responsibility for themselves and their work, seeking to understand how their role fits into the bigger picture.
7. Are fast learners, often through modelling other champions and are constantly seeking to improve.
8. Have enough intelligence to understand delayed gratification and alter what they do until they achieve desired results.
9. Have great self-belief. They do not need external encouragement, praise or recognition
10. Are flexible; they deal with changes to the job or conditions very effectively. Most would succeed at almost anything they put their mind to.
11. Look after themselves – they have a healthy diet, keep fit and get enough sleep. They do not let their social life compromise their work.

There are also some traits specific to individuals in teams and to team work that appear to be generic across teams.

Generic traits of champion team players

Champions generally would prefer to be paid for their own efforts rather than collectively however, in addition to the above, when working in a team, champions:

1. Are drivers; they keep their output high and seek to lift others rather than slow to the pace of others.
2. See themselves as part of a team and accept the give and take involved.
3. Care about others and are willing to help slower and newer team members.

In the work on iceberg lettuce and cauliflower rigs aspects of the system and organisation were not specific to one crop. They are likely to apply equally to other crops such as cabbage and calabrese.

Rigs: organisational requirements for optimum production

1. Keep all cutters in a line very close to the rig – maximum one step away.
2. Help your neighbour to help maintain that line near the rig without crossing into the path of a working cutter if possible which causes chaos.
3. Maintain the optimum ratio of cutters to packers through close monitoring depending on system being used.
4. Need at least one pacemaker in the cutting gang – i.e. someone who will keep the pace high.
5. Logistics – ensure enough trailers and packaging so there are no delays.
6. Have challenging targets for the team to aim for.
7. Ideally teams should choose each other. If this is not workable, teams should be chosen with a high % of potential champions taking nationalities into account in the mix.

Rigs: system requirements for optimum production

1. Smooth running with no breakdowns.
2. A vari-speed gear-box allowing minute adjustments to speed.
3. Sufficient cups so cutters never have to wait – a double track if necessary.

4. Sellotape and cutters (1 per cutter) on the front of the rig, right in front of the cutters. (We found greatest efficiency where the cutters also bag iceberg lettuce).
5. The ability to angle the tape cutters when there is a cross-wind.
6. Large enough trailers to take a sufficient quantity of pallets to avoid delays.
7. Dedicated and motivated drivers.
8. Supply the best (easy to use) bags and good sharp knives (sharp on end so a pushing action can be used). Knives must be sharpened daily. Some cutters tie the knives on the wrists to avoid losing them but the best tend to keep knives in their hand.

Champion teams are:

1. Self-organizing and self-regulating – they need minimal external help, guidance or control.
2. Proud of their status and achievements.
3. Competitive against themselves and others (though some may not be individually competitive, they support the aims of the team).
4. Focussed – they do not engage in idle chatter and have a strong work ethic.
5. Cohesive – they work together and support each other well.

2. Runner beans

Bean pickers from the three farms selected for use in the project were assessed for picking speed and quality. All three farms employ their picking labour from Eastern Europe (A mix of SAWS and ex-SAWS returnees) with a small number of other itinerant pickers. Between them, the businesses employ over 500 bean pickers.

There was a significant variation in output within each gang on the farms we visited. The difference between fastest and slowest typically exceeded 100%. Some of this was due to the greater speed of more experienced pickers (returnees from the previous season) when compared with new pickers. As the season progressed this difference reduced but was still significant.

It quickly became clear that supervisory staff were mostly focussed on quality and believed that quantity was up to the picker. In particular, care of the plants is crucial to maximising yield potential. There are two main ways that pickers can compromise yield:

- Missing beans and leaving overripe beans on the plants causes the plant to reduce and in time stop flowering.
- Picking beans without using the other hand to support the vine leads to broken vines that wither and die.

There was often a belief that fast pickers must be missing beans or damaging plants. In many instances this was not the case. A slower picker whose quality was excellent was always preferred by supervisors to faster pickers who 'needed watching'. However slowness did not necessarily result in excellent care of plant or quality of produce.

We documented the traits that we discovered to be consistently present in the best pickers (champions) and that were absent or partially absent in poorer performers. Together they form the model.

Crop specific traits of a champion runner bean picker

1. They know instantly which beans to pick into the container, which to pick and drop and which to leave. They waste no time deciding.
2. They have a thorough structured and consistent search pattern.
3. They move quickly and efficiently through the rows with purposeful movements. There is no wasted effort.

4. They pick rubbish very thoroughly because they know that old beans left on reduce crop and thus their future earnings. They always pick with 2 hands – they hold the plant with one hand and pull the bean with the other to avoid plant damage.
5. They take ownership of and care about their lines and their plants. “If you care about you, you care about the plant”. The tripods were referred to as “money trees.”

3. Iceberg lettuce

A number of rig teams from the three chosen businesses were studied and filmed. Individual top performers, team leaders and supervisors were interviewed. The workers were mostly eastern European students or labour contracted through gang masters. We did not observe any professional teams (i.e. Teams who have done the job together for several years).

The iceberg lettuce rig harvest teams that we studied varied from 12 – 25 depending on the size of rig. There was either a dedicated supervisor or one of the team was appointed by the supervisor to make agreed decisions and to contact the supervisor as required. The emphasis was always on management of quality rather than organisational efficiency and production levels.

All the businesses we worked with pay a piece rate per head or crate, divided equally between the whole team. There was not any quality based remuneration, though there may be repercussions for failing to meet required standards varying from the team having to sort the sub-standard batch to disciplinary measures. Keeping to quality standards is a key role of the supervisor.

Compared with individual hand picking (e.g. Runner beans) team rig harvesting is more complex. We observed and documented the traits of the top performers in the individual roles of cutting and packing. The model also includes the team traits present in the best performing teams (see ‘Generic traits of champion team players’, page 17). In addition the set-up and organisation of the rig will impact performance. These aspects form part of the model (see ‘Rigs: organisational requirements for optimum production’ and ‘Rigs: system requirements for optimum production’, p.17).

Crop specific traits of a champion iceberg lettuce cutter

1. Fit – Have the energy and stamina to keep working for 10 hours + and look to maximise conservation of energy by having a good consistent system
2. Flexible – Need to be able to bend over repeatedly without stiffness or pain. The best listen to their body and have a system to cope with this (e.g. One leg on bed – the other in the row and periodically rest the forearm on the raised leg to relieve stress on the back).
3. Sense of rhythm – the sequence of bend, cut, bag, twist, seal, place in cup, turn, should be rhythmic and should become automatic with practice
4. Good hand eye co-ordination – able to consistently cut accurately.
5. Spatial awareness – safe with a sharp knife close to others.
6. Dextrous – able to consistently bag the lettuce smoothly and quickly.

Task specific traits of a champion iceberg lettuce packer

1. Team player – sees themselves as part of a team and accepts the give and take involved.
2. Able to work well under pressure.
3. Sense of rhythm; the sequence of ‘pick up 2 lettuces, place in box, repeat x6, lift box, turn, stack box, take fresh box, place down’, should be rhythmic.

4. Cauliflower

Eight cauliflower rig teams on the three chosen businesses were studied and filmed. Individual top performers and teams collectively were interviewed. The teams varied from local labour to all SAWS (Student Agricultural Worker Scheme) and included teams with several years experience.

The cauliflower harvest rig teams that we studied varied from 6 to 11 people. Typically there were 4 cutters, 2 packers and one stacker. The business using the largest teams included a supervisor on each rig who fully worked in with the team. Elsewhere the teams were self-managing. In most cases there was a team leader appointed by the gang. Where this was not the case, the team was less effective.

Inevitably there were similarities with iceberg lettuce harvesting, in particular regarding team dynamics and organisation on the rig. (See 'Generic traits of champion team players', 'Rigs: organisational requirements for optimum production' and 'Rigs: system requirements for optimum production', page 17)

The models, below, for cutting and packing were created from the studies of top performers.

Crop specific traits of a champion cauliflower cutter

1. Fit –have the energy and stamina to keep working for 10 hours + and look to maximise conservation of energy by having good consistent system.
2. Flexible – Need to be able to bend over repeatedly without stiffness or pain and the best listen to their body and have a system to cope with this. Some use a bear like movement (lumber) from side to side which may relieve back stiffness and may aid calibration (eyes closer to the crop).
3. The sequence should be rhythmic – bend, cut, turn, cut, place in cup or on belt. It should become automatic with practice.
4. The nature of the cut should be a slicing movement rather than a hacking movement. The cauliflower plant should be pushed away from the blade to reduce effort by opening up the cut as you are cutting it.
5. Consistently cuts to an agreed acceptable standard (own QC).
6. Good hand eye co-ordination – able to consistently cut accurately. They are able to gauge correct size – whether by sight (open curds) or feel (closed curds). The knife is used to move the odd leaf when the curds are open. When the curds are closed, the movement is feel (calibrate for size), cut.
7. Spatial awareness – are safe with a sharp knife close to others.

Task specific traits of a champion cauliflower packer

1. Team players – see themselves as part of a team and accept the give and take involved.
2. Able to work well under pressure.
3. Sense of rhythm; the sequence of 'pick up cauliflower, place in bag, repeat until full (e.g. 8, 10, 12), lift box, turn, stack box, take fresh box, place down', should be rhythmic.

5. Supervision

We noted considerable variation in the role of and effectiveness of supervisors. In some cases each rig had a dedicated supervisor who helped with the work at times. Elsewhere the supervisor had responsibility for two or more rigs. All supervisors were responsible for maintaining quality and ensuring product left the rig correctly packed and labelled. The best team we studied had a supervisor who also saw his role as training the team to maximise production through teaching efficient techniques and coaching in a supportive way. At the other extreme, one supervisor said: "My role is to shout at them".

There is a real need for management to fully define the role of the supervisor. If maximising production is part of that role, there needs to be targets set, feedback on results and ideally incentives to achieve targets.

The following model is not definitive and represents traits observed in supervisors studied in this project.

Traits of a champion team supervisor

1. Excellent trainer and coach. Uses a system of show, practice and feedback.
2. A strong motivator – provides the conditions and environment for individuals to become motivated.
3. Firm, Fair and Fun – uses appropriate disciplinary and feedback techniques, to maintain both standards and morale. Problems are nipped in the bud quickly and efficiently whilst being fair (no favourites). Recognises the importance of team bonding and may use humour to raise morale and keep spirits high especially in difficult conditions.
4. Champion (or close to) cutter and packer.
5. Excellent observational skills – sees any problem quickly and gives regular feedback and encouragement.
6. Leadership - works in with the team and leads from the front when needed
7. Coach – Spots individual shortcomings and helps the individual overcome them.
8. Encourages each person to grow and do well and recognizes their success which gives them a sense of achievement.

In some cases, teams were lead by a member of the team, rather than a supervisor.

Traits of a Natural Team Leader

1. Very Focussed but always aware of the team and when required to support them whether it be helping to pack or cut, is flexible enough to change what he (or she) is doing. For example, he knows if he gets too far ahead, that may mean that it is time to help somebody else. If the baskets remain full for a while, he knows it is time to help the packer on the rig
2. Champion (or close to) cutter and packer.
3. Excellent observational skills – sees any problem quickly and gives regular feedback and encouragement.
4. Leadership - works in with the team and leads from the front when needed. Leads by example
5. Consistently and accurately monitors quality (QC)

D. *Transferring the models*

In the work that was carried out transferring the model the following techniques were used as appropriate:

1. Rapport – The necessary time was spent with each person to get on the same 'wavelength'. This involved acknowledging and accepting how the individual felt.
2. Empathic listening – listening was employed rather than just speaking. Listening was used with a view to understanding, rather than to reply.
3. Calibration – This refers, in this context, to noticing subtle changes in emotion through expression, voice and body language. This aided the understanding, particularly where the quality of spoken English was a limiting factor.

4. Questioning techniques – Carefully phrased open questions were used to elicit important information.
5. Anchoring – This is a technique that enables a person to capture the feeling(s) that would best serve them when doing the job, from some other part of their life. For example, a strong sense of believing that you will be successful.

To reduce costs it is important to increase average harvesting speeds, however this must be achieved without any loss of quality. All growers that were asked placed quality above quantity, although the use of piecework compromised this and gave a mixed message.

When referring to the aim of ‘increasing harvesting speeds’ in this report it is accepted that this means to do so without negatively affecting quality.

The transfer stage was deliberately kept relatively brief as on commercial holdings, time is a major limiting factor. Where possible (runner beans & iceberg lettuce) the supervisor did the actual transfer to demonstrate that the results were not due to any particular skills of the project. In the case of iceberg lettuce and cauliflower, the time spent was necessarily limited to the teams’ lunch break.

In commercial practice a supervisor would benefit from receiving more thorough training on the model and how to apply it. They would then use the traits in the model as tools to help individuals as required through the season.

Transferring the Model: Runner beans

On the chosen sites we spent @ 45minutes each with two supervisors, explaining the model and suggesting the best approach to transferring it. Both agreed the model was a full representation of the very best pickers they had come across. The supervisors subsequently each chose 4 pickers to transfer aspects of the model to.

We recommended not to attempt to transfer the whole model, rather just the traits which were most obviously missing. Supervisors were encouraged to monitor the selected pickers and teach other traits as appropriate.

Both supervisors were paid hourly and had no vested interest in increased performance. The first supervisor did not seem very motivated and was ‘going through the motions’. She was not intending to return the following season and was in her last month. The second was motivated and interested in both the model and improving her pickers’ performance (and returning the following season).

Transferring the Model: Iceberg lettuce

The chosen site had 2 rigs working in the same crop. Although neither team were ‘champions’, the slower team was only performing at 62% of the speed of the faster team. The slower team were less experienced than the faster team, however they were not improving. We spent @ 40 minutes with the leader of the slower team explaining the model and how to apply it. We gave the leader a copy of the model to refer back to.

The management on the farm and particularly the harvest supervisor had written the chosen gang off as lazy, disorganised and not interested in improving. This was partly due to them being from an agency that insisted on receiving an hourly rate for each worker.

We found that the workers were aware that they were not looked upon favourably, but did not understand what was expected of them or how to improve. Once they understood, they were keen to improve. They had no immediate financial incentive, but knew they would need to improve to get further work.

Transferring the model: Cauliflower

The chosen site had two rigs working on similar crops. Both teams were very experienced and the faster team was one of the best we have seen. The slower team was performing at 78% of the speed of the faster team. The slower team had been told they were the best by the manager (motivation?) and initially refused to believe they could improve. For instance when we suggested they were making several cuts to trim the top where one should suffice, they gave excuse that it was not possible with winter cauliflower. We showed them a video of a champion team cutting winter cauliflower with one trim cut and this convinced them it was possible.

We spent @ 40 minutes with the team transferring several of the traits. This was the only intervention.

Results and Discussion

Runner bean results

All pickers improved against the rest of the gang (control), however the results were varied. The control group consisted of 22 pickers. The figures in the tables below are based on 2 weeks before and 2 weeks after elements of the model were transferred. The results were an overall increase in picking speed of 1.2% on the first site and 18.7% on the second site. All the pickers on the second site improved and the best individual improvement was 30%. The improvements were measured against the rest of the gang as a control. They were based on a period of twenty days before the model was transferred and twenty days after.

The very small increase of 1.2% on the first site was, in our opinion, due to the supervisor failing to commit to transferring the model. The result on the second site was more in line with trial and commercial results in the soft fruit sector. We believe that even more could be achieved with greater training of the supervisor.

Site 1	Speed before as % of control	Speed after as % of control	% improvement
Picker 1	92.3	92.8	0.5%
Picker 2	87.6	89.3	1.7%
Picker 3	96.7	96.8	0.1%
Picker 4	82.9	85.4	2.5%
Average	89.9	91.1	1.2%

Site 2	Speed before as % of control	Speed after as % of control	% improvement
Picker 1	84.3	99.0	14.7%
Picker 2	89.9	106.5	16.6%
Picker 3	76.7	106.9	30.2%
Picker 4	97.4	110.7	13.3%
Average	87.1	105.8	18.7%

Care of plants

We were not able to accurately measure whether there were any changes in levels of damage to plants and missed beans. The supervisors reported that where there was any change it was an improvement. There was no evidence of any drop in standards.

Improvements were thought to be a result of the pickers having more interest in the job. Through setting targets beyond each day's work they were more able to see the benefits to themselves of plant care.

Iceberg lettuce results

We observed the team soon after the leader had spoken with everyone. There were two significant improvements immediately. Firstly The cutters had been up to 6 metres away from the rig and carrying several heads. Subsequently they were managing to keep a straight line close to the rig. Any cutter who got ahead would help by cutting a few heads in someone else's row. Secondly, if the packers could not keep up, a cutter was quickly despatched to help pack. This improved the flow enormously.

The figures below are based on a period of 15 days prior to transfer of the model and 20 days after (until crop levels significantly decreased). After the transfer of the model the speed of the team (transfer team) increased by almost 34% against the control (control

team). Most of this increase came in the first 3 days after the transfer. The improvement was due to a combination of better individual techniques, better organisation and a low existing performance. We believe that the improvement was sustained because the team was working in a more efficient way rather than having to work harder.

Iceberg lettuce	Output pre-transfer (pallets / hour)	Output post-transfer	Gain (loss) %
Control team	4.53	4.68	3.3%
Transfer Team	2.82	3.90	38.3%
Transfer as % of control	62.25%	83.33%	33.86%

Quality of work

The transfer team were originally working to an acceptable quality standard. This standard was maintained.

Cauliflower results

After aspects of the model had been transferred the initial observed change was dramatic with a 24% improvement and much better technique and teamwork. The cutters had taken on board the single cut to trim the top and were helping each other out. I.e. if a cutter got ahead, he would cut a few heads from his neighbour's row rather than stay in front. We told the fieldsman that we believed they could sustain a 20% improvement. He was worried (without evidence) about quality falling and said he would "be happier with 10%". The sustained improvement was 11.2%. It is likely that this result was affected by the fieldsman's concerns regarding links between speed and quality.

Cauliflower	Output pre-transfer (heads / hour)	Output immediately post-transfer	Sustained output post-transfer	Gain (loss) %
Control team	988		979	(0.9%)
Transfer Team	769	953	848	10.3%
Transfer as % of control	77.8%		87.3%	11.2%

A second business was visited with the intention of working with a slower team. What transpired was that the team were guaranteed minimum wage plus a travelling allowance due to the 2.5 hour journey each way. The piecework rate was set at a rate that the gang did not believe it could achieve. As a result they worked steadily but not quickly and were happy to accept day pay of £50. The fieldsman was powerless to act as the business had a global, all year round rate per head, regardless of quantity, quality or location.

The business was losing as the output on hourly rate equated to a cost 20% higher than the piece rate. Although money is not the only motivator, when low piece rates are combined with 5 hours per day travelling, there is no appetite for improvement.

Quality of work

Despite the fieldsman's concerns, standards were maintained. The initial improvement of 24% was in part due to the one-cut trim rather than the previous several cut trim. There was a need for an adjustment in the mind-set of the cutters. They understood (or chose to understand) the instruction as being 'you only need one cut' when the full instruction was 'when you cut accurately, you only need one cut'.

Once this was sorted there were no further issues.

General Comment on Results

The results give an indication of the efficacy of the model and its transfer. The nature of commercial horticulture is that crops vary from field to field and day to day. The scale of the project (time and cost) prevented larger replicated trials. We are indebted to grower businesses for enabling us to carry out this project and at all times respected that these are commercial operations that we needed to minimize disruption to. The headline results should thus be viewed with caution. For instance, the 34% improvement in iceberg lettuce is much greater than the 11.2% in cauliflower. Both models are equally valid and the results reflect other factors that are mentioned in the respective results sections above.

There are a number of factors that will influence the success or otherwise of using these models including:

1. The quality of the supervisor – e.g. communications skills, motivation, technical knowledge.
2. The degree of 'buy in' from the supervisor.
3. The level of support and feedback received from management.
4. The beliefs of managers / supervisors will influence results achieved. E.g. When you believe a team / individual will not improve, you don't put the effort in to help them.
5. The level of interference / distractions. E.g. Machinery breakdown, running out of crates, aggressive supervisor, extremes of weather.
6. Remuneration. E.g. Piecework rate too low so workers settle for day pay.

Selection and Training of Supervisors / Fieldsmen

It quickly became apparent that the calibre of supervisors, the training they receive and the expectations of them were very variable.

Many supervisors gave only initial training to new pickers on the first day. After that pickers were told off if quality was unacceptable and, in most cases, missing beans / heads that were ready to harvest. There did not appear in most instances to be any attempt to help workers learn better techniques.

All the supervisors we came into contact with were paid by the hour. They were not motivated to increase picking speeds as all the gain would go to the picker and the farm, whilst they run the perceived risk of increasing quality problems.

Pre-selection of pickers

The project has highlighted the problems with slow, unmotivated pickers from Eastern Europe through SAWS (Student Agricultural Worker Scheme). These pickers frequently came from wealthier families and were not primarily here to work. They were here for other reasons such as a holiday, to improve their English or because their university or parents suggested it.

Commercial experience in the soft fruit sector has shown that these pickers can and do improve through application of the champion picker model, however from a low starting point. They often take an inordinate amount of the supervisor's time for the improvements gained.

If these workers were to be removed, or preferably never arrive, much greater improvements in average picking speed could be achieved. To this end, some form of pre-selection of labour is extremely desirable.

Although local labour is still available in some parts of the country, growers report that this source is drying up and anticipate needing more non-local labour in coming years.

Conclusions

- The model can be used to train harvest workers to improve harvesting speeds without loss of quality.
- Growers can make significant savings using this approach
- Good techniques will make an above average picker / worker; mental traits such as strong motivation and positive attitude make a great picker / worker.
- Both physical and mental traits can be taught.
- The machinery and organisation must not compromise efficiency.
- Managers and supervisors need a positive attitude and an open mind for the potential of this endeavour to be realized.
- Pre-selection of labour could add to the potential gains

Appendix 1 – Background Research

The following is a list of research material studied for this project. Further details can be obtained from Chris Rose & Associates Ltd, contact via HDC.

Adas Project Report_CC0360_2904_FRP
Cauliflower – the effect of warmer winter 1995/6

Hortlink Caulicut Project
Automated Cauliflower Harvesting

PostHarvest Technology Research & Information Center
Cauliflower (should not roll) post harvest tips

University of Illinois
Beans – varieties, when to plant, spacing and depth, care, harvesting, etc..
<http://www.urbanext.edu/veggies/beans.htm/>

Postharvest cooling and handling of cabbage and leafy greens
North Carolina Agricultural Extension Service
Greens, marketing, packing house, postharvest handling, field workers and quality

Tygard machine & Manufacturing Co
Productivity rate and the labour pool

Harvesting and preparation for market
Knives – care and shape, sun, mechanical damage, cooling, maturity standards (Kadar 1992 and 1983 Post harvest quality maintenance of fruits and vegetables in developing countries
Lieberman M. Post harvest physiology and crop preservation Plenum Publishing corporation p455-469

Maturity indices of vegetable crops
Harvesting practice
1989 Prevention of post harvest food losses: fruits, vegetables and root crops

A training manual Rome UNFAO 157pp (all things agricultural)

Minnich J 1983 Gardening for maximum nutrition Emmaus, Pa: Rodale Press

Harvesting containers: Friend Manufacturing Corporation, Prospect Street, P O Box 385, Gasport, New York, 14067

Harvesting tools: Field Packing Aids, Self Propelled Field Pack System

Transport to Packinghouse

Manufacturers and Suppliers of Post Harvest technology materials and equipment – addresses, telephone and fax numbers

University of Illinois : Lettuce facts

Work Flow : Overview of managing projects (software)

Hawthorne Effect – 1927 -1932

Hawthorne Plant of the Western Electric company (increase in worker productivity produced by psychological stimulus of being singled out and made to feel important – factored in by Chris Rose Associates)

System Dynamics – MIT Sloan School of Management (various documents on file)
History of Farming – www.GradSchool.com

David C. McClelland – human motivation and organizational performance, psychology of leadership

Successful teams – Red Arrows
Creating top Flight Teams by Hilarie Owen

Symbolic Modelling – Penny Tompkins and James Lawley (various documents)

System Dynamics Modelling for Project Management by John D. Sterman

The Hawthorne Defect – a report taking an opposite view of a theory that was unproven, unfounded and misleading

Center for food safety
<http://www.griffin.vga.edu/cfs>

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Nutrition facts, availability, how to prepare, buy, store

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