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a) i)

Research & development of agricultural technologies, is vital in catering for a ~~global~~ growing economy, the development of 3rd world countries and to overall ~~inere~~ increase production.

The CSIRO (Commonwealth Scientific Industrial research organisation) is one of Australia's largest research organisations. It aims to increase production & yield, while minimising cost. Research is needed when developing products & technologies, to allow Australia to maintain its competition in the global market.

For example, 'Sportswool' was developed by the CSIRO, which is synthesised from merino wool, & is used for soccer jerseys in England. The CSIRO also researched into biotechnology when developing BT cotton.

This variety of cotton is genetically modified through the insertion of a gene from a free-living bacterium, into the traditional cotton crop.

This gene now gives the BT cotton variety resistance to the heliothis moths. Through the development of this product, it has allowed for an increase of up to 90% yields & a decrease of up to 80% less chemical application. The CSIRO is an excellent

example of why research is needed in the agricultural industry. The research that is obtained, is collated & analysed to allow researchers to produce a product that has the best, & most effective design, for increased productivity.

ii) Newly developed agricultural technology, may not at first be widely accepted by the agricultural industry. This may be due to the cost of implementation. For example the NLIS (National Livestock Identification System) was designed to trace diseases to manage outbreaks & quarantine. However this technology is very expensive, with each tag costing up to \$2.60. Recently, however the Federal government passed a legislation, making it law that every ~~or~~ cow/sheep must have an NLIS tag. For a farmer to benefit from the NLIS system, Automated drafting systems & weighing stations are available, however can cost up to \$70,000. Also implementing these technologies can also be a hassle & ~~the~~ traditional farmers tend to stay with what they have. Another reason technology might not be accepted is the farmer's justification to purchase & use the technology. For example GPS devices are magnificent at saving

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times decreases stress, & optimally placing seed however
is only ~~beneficially~~ justifiable to broad acre
farming. A farmer that has a smaller
farm, may not feel the need in adopting
the GPS system technology.

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Question 31 b) →

There are many new technologies & recent developments in computer related technologies, that a farmer can implement to manage & monitor factors associated with agricultural production. These technologies ~~and~~ includes; GPS (Global positioning Satellites), NWS, AMS (Automated milking Systems, Climate & weather forecasting & Biotechnology.

A GPS, is a group of satellites that orbit the earth. A GPS system can use these satellites to triangulate a position up to 2cm. This is done using travel time of sound/radio waves. The newly developed CFX-750 GPS device, by Trimble ~~has~~ uses a minimum of 4 ~~GLONASS~~ ~~satellite~~ satellites, to position a tractor in the field. The CFX-750 includes functions such as variable rate applications, inter-row sowing & pilot guidance. A farmer can use the variable rate application function when sowing to automatically place seeds in optimum density in particular paddocks. This can also be used when applying fertiliser. The GPS system collects data during harvesting regarding tonnage/hay & when spreading fertiliser; ~~the~~ ~~variable~~ places it in regions where decreased yields ~~at~~ were obtained. This maximises sustainability & increases productivity & yields. The inter-row sowing function manages

the tractor's position in the field, automatically,
 or on an annual basis. For example if the
 spacing between times is ~~300~~ 220mm, then
 every year, the device will automatically shift the
 swath over 110mm. This is used to ensure
 the same section of the paddock isn't being sown
 every year, which would deplete all the nutrients.
 The pilot guidance system is ~~either~~ ^{either} hooked in to
 the tractor's hydraulics ^{steering}, or attached to the steering
 wheel with a EZY-Steer device. This system allows
 the CFX-750 unit to control the 'movement'
 of the tractor. Through using GPS technology,
 a farmer can manage & monitor yield/ha,
 seed density, seed depth & fertiliser density. The GPS
 technology has had a dramatic change on
 the lifestyle of a broad-acre farmer.

NLIS (~~the~~ National Livestock Identification System)
 is an electronic ear tag used by the
 industry to trace & prevent disease outbreaks. It is
 a Federal Government initiative. ~~There~~ The tag is
 individual for each animal, meaning the farmer
 can monitor the ~~growth rate~~ growth rate, weight
 over time, age & EBV (Estimated breeding value). When
 the cow comes into the drafting/weighing system, the
 farmer can have input data into the computer
 to indicate ~~he~~ ^{he} wants

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animals ^{over} ~~with~~ specific weights in on particular yard for selling, & the system will automatically do this. The NLIS tag is scanned when entering the race, & weighed, in which the data is uploaded into the tag, & then is drafted to a specific pen. Through using an NLIS system, it allows the farmer to easily & quickly be able to separate & draft his stock. The farmer can also ~~keep~~ ^{monitor} information specific to each animal, allowing them to select the best animals for breeding, the ones with the most favorable traits. Through associating this new technology ~~with~~ into production, a farmer can monitor & manage cattle on an individual scale.

Through the development of robotics into the Dairy industry, Automated milking systems, ^(AMS) dairy farmers can now ~~alone~~ manage up to 100 ~~catt~~ head of cattle / hour. The ~~AMS~~ Automated milking system, can monitor information ~~of~~ regarding milking yields, ^{flow rate & milk ejection,} for each individual cow, due to an electronic tag (NLIS), ^{that is scanned.} Through collecting & using this data, a ~~Dairy~~ ^{Dairy} farmer can successfully ~~to~~ breed from cattle with higher milking yields, to obtain maximum production. The AMS has allowed for a dramatic change in the lifestyle of a dairy farmer.

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The ~~then~~ advance in weather forecasting, has allowed researchers such as ~~BMS~~ BMS, (Bureau of Meteorology & Statistics) to be able to ~~analyze~~ collate & analyse previous weather patterns, to accurately predict the weather forecast over a 7-12 day period. A farmer can use this ~~through~~ information, to determine the optimal times for farming practices such as; sowing, spraying & harvesting. Through websites such as Weatherzone, the farmer can have emails sent daily, allowing him to monitor the weather & manage certain ~~deciso~~ decisions based on the ~~for~~ weather forecasts.

Through the use of various advancements in computer related technology's, farming in the 21st century has become more sustainable, and have allowed farmers to more easily manage factors relating to production. The information given from these technologies, indicate to the farmer what must be done for maximum profitability, & sustainability, which in turn, increases his profit margin.