Gross Margins
&
Crop Production Systems

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The comparison of Barngreens and Greenbeds systems with alternative crop production systems

In order to place this project into the context of the range of existing cropping systems from hydroponics to open field rain fed systems there is a need to apply a standard basis for measuring and comparing the biomass production and profitability of each alternative. Today the standard commercial basis used to plan annual production is gross margins. Gross margins are an estimate of the contribution of a crop or animal enterprise (activity) to the total profit of a farm.

Gross margins are calculated by deducting the annual variable costs of production per hectare from the income received for each crop also calculated on an annual per hectare basis.

Variable costs are those input costs which vary in proportion to the area of crop produced such as seed and fertilizer.

Income is calculated on the basis of the yield of saleable crop/hectare measured as kg./hectare and this is multiplied by the unit price/kg. received on sale. The unit prices are farm gate prices.

Therefore, the formula for Gross Margin for each crop is:

GM = Income/hectare – aggregate variable costs/hectare

or

GM = [yield/ha. x unit price] – [(labour x labour rate) + (fuel/energy x unit price) + (fertilizer x unit price) + (seed x price) + (pesticides x price) + (irrigation water x price) + (sacks/packaging x price)]

The number of variable inputs in a Gross Margin calculation

The number of variables used in gross margin calculations can vary from one or two variables in the case of harvesting output from naturally occurring ecosystems, to about 10-15 in field rainfed agriculture to well over 30 in systems where there are controls over the whole range of environmental factors such as temperature, light intensities and wavelengths, water and a complex of logic circuitry managing the whole system.

Further details on gross margins and their application is provided in Annex 1.

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Annex 1

Why are gross margins useful?

Gross margins are used by farmers to optimise the mix of crops on their farm so as to maximise their profit by maximising the use of their labour, land capacity and farm equipment.

Different crops are better suited to specific soil conditions across the texture spectrum of sand, silt and clay content. So, land is assigned to those crops with the highest gross margin for each type of soil until the different soil categories are occupied. The mix of crops are combined to make sure the overall area does not exceed the capacity of a farmer's equipment for seedbed preparation or harvest. This is critical for rain fed open field systems where there are specific operational windows in the years for preparation and planting and harvesting, especially in the case of cereals. The demand for labour input varies significantly over the crop season depending on the crop so the land and equipment allocations also need to ensure that the combination of crops does not create a problem of shortage of labour.

The most effective way to calculate the optimised combination of crops to maximise potential aggregate gross margin[1] is to use the computer-based SIMPLEX linear program. On the other hand, the Swedish Extension services in the past applied a so-called "Swedish method" which enabled a farmer to produce plans by applying the logic described and just using a calculator. With experience farmers could attain plans that were very close to the results obtained by the computer. The "Swedish method" in the previous paragraph was commonly taught in farm planning classes in the UK.

Status of Gross Margins today

Gross margins as a planning tool were pioneered in the very early 1960s and are still in use as a generalise standard for use in farm planning.

The relevance of Gross Margin analysis to crop production systems

In the context of farm planning, gross margins provide a useful indicator to compare the profitability of any vegetal or animal biomass production system located in temperate through to tropical and arid agricultural systems and including hydroponics, greenhouse and covered production to the normal rain fed agriculture including primitive "slash and burn" systems.

Gross Margin components as measures of efficiency and performance

In the context of climate change, there are several measures of alternative crop systems performance. Therefore, the inputs which generate greenhouse gases such as fuel can be modified to estimate the changes in associated costs and yields associated with introducing alternative energy systems which emit less greenhouse gases. The importance of this ability it that famers will not introduce changes crop inputs that render them unprofitable unless there are alternative substitutes to compensate losses.

Changes in mulching techniques of closed systems that can circulate water can be used to reduce water demand and costs and the results in economic viability terms compared with systems that do not possess such economies.

[1] McFarquhar, A. M. M., "*Research in farm management planning methods in Northern Europe*", Journal of Agricultural Economics, May, 1962. This paper by Alistair McFarquhar, of Cambridge University, described the various optimization methods in use including the Swedish Method which was adopted as a basis for instruction and practical procedure for students at the School of Agriculture to carry out farm planning.

In terms of productivity measured in terms of the contribution of any input factor to physical yield or economic changes, the measures used are the gross margin components of yield and then applying prices to calculate the change in gross margin, costs and income.

Data collection to establish reference benchmarks

In normal production systems applied across different farms there will be difference in performance which are generally classed as:

- High performance practice
- Average performance practice
- Low performance practice

In terms of production economic viability, the indicator used is gross margin and the ranking or practice performance groups are established using data collected from as many representative farms as possible (usually through surveys).

The “average” levels of performance attained within each level of performance are used as benchmarks for farmers to compare with their own production. Those with lower performance can inspect the production inputs and methods of farm data which has a better performance to detect what they need to change to improve performance.

Therefore benchmarking is an important output from data collection, such as in the case of Greenbeds, to establish planning benchmarks to benefit the producer community.