Methodology to make Conservation Agriculture a Practical Reality for the Small-Scale Farmer.

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1. Introduction.

In Africa 33% of small-scale farmers are undernourished (FAO/WFP. 2010). The national yield of Zimbabwe is cited at less than 0.5 MT/Ha (Farming for the Future, 2009). This means that many farmers are not able to sustain themselves from the land that they are utilising, even though they spend many hours tilling and working the land. Most of the seed and fertilizer utilised is managed so inefficiently that it does not produce a viable return (Thierfelder and Wall, 2009).

Many well meaning Non- Governmental Organizations (NGOs), who understand that conservation agriculture (CA) is a sustainable solution to this predicament have provided inputs to attempt to persuade farmers that there is better way of agriculture. However, this often fails once the "carrot" in the form of free inputs is removed, the farmers quickly revert to their conventional methods accepting soil degradation and yield decline.

Foundations for Farming has been a regional leader in the area of conservation agriculture for many years, and have had much success through their training techniques to convince farmers that CA is a more sustainable way of crop production. Due to the fact that CA is initially more labour intensive many farmers are discouraged from continuing to practice CA (Farming for the Future, 2009). One of the major efforts of Foundations for Farming over the last 30 years has been to re-establish the joy of farming and instil hope into individual farmers and rural communities. A new intervention has been developed, which alleviates many of the previous limiting factors and brings a new measure of hope as a practical solution to feed a family for a year.

This primary objective of this initiative is that a family should feed itself. It removes the burden of excessive labour in terms of field preparation and collection of mulch material. It provides all the inputs required to produce a crop, yet is so simple that once farmers are envisioned they are no longer reliant on the inputs to be successful.

2. Materials and Method

This new way of approaching food security at farm level and based on the principles and practices of CA is called "Pfumvudza", which literally means "New Season". The Pfumvudza concept has resulted in the development of a very precise collection of essential inputs. These inputs have been divided into two 23kg packs, which have all the ingredients necessary to meet the needs of the plot described below. The inputs include (per plot): Packet 1, 2 x 6kg of Agricultural Lime. Packet 2, 2 x 8kg of basal fertilizer. Packet 3, 2 x 1kg of maize seed. Packet 4, 2 x 4kg of Top-dressing. Packet 5, 2 x 4kg of Top-dressing. 2 x 5ml fertilizer cups and 2 x 8ml fertilizer cups. These quantities have been divided into 2 easily transportable packs and ensure there is enough nutrients to plant 1456 stations, using the Foundations for Farming methodology.

A rectangular block of land, 16m by 39m is demarcated early in the season. The longer side preferably extending down the slope. Steel pegs should be used to permanently identify these corners.

All plant material in the internal area of this plot is then removed, using a hoe. The plants must be cut off at ground level, with minimal soil disturbance. All this plant material is then evenly spread over the entire area providing a thick mulch layer. If insufficient material is available, at least 30% ground cover, additional material must be added. Due to the unbelievably small area of land being utilised this additional material is easily found especially when the process is done early in the season.

Using the corner pegs as guides, carefully dig 8cm deep planting stations in a matrix of 60cm by 75cm across the entire area. The in row spacing across the slope will be 60cm and the between row spacing down the slope 75cm. A plot of 16m by 39m will result in a total of 1456 planting stations. The holes should also be dug with the soil being deposited on the downward side of the station. The field should be kept weed free at all times.

A 5ml cup of agricultural lime (from pack 1) is spread across the base of the planting station, after which an 8ml cup of basal fertilizer (from pack 2), is also placed along the base of the planting station. After this the fertilizer is carefully covered with a small amount of soil, to ensure there is no direct contact between the fertilizer and the seed. During this covering process it is essential that a basin of 5cm in depth is maintained to ensure an even planting depth.

After the first effective rainfall (70mm after 15th November), (Oldreive, 2006) has been received seeds can be planted. The ideal timing would be during the month of November. Three seeds are evenly placed within each of the planting stations, (from pack 3), at a depth of 5cm and then covered. The stations are levelled (without depression) and preferably covered with mulch.

Three weeks after emergence, if possible, when the soil is moist, the field is thinned to 2 plants per planting station. This ensures that there is an optimal population of 44,000 plants per hectare. Allowances are made where there a less than 2 plants in a station, and an extra plant is left in one of the adjoining stations.

At this point in time, 3 weeks after emergence, the first of two split top-dressings is applied, (from pack 4), using a 5ml cup. The top-dressing is spilt to avoid large nutrient loss in times of high rainfall. This is done 10cm from the plants on the upslope side. A second application is done once the crop begins to tassel.

3. Discussion

Nothing of what has been revealed to this point is out of the ordinary except for the statement made that from this small piece of land a family will feed itself. This plot has been designed in such a way that it is easily possible for a family to harvest a bucket of maize from each row. This bucket of maize (approximately 17kg of shelled kernels), is adequate to feed a family of six for a week. To achieve this each of the 56 plants per 16m row must produce at least one cob weighing 300g. This has been proved possible on a small scale at our Resthaven Retreat demonstration plots, in Harare Zimbabwe. (Refer to Table 1.) During this 2013/2014 season a total of 12,000 of these

packs have been planted and we eagerly await yield results, which can be compiled to support these claims.

will show that 56 cobs of this size will easily fill the bucket. Using the methods of Foundations for Farming it is easy to achieve this from 56 maize plants. These plants as will be discussed in the methodology will be grown in 28 planting stations, and with an in row spacing of 60cm between stations, which equates to a row of 16m. In other words a bucket of maize can be produced from one 16m row of maize, and thus enough for an entire year can be produced from 52 of these rows. This plot would thus be 16m by 39m in size or $\frac{1}{16}$ hectare.

The reasons why CA has a slow adoption in Africa can be eliminated using the Pfumvudza model. Increased labour is one of the main reasons for not adopting. In a hectare 22,000 planting stations are required. In a Pfumvudza plot only 1456 stations are required. This means most farmers will easily achieve this goal in a day or two at most. Ownership is another vital part of ensuring sustainability in any model. This is particularly true in African farming. Thus to promote ownership farmers are encouraged to purchase these packs for themselves. If compared to the costs usually incurred by a farmer to plant a hectare of maize the cost of 2 of these packs ($50) is far less. The packs have also been intentionally split thus requiring 2 packs per plot, this allows for easy handling and transportation. Each pack has a weight of 23kg.

Mulch is often left out in CA adoption simply because the task of gathering enough to cover a hectare is simply too onerous. Due to the limited size of a Pfumvudza plot adequate mulch cover can be achieved. Rainfall also effects the standards of many farmers crops, either due to late start or dry spells during the season. A dedicated farmer, who has taken ownership of his plot will be able to apply enough irrigation by hand if necessary to a plot of the size of a Pfumvudza plot. Farmers who own limited land sizes as well as women are no longer excluded as with Pfumvudza both groups can effectively be involved.

Pfumvudza is a concept, that was developed to feed a family for a year. It highlights the fact that by simply farming at a higher standard it is possible to feed a family from a very small area of land. However, it requires training to ensure success. The availability of the input pack encourages farmers through the convenience of all the inputs being in one place, but is not essential for success as farmers can use other available inputs at hand (manure, compost etc). Pfumvudza is only a starting point into smallholder farmer food security and can be applied not only to maize but to many other crops. Combinations of maize with soybeans can even be used to feed a small chicken unit, which will create additional income and nutrition in the longer term. This is a revelation to feed a nation!

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