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# Effect of Groundnut (Arachis Hypogaea L.) Intercropping with Different Crops

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**Abstract**
Intercropping is growing of two or more crops simultaneously in the same land and popular in rain-fed agriculture, with limited resources, because one crop can exploit a resource that the other is not exploiting fully. Cereal-legume mixture is the common form of intercropping practiced by most small scale farmers in the tropics and subtropics. This method conserves soil water by means of reduction of the evaporation losses and increases the organic matter in the soil, which in turn improves soil structure, infiltration and water retention and helps prevent soil erosion. Groundnut fixes atmospheric nitrogen with the help of Rhizobium in the root nodules which helps to partially fulfill the crops nitrogen requirement. Crop combinations having shade tolerant legumes with non-climbing habit such as groundnut, cowpeas, soyabean or phaseolus beans, with maize, Sorghum, millet, cotton or castor beans have given greater overall yield from intercropping compared to sole cropping. Intercropping system helps for greater stability of yield, improve soil fertility, enhance ground cover thereby reducing weed competition, suppressing soil erosion and providing N for use by subsequent crops. Evidence showed that the nitrogen contribution of Groundnut on the growth of Maize in intercropping system is equivalent to an application of 96 kg N-fertilizer per hectare at a ratio of plant population densities of 1:4 Maize to Groundnut plants.
**Keywords**: Intercropping, Intensification, Nitrogen and resource

## 1. INTRODUCTION

Intercropping agriculture, as defined by many researchers is growing of two or more crops simultaneously in the same land. It is popular in rain-fed agriculture, with limited resources, because one crop can exploit a resource that the other is not exploiting fully. Mixed or intercropping as a method of crop intensification is practiced in densely populated countries to produce more food per unit area. Cereal-legume mixture is the common form of intercropping practiced by most small scale farmers in the tropics and subtropics. Intercropping conserves soil water by means of reduction of the evaporation losses and increases the organic matter in the soil, which in turn improves soil structure, infiltration and water retention and helps prevent soil erosion. The beneficial interaction that is perhaps most widely applicable in intercropping systems is the better use of environmental resources. Groundnut is one the five widely cultivated oilseed crops in Ethiopia (Wijnands *et al*., 2009). Eastern Hararghe zone of Oromia region hold primary position in producing and supplying both domestic and export markets as compared to other parts of the nation.

Groundnut is grown under rain-fed and used for oil extraction, and for confectionary in Ethiopia. Moreover, it generates considerable cash income for several small scale producers and foreign exchange earnings through export for the country (Geleta *et al*., 2007). Groundnut fixes atmospheric nitrogen with the help of Rhizobium in the root nodules. This helps to partially fulfill its nitrogen requirement. A number of research workers have found that crop combinations having shade tolerant legumes with non-climbing habit such as groundnut, cowpeas, soyabean or phaseolus beans, with maize, Sorghum, millet, cotton or castor beans have given greater overall yield from intercropping compared to sole cropping (Bodade, 1964; Enyi, 1973).

The main reason for greater stability of yield in intercropping is that; if one crop fails, or grows poorly another companion can compensate, and such compensation cannot occur if crops are grown separately. Multiple cropping has been practiced for centuries by small-scale farmers in Africa to reduce the risk of crop failure, attain higher yields, and to improve soil fertility (Litsinger and Moody, 1976).

On the other hand, a major problem of cropping systems is the reduction in soil productivity that accompanies most systems of continuous cultivation, while intercropping usually includes a legume which fixes nitrogen, and which may confer some benefits to the system, because the cereal component depends heavily on nitrogen for maximum yield (Ofori and Stern, 1986). Moynihan *et al.* (1996) mentioned that intercropping annual legumes with grain crops has been proposed as a cropping strategy to enhance ground cover, thereby reducing weed competition, suppressing soil erosion, and providing N for use by subsequent crops. So, with such systems synthetic N-fertilizer and herbicide use might be reduced. Millet, when intercropped either with cereals or legumes, used water more efficiently for grain production (Oluwasemire *et al*., 2002). Legumes are particularly attractive as components of grain cropping systems because of their ability to fix N and serve as a green manure with a low C: N ratio (Sims and Slinkard, 1991).

Pilbeam *et al.* (1995) found that if the legume was grown in association with another crop, commonly a cereal, the nitrogen nutrition of the associated crop might be improved, either by direct N transfer from the legume to the cereal, or by simple sparing of the available soil mineral. Recent studies show that the nitrogen contribution of Groundnut on the growth of Maize in intercropping system is equivalent to an application of 96 kg N-fertilizer per hectare at a ratio of plant population densities of one Maize plant: four Groundnut plants. The advantages of intercropping can be increased when the degree of complementation between the companion crops is maximized and the inter-crops competition is minimized (Willey, 1979).

The general trend in most intercropping experiments is that the yield of a given crop in the mixture is less than the yield of the same crop grown alone, but the total productivity per unit of land is usually greater for mixtures than for sole crops (Willey, 1979). When competition for light during initial growth occurred it caused an inadequate supply of assimilates to the roots because of shading and thus it limited root growth, and that might affect nodules formation and further N fixation (Zakia Ahmad *et al*., 2008). Although groundnut has many advantages recording to yield potential with companion crops and maximum utilization of land, little research work has been done in selection of the appropriate companion crops with proper plant population.

Therefore the objective of this paper is to review the effect of groundnut intercropping with different crop.

## 2. LITERATURE REVIEW

### 2.1. Plant Density in Intercropping System

In spite of the capacity for greater productivity of mixed/intercropping, farmers do not often realize its beneficial effects partly because they often plant their crops at sub optimal population densities (Pal *et al*., 1993). The associated species and temporal differences between the component crops determine the total plant population required to obtain a yield advantage in intercropping. The total density also ascertained depending on the environmental resources and growth habits of the species. When there was severe drought, intercropping beans with maize resulted in greater stability of population, since any loss of plant density of one crop tended to compensated by the other crop which is a major factor influencing the decision to intercrop (Willey, 1979).

Component populations mainly determine as how much of the final yield is contributed by each component. When the component crop densities are approximately equal, productivity and efficiency of intercropping appears to be determined by the aggressively dominant crop (Willey, 1979). Ofori and Stern (1987) in a maize bean intercropping that indicating maize density from 18000 to 55000 plants $ha^{-1}$, reduced leaf area index by 24% and seed yield by 70% in the component bean. Tamado (1994) reported that 50% sorghum and 100% groundnut association gave the highest relative pod yield of groundnut component as compared to the highest proportions. The study also reported that higher proportion of sorghum component reduced the dry pod yield, number of pegs, number of pods and dry matter weight of association's groundnut more as compared to lower proportions. Intercropping study that involved sorghum and groundnut with different special arrangements also showed highly significant differences in dry pod of the associated groundnut due to the effect of special arrangements.

### 2.2. Resource Use in Intercropping System

One of the advantages of intercropping system is its efficient and complete use of growth resources such as solar energy, soil nutrients and water (Francis, 1986). Intercrops are most productive when their component crops differ greatly in growth duration so that their maximum requirement for growth resources occur at different times (Fukai and Trenbath, 1993). For high intercrop productivity, plants of the early maturing component should grow with little interference from the late maturing crop. The later may be affected by the associated crop, but a long time period for further growth after the harvest of the first crop should ensure good recovery and full use of available resources (Fukai and Trenbath, 1993).

Intercropping allows effective utilization of growth resources through crop intensification both in space and time dimensions. The conventional ways of intensifying crop production are vertical and horizontal expansions. Intercropping offers two additional dimensions, time and space (Palaniappan, 1985; Francis, 1986). The intensification of land and resource use in space dimension is an important aspect of intercropping. For example, enhanced and efficient use of light is possible with two or more species that occupy the same land during a significant part of the growing season and have different pattern of foliage display. Different rooting patterns can explore a greater total soil volume because of the roots being at different depths (Palaniappan, 1985; Francis, 1986).

These differences in foliage display and rooting patterns create the space dimension of intercropping. Another important feature is a difference in time of maturity and hence in nutrient demand among different species in intercropping which will create the time dimension of the system. The difference in time dimension will lead to efficient utilization of resources by lessening competition among the intercrop components (Palaniappan, 1985). The ability of intercrops to intensify resource use both in space and time dimension make greater total use of available growth resources than mono cropping (Francis, 1986). Research conducted on intercropped sorghum and groundnut revealed that an increase in total dry weight of both sorghum and groundnut. Nutrient Use Efficiency (NUE) of the individual crops in an intercrop is mostly lower than their respective sole crops. However, the cumulative NUE of an intercropping system was in most cases higher than either of the sole crops ( Chowdhury and Rosario, 1994).

### 2.3. Maize Intercropping with Groundnut

The stimulatory effect of Groundnut on maize can be explained firstly by the direct releasing of fixed nitrogen from Groundnut. This may confirm the fact that nodules of legumes become active at the flowering stages only, and in turn releasing nitrogen which has been taken up directly from the soil and incorporated in the formation of ears/plant, secondly by the releasing of some allelochemicals from legume plants which stimulate the growth and yield components of associated maize plant (Zakia Ahmad *et al*., 2008). The increase in total production and higher reduction in groundnut in intercropping systems as compared to sole groundnut system may be associated with the above ground competition for light between maize and Groundnut in the mixtures (Willey, 1979).

Because of N-fertilizer application in excess there would be low nitrogen fixation and Groundnut was dependent on the mineral N supply of the soil and therefore competitor strongly with maize. N application did not decrease the competition between the two species as nitrogen fixation contributing to the nitrogen supply of Groundnut was further reduced. The application of nitrogen to the maize reduced not only the nodule weight per plant but also the rate of fixation per unit of nodule weight (Nambiar *et al.*, 1983). Groundnut-maize intercropping achieved land equivalent ratios (LER) greater than 1 and gave higher economic returns. The yields obtained from the intercrops were found to relate directly to their population densities, giving an indication that the overall plant population can be skewed to favour one crop over the other in the intercrop depending on the farmer's priority or individual crop profitability (Langat *et al*., 2006).

After successfully establishing the advantages of groundnut-maize intercropping systems through decades of scientific research, new promising maize and groundnut varieties should as a matter of principle, be evaluated and only released to farmers based on their ability to meet the demands of current intercropping systems. The reduction in leaf area indices of intercropped groundnut was probably as a result of reduced photosynthesis due to the shading effect of the maize plants. Less dry matter was therefore available to support new leaf production and development, leading to reduced leaf area index (LAI) in the intercropped groundnut compared to its sole counterpart (Dalley *et al*., 2004).

Sunlight availability will critical for photosynthate production and played a major role in the formation of leaves and development of larger LAI which then supported more photosynthesis (Dalley *et al*., 2004). Results of intercropping study by Rwamugira and Massawe (1990) showed that maize intercropped with groundnut responded to fertilizer up to 60 kg N ha-1 while sole maize responded up to 120 kg N ha-1. In nitrogen uptake study of intercropped maize and groundnut, it was observed that at low nitrogen levels, the nitrogen content of intercropped maize was higher than that of sole maize, indicating some transfer of fixed N from the groundnut to maize. The relative yield advantage of intercropping compared with sole cropping was 44% at zero nitrogen level but this decreased with increase in applied nitrogen and it was zero at the highest nitrogen level (Rao *et al*., 1979). This has important implications in practice because it suggests that intercropping may be more advantageous in low fertility situations.

### 2.4. Sorghum Intercropping with Groundnut

Sorghum planted simultaneously to avoid the risk of crop failure by the end of the growing season as a result of poor and erratic rainfall. Soil fertility declines when its nutrients content diminishes and/or when it's physical, chemical and biological makeup changes in ways that lower its ability to support and nourish plants. So the fertility and productivity of these lands can be improved by replacing the nutrients from mineral or organic sources, application of crop rotations, or partially returned through crop residues and multiple cropping. The latter alternative could be achieved through growing cereals in association with legumes, which offers the best opportunity for conserving soil fertility through nitrogen fixation and returning greater amounts of organic matter to the soil, thus improving its cation exchange capacity (CEC) and physical and chemical conditions (Schmidt, 1993).

In Sorghum Groundnut, the decrease in organic matter and consequently nitrogen percentage could be attributed to its decomposition and utilization by the growing crops, or to less organic matter production as a result of moisture stress at flowering and seed development phases of groundnut plants during the second half of the second growing season (Siddig *et al*., 2013). They could also be attributed to photosynthesis reduction due to partial shading of groundnut by sorghum plants which could result in reduced nodulation and N fixation by the legume. By comparing three row intercropping arrangements viz., alternate single rows of sorghum and groundnuts ($S_1G_1$), two rows of sorghum with single rows of groundnuts ($S_2G_1$), single rows of sorghum with two rows of groundnuts ($S_1G_2$) plus sole sorghum as control ($S_1$), $S_1G_2$ treatment recorded the highest percentages of organic matter (0.092, 0.054%) and total nitrogen (0.76, 0.68%) at the end of two seasons, followed by $S_1G_1$ treatment. On the other hand, the control ($S_1$) produced the lowest values of nitrogen (0.063, 0.032%), organic matter (0.66, 0.47%) and electrical conductivity (0.08, 0.12 dsm-1), and the highest soil pH (6.86, 7.12) by the end of the first and second seasons, respectively (Siddig *et al*., 2013).

The less decrease in nitrogen and organic matter percentages in intercropped treatments compared to sole sorghum might be attributed mainly to the effect of legume residues on organic matter formation and N-fixation. Moreover, this confirms that intercropping meets one of its motives, i.e. increasing availability of nitrogen and organic matter to the mixed population through fixation by the legume, thus maintaining soil fertility. $S_1G_2$ treatment was superior in groundnut total pod yield and in all sorghum productivity components, except number of productive tillers/plant where the control ($S_1$) showed superiority during two seasons (Siddig *et al*., 2013). Experiments conducted at International Crop Research Institute of Semi Arid Tropics (ICRISAT) with this combination have given yield advantages as high as 38% (Rao and Willey, 1980).

### 2.5. Sesame based Intercropping and Biological Importance

Venkateswarlu *et al.* (1980*)* concluded that intercropping of one row of sunflower or sesame in groundnut grown at 30 x 5 cm gave total yield of 787 and 852 kg ha$^{-1}$, respectively. Intercropping of sunflower, sesame and green gram (*Viana radiatax* L.) in groundnut gave total yield 364, 368 and 378 kg ha$^{-1}$, respectively as compared to seed yield of 281-312 kg ha$^{-1}$ in sole groundnut. Baskaram *et al*. (1991) investigating the effect of intercropping sesame at the ratio 1:4 with pearl millet or groundnut reported reduction of shoot web of sesame by about 40% as compared to sole crops.

Samui *et al*. (1992) found intercropping of groundnut with sesame reported the highest pod and seed yield of 1489 and 1624 kg ha$^{-1}$, respectively from sole crops, but the overall pods and seed yield were increased by intercropping. The highest total pod sand seed yield was from one row of sesame to two rows of groundnut (992 and 1038 kg ha$^{-1}$) in sesame and groundnut respectively. The lowest yielding intercropping system was 1:1 groundnut and sesame. Maitia *et al*. (1998) reported that groundnut and sesame intercropping at the ratio of 2:1 or 1:2 without nitrogen and phosphorous fertilizer increased the yield of the two crops. Sarker *et al*. (1995) investigated the sustainability of intercropping system with pulse and oil crops and revealed that intercropping of groundnut with sesame was found to be most beneficial. Among the intercropping associated sesame + groundnut under 2:1 row arrangement gave the maximum sesame equivalent yield ( 1245 kg ha$^{-1}$ ) and land equivalent ratio (1.35) and monetary advantage was greater as compared to the sole cropping.

### 2.6. Effect of Intercropping Different Vegetables with Groundnut

Intercropping offers more stability, less risk, better utilization of limited resources and wide diversity in the production of food. Because of land is limitation, people suffer from different nutritional deficiency like protein and calorie as well as vitamins and minerals. So, horizontal expansion like intercropping among other methods might play an important role in increasing production. Intercropping has been recognized as a potentially beneficial system of crop production. The intercropping system increases total production in addition to stabilization of production in the rainfed areas (Rao and Willey, 1980). By adopting appropriate standard geometry in the intercropping system, the total productivity can be enhanced. The returns from intercropping are higher and more dependable than those from the relevant crop (Rao *et al.,* 1979). Groundnut and vegetable are mainly row seeded crops and grown in the same season. The growth of groundnut is very slow in winter season. So, during this time the space between two rows of groundnut can be utilized by cultivating vegetable as intercrop.

### 2.7. Groundnut and Castor Intercropping

Reddy *et al*. (1965) reported that growing castor mixed with groundnut was better than raising a pure crop of castor, and monetary returns were 61.9% higher than pure castor. They also reported that the yield of castor was more when it was grown mixed with groundnut compared to castor grown mixed with greengram, cowpea, *Setaria,* millet or sorghum. There was a clear increase in production when castorbean and groundnuts were planted together compared to sole cropping.

### 2.8. Groundnut and Cassava Intercropping

Introducing an additional crop like groundnut between the traditionally wide-spaced cassava plantings would increase the production efficiency of cassava-planted land as well as conserving soil moisture and fertility. An experiment conducted at Khon Kaen University, Thailand in 1977, produced higher yields of cassava (26 756 kg/ha) when intercropped with groundnuts compared to sole crop of cassava (24 538 kg/ha). Intercropped groundnut increased the yield of cassava by supplying additional nitrogen from nitrogen fixation. This groundnut/ cassava combination gave around double the net income compared with the sole cassava planting.

### 2.9. Groundnut and Pearl Millet Intercropping

Millet and groundnut is a combination used on lighter soils and it is found in both India and West Africa. It is typical of crop combinations where there is little difference between the growing periods of the two crops but some difference in canopy height; more specifically, of course, it is typical of the cereal/low canopy legume combinations that are so prevalent in many parts of the world. In the growth patterns and yields of a one row millet and three rows groundnut intercropping system which equivalent to row proportions (25%:75%), accumulation of dry matter in the intercrop groundnut was less than the 75% sole crop 'expected' yield, indicating that its growth was being depressed by the millet (Reddy and Willey, 1981).

But it was able to recover from this effect towards the end of the season, especially after the millet harvest, and at final harvest actual yield was similar to 'expected' yield. In contrast, dry matter accumulation in intercrop millet was more than twice its 25% sole crop 'expected' level and at final harvest yield was 62% of the sole crop. Combining these dry matter yields into a relative yield total gave an overall advantage for intercropping of 36%; for seed yields the advantage was a little less (25%) because of small decreases in the harvest indices of both millet and groundnut. The manner in which resources were utilized more efficiently in these two intercrop combinations is indicated by the light interception pattern and the efficiency with which intercepted light was converted into dry matter (Reddy and Willey, 1981).

In the millet/groundnut combination, although some temporal difference was observable between the crops, by the end of the season the total amount of light intercepted by the intercrop was virtually identical with that 'expected' from the interception patterns of the sole crops. As to the use of other resources in these two combinations, there-is some increase in the extraction of water from the soil profile compared with the sole crops and an improvement in total water-use efficiency because a greater proportion of the evapotranspiration passes through the crop as transpiration instead of being lost as evaporation from the soil surface. In recent experiments with millet/groundnut there is also some evidence of a greater production of dry matter per unit of water transpired. For nutrient use the pattern has been identical for both combinations in that any increase in yield over sole cropping is associated with an equal increase in nutrient uptake (Natarajan and Willey 1981; Reddy and Willey, 1981).

The study made in the Millet and Groundnut showed that even where intercropping did not reduce the yield of groundnut dry matter per plant it still markedly reduced the rate of fixation (Nambiar *et al.,* 1983). These effects have been largely ascribed to the shading effect of the cereal and the fact that a reduction in photosynthesis may affect fixation more readily than growth. Strictly speaking, intercropping is only advantageous if the nitrogen benefit is greater than in some alternative sequential system where sole legumes are followed by sole non-legumes. When the farmer's objective is to grow a balanced proportion of both crops (e.g. the millet and groundnut system), the possibility of lower fixation rates in intercropping suggests that the net nitrogen benefit could be greater in a sole crop sequence.

But of course if a farmer is growing disproportionate amounts of legume and non-legume the easiest way of dispersing any nitrogen benefit uniformly across the non-legume may be to distribute both crops over the same land area. If there was no yield advantage (or disadvantage) of intercropping, i.e of the LER = 1 (LER = Land Equivalent Ratio, or the relative land area required as sole crops to produce the yields achieved in intercropping or

$$LER = \frac{\text{Yield of Intercrop}}{\text{Yield of Sole crop (1)}} + \frac{\text{Yield of Intercrop}}{\text{Yield of Sole crop (2)}}$$

With time there was an increasing dry matter yield advantage for intercropping; at final harvest the actual LER was 1.29, i.e., an advantage of 29% for intercropping. Grain and pod yields closely followed this pattern and actual LERs were 0.71 for groundnut and 0.55 for millet, giving a total LER of 1.26, or an overall yield advantage of 26% for intercropping (Sharner *et al.,* 1982)

### 2.10. Effect of Groundnut Intercropping on the Succeeding Crops

Grain legumes like groundnut have been reported to provide an equivalent of 60 kg N ha-1 to subsequent non-legume crop (Ghosh *et al*., 2007). There have been several reports of increased production of cereal following groundnut in the crop sequence. Bado *et al*. (2006) reported that lower doses of N (20 kg N ha-1) fertilizer were required by sorghum following groundnut compared to sorghum following cowpea (60 kg N ha-1) to achieve the same yield results. Similarly, wheat which followed groundnut recorded higher grain yield than that following pearl millet (Ghosh *et al*., 2007). Groundnut and maize intercropping system increased the nitrogen uptake and yield of succeeding wheat crop, and intercropping sorghum with groundnut reportedly reduced the nitrogen fertilizer requirement of the succeeding wheat crop by 30-84 kg N $ha^{-1}$ over sole sorghum (Nair *et al*., 1979). Groundnut included in the cropping system is known to help solubilize insoluble P in the soil, improve the soil physical environment, increase soil microbial activity, restore organic matter and smother weeds (Ghosh *et al.,* 2007). The experiment done on the groundnut and maize followed by a post rainy season crop of sorghum to study the residual effect of sole versus intercropped groundnut showed that if no nitrogen were applied to the groundnut and maize intercrop, there was a beneficial residual effect on the following sorghum. Where nitrogen was applied to the maize, however, the groundnut growth was suppressed and the residual benefit rapidly diminished (Rao *et al*., 1979)

### 2.11. Intercropping Systems as Control of Weeds

It is often claimed that traditional intercropping systems give better control over weeds. Weed growth basically depends on the competitive ability of the whole crop community, which in intercropping largely depends on the competitive abilities of the component crops and their respective plant populations. Broadly, where the total intercrops population is higher than in sole crops (which are very often the case), then greater weed suppression can be achieved (Moody and Shetty 198; Rao and Shetty 1977). Because of the additional total dry matter and leaf area index achieved with millet and groundnut, this combination may give better weed suppression than might be expected from its simple sown proportion.

### 2.12. Beneficial effect of Groundnut and Intercropping on Soil

It is popular in rain-fed agriculture, with limited resources, because one crop can exploit a resource that the other is not exploiting fully. This is especially important in the semi- arid tropics, where the growing season is short and soil moisture and fertility are the main constraints. Intercropping conserves soil water by means of reduction of the evaporation losses and increases the organic matter in the soil, which in turn improves soil structure, infiltration and water retention and helps prevent soil erosion. Through biological decomposition and mineralization, the organic matter also can increase the level of soil nutrients available for plant production (Siddig *et al*., 2013).

Intercropping is done according to the definition of heavily leached and some nutrients are removed by erosion and surface run off, due to their sloping nature, others along with the crops after harvest. The continuous cropping of the same smallholdings with the same crops (mostly cereals), without rotations or fertilizer application, besides the poor land management, have also contributed to degradation and exhaustion of the valuable agricultural lands. Growing cereals in association with legumes offers the best opportunity for conserving soil fertility through nitrogen fixation and returning greater amounts of organic matter to the soil, thus improving its cation exchange capacity (CEC) and physical and chemical conditions (Schmidt, 1993). Tall cereals do not cover the soil well because they have upright leaves and they are planted far apart but legumes like groundnut cover the ground very quickly after they are planted.

### 2.13. Yield Stability

The better control of pests and diseases and the greater relative advantages under stress that have just been referred to; where these occur, they can provide a useful buffer against low yields in adverse years. The most universally applicable one, is that if one crop fails, or grows poorly, the other can compensate; such compensation clearly cannot occur if crops are grown separately. Jodha (1981) showed that in India intercropping is often associated with erratic rainfall/high risk environments, while Norman (1974) found that in northern Nigeria farm incomes were less variable where there was greater reliance on intercropping.

## 3. CONCLUSION

Intercropping is system of crop maximization per unit area per unit time in areas with short growing season and soil moisture and fertility are the main constraints. This system conserves soil water by means of reduction of the evaporation losses and increases the organic matter in the soil, which in turn improves soil structure, infiltration and water retention and helps prevent soil erosion. Groundnut fixes atmospheric nitrogen with the help of Rhizobium in the root nodules which partially fulfill its nitrogen requirement. Evidence identified that groundnut has a potential to combine with maize, Sorghum, millet, cotton or castor for greater overall yield from intercropping compared to sole cropping. In most intercropping experiments the total productivity per unit of land is usually greater for mixtures than for sole crops. One of the advantages of intercropping system is its efficient and complete use of growth resources such as solar energy, soil nutrients and water.

Growing cereals in association with legumes offers the best opportunity for conserving soil fertility through nitrogen fixation and returning greater amounts of organic matter to the soil, thus improving its cation exchange capacity (CEC) and physical and chemical conditions. By adopting appropriate standard geometry in the intercropping system, the total productivity can be enhanced. Generally it ensures crop yield stability, proper resource utilization, benefiting the succeeding crop from the residuals, efficient land use system, maintain diversity and ecological balance.

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