

DEVELOPMENT OF ORGANIC AGRICULTURE

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Organic agriculture is an agricultural production method in which yields are at least adequate economically but are also sustainable, respecting the natural resources at or near the production site (for example, water, air, soil fertility, disease resistance). Organic farmers aim for



optimal production under the conditions set by organic agriculture organisations. Environment-friendly principles and methods have replaced chemical fertilisers, pharmaceuticals, pesticides and growth regulators. Organic farmers stimulate production through fine-tuned management of the

soil. Effective soil management is regarded as the linchpin on each organic farm. The organic farmer's respect for nature is reflected in his/her actions, which are based on the self-regulating capacity of the various living organisms.

The development of farming systems: Organic farming is increasingly aiming at a closed nutrient cycle which can be achieved by combining crop production and livestock. Thus arable farms are now seeking ways to re-introduce mixed systems by letting beef cattle range outdoors in summer and stabling them in winter. Other arable farms are forming collaborations with more or less distant livestock farms: a kind of mixed system at one remove. Such farms are now calling for new plant breeding products.

The development of soil enhancing cultivation systems: In organic farming we find greater diversity in crop management systems because organic systems are more dependent on changing natural circumstances than are conventional systems. Organic farmers should be able to choose from a wide range of crop characteristics. Plant breeders should play a major role in all this. Enhancing soil condition (soil life, humus content and structure) as a basis for sound crop growth is central to every organic system. It means that a sound fertilisation regime is coupled to a sound cropping programme. The choice of crop is determined by market demand and complementarity of crop characteristics.

The development of basic seed stock for the organic sector:

Characteristics of varieties for organic growing: The organic farmer will base his choice of crops on soil type, soil condition, climate, rotation and market demand. More often than not, his criteria will be similar to those of his conventional counterpart but his priorities are different. In organic growing, qualities such as rapid early growth, (the crop's contribution to weed reduction on the farm), resistance to pests and diseases, adaptability to lower fertiliser input, role in crop rotation and product quality are important. Obviously yield is important too, but it is not the overriding factor.

Adaptability to soil and level of fertilizing: The organic farmer relies heavily on the natural resources available on the farm and wishes to be independent of external artificial means to the largest possible extent. This requires great adaptability of the crops grown. The corrective actions a farmer can apply are also limited.

To get the best possible yields on a given site, growers use cultivars that are adapted to that particular environment and to nutrient levels which fluctuate with the seasons. Adaptation does not mean 'maximum utilisation' but rather the 'optimal interaction' with the conditions given.

Resistance to pests and diseases: Organic farmers use prevention rather than control measures to head off pests and diseases. This means that resistance in varieties is an important quality; it should be effective and durable. The ability to resist pests and diseases is based on more than a plant's absolute resistance. Absolute, monogenetic resistance is likely to break down sooner or later, as, for example, in apple production where a new race of the apple scab pathogen has been found recently in a newly introduced resistant variety.

Quality of the end product: Organic farmers pay much attention to quality characteristics such as taste, keeping quality, form, structure and colour of a product. Quality is controllable when a farmer carefully selects variety characteristics, soil type and management strategy. Now that supermarket chains are increasingly selling organic products, the pressure on prices is high and strict demands are made on quality. New carrot varieties for instance, that meet the demands on size, smoothness and high yields, lack taste. This might be improved by a change in breeding priorities

Organic propagation: Seeds, seedlings and plant material are the basis for cultivation. Good quality is vital

here. Producing good propagating material requires great skill. In organic farming an effort is made to work with organically produced stock. Most propagating material however is conventionally grown. Seeds treated with conventional products may be used only if users are unable to obtain non-treated seeds on the market. However organic growers are not allowed to use detergents or germination promoters. In arable farming where seed production does not differ much from crop production, organic growers use their own non-treated seeds as basic stock for self-fertilising crops such as cereals, peas and beans. There are firms that produce organic propagating material and seed stock of various field crops (e.g. potato) but the organic propagation of hybrids has not yet begun.

Organic plant breeding:

Plant breeding programmes that are focused exclusively on organic farming hardly exist on the scale needed, but the need for such programmes is rapidly increasing. The fact that conventionally grown varieties are used in organic farming does not necessarily mean that they are the most suitable. With respect to nitrogen uptake efficiency, contribution to weed reduction on the farm, resistance to pests and diseases and quality they leave much to be desired. An organic sector in development needs plant breeding. The growing impact of gene technology in conventional breeding must also be reckoned with. The organic sector's stated intention of wanting to steer clear of genetic modification implies that it does not wish to be dependent on conventionally produced varieties.

Kunz' principles for breeding for organic conditions are as follows:

- In the selection of parent stock for cross breeding purposes the specific conditions on the farm must be taken

into account. Various biodynamic farms and one conventional farm in Switzerland made trial plots available. The sites were characterised.

- Selection and the development of hybrids must take place directly in the area where the new hybrid is to grow so that site-specific natural selection can take place. The prevailing specific selection criteria can be taken into account and they can be worked out more specifically.

- The hybrid population should be narrowed down genetically only to the extent that is necessary for the given site. Heterogeneity should be maintained to some extent, not only to allow continued organic development

of the variety (progeny) under the supervision of a breeder but also to allow for crop diversity, which seems to make more sense than conserving a range of gene banks.

Summary and conclusion:

The organic sector is growing steadily. Initially it was strongly focused on optimising crop growth, opening trade channels and boosting sales and public

image. Not until recently have efforts been made to optimise the basic seed stock. Increasingly existing varieties are being propagated in organic conditions. The breeding of new varieties for organic agriculture however has not yet got off the ground. Yet the need for organic breeding is growing rapidly particularly with the rapid rise of biotechnology and the organic sector's decision to remain gmo-free. Plant breeding can play an important role in optimising organic management by focusing not only on high yield but on such qualities as rapid early growth, (the crop's contribution to weed reduction on the farm), resistance to pests and diseases, adaptability to lower fertiliser input, role in crop rotation and product quality.









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