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Reaching the Unreached through Open and Distance Education in Agriculture

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Abstract:
Achieving quality in higher education is a major concern for India today. Despite several efforts taken by conventional system a significant gap remains in spread of higher education to every segment of population. Open and Distance education has been a revolutionary attempt to bridge up this gap. One pioneering effort to spread agricultural education through distance learning mode has been taken up by the School of Agricultural Sciences, Yashwantrao Chavan Maharashtra Open University (YCMOU), Nashik, Maharashthra. It has set an example not only by paving the way for distance education in agriculture in India but also by taking effort in providing employable skills to its students which is call of the hour. It also promotes self-employment and entrepreneurship among rural youths in agriculture and allied fields. This article narrates the development path of this institute along with its special features that made it successful in reaching a wider mass beyond all socio-economic hurdles.
Key words: Open and distance education, self-employment, entrepreneurship, agriculture

In spite of securing place among the fastest growing economies in the world, India still lags behind in terms of achieving higher education standards. The Gross Enrolment Ratio (GER) in India is still as low as 17.9 per cent against the global average of 26 per cent. This figure gets even more dismal when urban-rural divide is considered. GER in rural India is estimated to be about 7.51 per cent, while urban areas have a GER of about 23.79 per cent. Again the status of rural females (5.67%) is worse than that of their male counterparts (9.28%). Only 3.7 per cent of males and 1.6 per cent of females are graduates in the rural areas (Gupte, 2015). In the age group 22 to 35 years, around 15 per cent in the northern region and 13 per cent in the southern region have access to higher education while, in the north-central region, only 10 per cent men and 6 per cent women and in the northeast, only 8 per cent men and 4 per cent women have access to higher education (Nagaran, 2014). The causes of exclusion are many like constraints of locality, gender, poverty, socio-cultural barriers etc. There is serious concern about not only the quantity but also the employability and skill imparting ability of the present education system. Youth unemployment rate in India is 12.5 per cent in India which is quite alarming (MoL&E). Presently, 62 per cent population in India is in working age group (15-59) with more than 54 per cent below 25 years of age. However, this demographic dividend can be fruitful only

if it is educated, skilled and finds productive employment. 109.73 million additional skilled manpower will be required by 2022 in India (MoSDE). Considering this, special emphasis has been given on skill, innovation and entrepreneurship development in Twelfth Five Year Plan (2012–17) (GOI, planning commission). Though the government has undertaken several initiatives for delivery of quality higher education there has been severe shortcoming in the system posing an overwhelming challenge (Shaguri, 2016). Presently, supplementary modes of education are required besides the traditional system. In this context, open education and distance learning are especially important for Indian higher education system that can combat the fundamental challenges of equity, quality and access. At present distance education comprises of 11 per cent of total higher education facilities in the country (MoHRD, 2016). Though, provision for agricultural education through distance learning mode is still not very common, it is utterly important in near future. There is remarkably low enrolment in agricultural education despite, agriculture being the mainstay of Indian economy. Agriculture engrosses only 0.61 per cent enrolment at undergraduate level, 0.58 per cent at postgraduate level and 3.84 per cent at Ph. D. level (Ministry of HRD, 2016). Therefore, providing facility for distance education in agriculture is essential. One such initiative is taken by the Yashwantrao Chavan Maharashtra Open University that has established School of Agricultural Sciences especially for distance education in agriculture.

EVOLUTION OF THE SCHOOL OF AGRICULTURAL SCIENCES, YCMOU:

The Yashwantrao Chavan Maharashtra Open University (YCMOU) was established on 1st July, 1989 through Act XX of 1989 of the Maharashtra State Legislature, justly named after Yashwantrao Chavan, Maharashtra's great political leader and builder of modern Maharashtra. The need for education in agricultural disciplines was soon realized and the School of Agricultural Sciences was established at YCMOU in 1990. It started its journey with 81 students offering a certificate program in grapes production technology. Today it has strength of 281000 students in 16 academic programmes that range from certificate program in gardening to post graduate and research program in Agricultural Extension. This school offers 2 certificate programmes, 8 diploma programmes, 2 bachelors' degree programmes in agriculture and horticulture, and post graduate and Ph. D. in agricultural extension. It serves its students through a strong network of 60 agricultural education centers, 15 ICAR affiliated KVKs and 45 SAU affiliated colleges of agriculture and horticulture. Around 600 out sourced professors, scientists and agricultural extension officers build the teaching hub of the school. The YCMOU is the 5th Open University in India and besides the IGNOU, the only Open University that offers need based programs in agricultural sciences exclusively, through distance mode of education. Based on its performances it has own the International 'award of excellence for institutional achievement from Commonwealth of

Learning (COL), Canada on 1st August, 2002.

VISION OF THE INSTITUTE:

The school takes pride in its motto of reaching the unreached section of the population like school drop-outs, practicing farmers, farm women and rural youths through providing vocational, professional and employment generating mass education in regional languages. It also aims to promote sustainable academic and operational support to farming community. This school has opened up educational opportunities to innumerous practicing farmers and rural youths of various regional Centers in Maharashtra like Nashik, Pune, Kolhapur, Amraoti, Aurangabad, Nagpur, Mumbai *etc.* Therefore, it has succeeded at least to some extent to bridge up the rural-urban divide in access of education. Furthermore, 40 per cent of their student strength comprises of female students. This has been possible due the flexible educational programmes that YCMOU provides to make learning more convenient for those who cannot make it to conventional education system.

The University takes effort to spread education among mass by all possible means like continually keeping the tuition fees in an affordable range. The initial tuition fees charged from the students was Rs. 500 per year in 1990 which has increased to Rs. 6000 in 2017 which is quite low in comparison to many other agriculture colleges in the state. The university is currently financially self supporting and generated sufficient financial resources to support development of new academic programs and revision of old academic programs after every 5 years.

INNOVATIVE FEATURES:

YCMOU has a number of innovative features like student friendly curriculum, multiple entries, multiple exits, vertical mobility and credit transfer from certificate to post graduate to all academic programs that make it more feasible and flexible for learners across all socio-economic backgrounds. The place, pace and time of learning can be chosen by the students. It creates kind of rehabilitation scope for many rural youths who have been abandoned by traditional education system. The university is equally conscious about content creation, program delivery mechanism and the end product. There is provision for self-instructional learning material and face to face contact sessions to impart more practically applicable knowledge among the learners. Learning materials in compact modular format are developed in-house by the university with the help of around 300 Agricultural University Professors in Maharashtra. Total 192 such text books and work books are developed by the university. Besides, supportive learning materials from other sources are also made available to the students. Practical face to face contact sessions are held 6 days per month from August to February to facilitate hands-on knowledge of the students that help them to find suitable employment opportunities later. In a year, 40 contact sessions are organized each of 6 hours duration. The university follows a collective approach in planning and development through periodic revision of course content and implementation

mechanism. They regularly revise academic sessions by consultation with peer group. They always prioritize on a curriculum that provides self-employability skills. There has been arrangement for third party assessment of students as well that assures concrete evaluation without any bias and guarantees fruitful learning.

Apart from evaluation of students, systematic assessment of teachers and the Agricultural Colleges and Krishi Vigyan Kendras running YCMOU Study centers in Maharashtra is also made sure by the university authority. The present teacher student ratio is 1:40. Orientation and training these 600 head, coordinator, accountants and teacher councilors and 300 B. Sc. (Agri/Horti) project guides and evaluation and viva exam experts also take place on regular basis. The university has evolved a work culture in its organization in which accountability rather than authority is ensured for each post. The university follows a corporate model of mass education with special consideration to resource generation and utilization for sustainable development. The periodical accreditation of host institutes takes place through various quality parameters and benchmarks based on 100 points evaluation report. A professional team from the university headed by the director of the School of Agricultural Sciences visits the institution to assess infrastructural capabilities before signing Memorandum of Understanding (MoU) with the Center operating institute. The MoU is signed with the partner institute to recognize it as authorized study center of the university. Annual or periodic visit is made to the partner institute to monitor and evaluate their progress.

The university looks forward to revisit, revise and consolidate all programs with consistence with new ICAR and UGC guidelines and evaluate and monitor all agricultural education centers in line with NAAC accreditation system. The university is already financially self supporting and not depends on the government funding for day today developmental and operational expenditure including salaries of staff.

COLLABORATION AND PARTNERSHIPS:

In order to strengthen its educational base and to extend its educational activities it has tied up with a number of reputed national and international organizations like National Bank for Agriculture and Rural Development (NABARD), Indian Council of Agricultural Research (ICAR), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Food Policy Research Institute (IFPRI), Washington, Commonwealth of Learning (COL), Canada. It has associated itself with ICAR funded National Agricultural Innovation Projects (NAIP) on reusable learning objects technology. Another important collaboration is with DEC, IGNOU on documentation and dissemination of indigenous agricultural Technology. With COL it has signed a programme on life-long learning of farmers and technology mediated open and distance education.

Considering the tremendous success of the school of agricultural Sciences the university took one step forward in October, 1996 by establishing a KVK in the university. This KVK is ICAR

affiliated and takes initiative in conducting on farm testing, front line demonstration, vocational training for rural youth and several extension activities. It has a model demonstration farm in 100 acre land that conducts several experiments on modern technologies, high density plantation, micro irrigation system, low cost technology, organic fruit production, precision farming etc. It also has horticulture nursery, vermin-compost unit, soil and water testing lab, bio-agent production lab, post-harvest technology lab etc.

CONTRIBUTION IN EMPLOYMENT GENERATION AND ENTREPRENEURSHIP DEVELOPMENT:

The noteworthy feature that makes this university is that it doesn't end its responsibilities by providing theoretical education to its students but makes sure for them a secure livelihood option after they leave the university by providing them with right kind of skills. The curriculum is designed in a way so as to provide vocational, professional and employment generating skills to students that opens up several scopes for them in public as well as private sector and also for self-employment. From 1990 to 2016, nearly 281000 students have been admitted in various academic programs in agricultural sciences, out of which nearly 210000 (74.73 %) students completed their education while nearly 71000 (25.27 %) students dropped out from the system during last 26 years. Out of the passed students, nearly 20000 (9.52 %) are employed in Government jobs like Gramsevak, Talathi, Agricultural Assistant, Forest Guards, Sale Tax Inspectors, Police Sub Inspectors, Forest Officers, Agricultural Officer etc, 30000 (14.28 %) in private jobs like Seed Production Assistant, Nursery Supervisors, Gardeners, Pollinators, Emasculators etc, and 40000 (19.05 %) are self-employed in Agro-service Centers, Ornamental Horticulture Nurseries, Bio-fertilizers and Bio-pesticides Production units. Moreover, remaining 120,000 (57.14 %) students joined their own farming at their native and are doing excellent in using their knowledge and skill in modern farming. Some of the Ph.D. degree holders of the university in Agricultural Extension are presently, working as Programme Coordinators in several KVKs in Maharashtra, Gujrat, Andha Pradesh and Karnataka. Some are engaged in teaching in SAUs and some are serving as officials in several ministries of Government of Maharashtra and Government of India. Among the private sector employments the pass-outs of the university are absorbed into various seed production companies, irrigation companies, fertilizer companies and landscape consultancy in reputed business houses like the Tata and Reliance group. Today, more than 50 per cent gardeners in Mumbai, Pune, Thane, Nashik and Nagpur are the product of YCMOU. Most of the seed production companies of Pune, Nashik, Aurangabad, Jalna prefer to recruit the diploma holders of the university as they have better capability to fit into the requirements of the companies with more practical and applied knowledge and skills.

The institute is also piloting many rural youths to engage into self-employment and entrepreneurial ventures. One such successful young

entrepreneur who started his life with YCMOU is Mr. Yogesh Patil who has started a Papaya nursery after doing Diploma in Horticulture has an annual capital turnover of Rs. 25-30 lakh now. One more example is Mr. Durgesh Patil who has started a dairy plant that assures quality milk to the customers and is one of the most popular milk plants in Nashik at present. Mr. Dattu Dhage is another rural youth who after completing a course with YCMOU has established a vegetables nursery in 2006 which has gained popularity among the farmers of the districts in a short period. It produces around 37 lakhs of seedlings annually and has a strong customer base of 1500 farmers that secures him a net profit of 16 lakhs annually. Another successful vegetable nursery is established by Mr. Bhausaheb Jadav who took training on nursery management from YCMOU and makes an annual profit of 10-12 lakhs presently. His firm specializes in exotic vegetable seeds production which is suitable for cultivating vegetables for export purpose. YCMOU also provides employment for rural youths by recruiting them in various posts on their farm operations.

CONCLUSION

In a short span of time the School of Agricultural Sciences of YCMOU has established itself as a successful model of mass education in the field of agriculture. It has literally taken education to the doorsteps of those who could not have accessed it otherwise. It has adapted a number of groundbreaking features over the time that has helped it to take open and distance learning to another level. Moreover, it doesn't keep its roles limited to imparting education but enriches it with self-employability skills through practical training. Today, it has become the new destination for many farmers and rural youths because of the convenience it creates for them to attain higher education and to secure employment at the same time. Therefore, it is continually contributing to drawing a vast portion of rural youths into agricultural activities which is otherwise not considered to be a profitable occupation for young generation today. Besides exemplifying itself as successful distance learning venture in agricultural education the School of Agricultural Sciences is simultaneously aiding to skill and entrepreneurship development in agriculture and allied sectors. Such endeavours should be replicated in other parts of the country to make agricultural education more reachable, applicable and feasible among youth of the nation.

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Significance of Donkey's milk: An overview

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Hippocrates (460 – 370 BC), the father of medicine, was the first to write of the medicinal virtues of donkey's milk Nowadays, donkey's milk consumption has been reevaluated for its potential benefits to human health. For example, in infants with intolerance to cow's milk i.e., showing cow milk protein allergies (CMPA), donkey's milk represents a good alternative due to its chemical characteristics similar to those of human milk. Its protein composition and the ratio between caseins and whey proteins reveals a high similarity with human milk, thus, in the last 10 years, an increasing interest arose to obtain a full characterization of donkey milk proteins, here acknowledged. Digestibility data, mainly derived in vitro with human gastrointestinal enzymes, showed the high digestibility of donkey caseins and major whey proteins except lysozyme and α-lactalbumin which proved to be quite resistant. The reported antimicrobial properties of donkey milk open concrete possibilities to use donkey milk as natural food preservative. Due to its attractive healthy properties, donkey milk was investigated for useful applications or to develop novel foods characterised by a high nutritional profile.

CHARACTERISTIC FEATURES OF DONKEY'S MILK

1. Donkey's milk fatty Acids

Donkey's milk consumption is wide spread in the Mediterranean area where these animals have been adapting to the local vegetation and, therefore, dairy production is higher than in other areas in the world.

Donkey's milk composition is affected by the stage of lactation and, in particular, its fat content which tends to decrease during lactation. Saturated Fatty Acids (SFAs) represent the most representative fatty acids which are comparable to the composition of mare and human milk. Palmitic acid (C16:0) is present at the highest concentrations but its content is less than that of cow's and human milk. On the other hand, long chain fatty acids, such as stearic acid (C18:0), are present in modest amounts, while it has been detected at higher levels in cow's and

human milk (7-13%). The SFA content tends to decrease during lactation, while small changes in the SFA content have been reported in human milk and rather an increase in these fatty acids has been detected in cow's milk. The unsaturated fatty acid of donkey's milk is similar to that of mare and human milk but higher than that observed in ruminant's milk (23-32%). The monounsaturated fatty acids content increases during the lactation period and their increased content in the human diet seems to exert beneficial effects by lowering plasma low density lipoprotein (LDL) cholesterol and total cholesterol levels as well as the fibrinolytic activity of circulating plasma.

2. Donkey's milk caseins

Total protein content of donkey milk ranges between 15 and 18 g/L and the casein fraction represents about 35–45%, much lower than the milk of ruminants (>70%) but more similar to human milk (<30%). The available knowledge on donkey milk caseins is limited, compared to conventional dairy species and a full characterisation was also complicated by their heterogeneity, partly due to post-translational processes, genetic polymorphism, non-allelic deleted forms. A combination of electrophoretic, chromatographic, and proteomic-based methods allowed the identification of the four casein fractions (αs1-, αs2-, β-, and k-casein). Casein (CN) distribution of donkey milk showed β-casein as the predominant one, followed by the αs1-casein whereas αs2-casein was detected as minor component . k-casein was only found in traces and is reported to be the most heterogeneous individual casein, likely due to different levels of glycosylation .

3. Donkey's milk whey proteins

Donkey milk is characterised by a high proportion of whey protein. Most of the alleged nutritional properties of this milk can be attributed to this fraction, that is mainly composed of β-lactoglobulins , α-lactoalbumin and lysozyme . The other three minor proteins immunoglobulins , serum albumin and lactoferrin are also present. Even if the whole whey protein fraction is considered to be responsible for the low bacterial count of donkey milk , the antimicrobial activity is mainly attributed to lysozyme and, to a lesser extent, to lactoferrin . These minor proteins, together with immunoglobulins, are believed to work in synergy, for inhibiting microbial growth and reducing the incidence of gastrointestinal infections. Lysozyme , whose content is particularly high in donkey milk (up to 4

Table 1: Comparison between major constituents of various milks

Milk composition	Human	Cow	Donkey
pH	7.0 – 7.5	6.6 – 6.8	7.0 – 7.2
Lactose (g/100 gm)	6.3 – 7.0	4.4 – 4.9	5.8 – 7.4
Protein (g/100 gm)	0.9 – 1.7	3.1 – 3.8	1.5 – 1.8
Fat (g/100 gm)	3.5 – 4.0	3.5 – 3.9	0.3 – 1.8
Total Solid (g/100gm)	11.7-12.9	12.5-13.0	8.8-11.7

g/L), has two variants (A and B) both containing 129 amino acids. In general, lysozyme has an important role in the intestinal immune response since it acts as a powerful antibacterial protein, splitting the bonds between N-acetylglucosamine and N-acetylmuramic acid of the peptidoglycan thus, Gram-positive bacteria are more sensible to lysozyme than the Gram-negative. However, a synergistic action with lactoferrin is supposed to enhance antibacterial action against also towards some Gram-negative bacteria . These natural preservative properties could be the reason for lengthy shelf-life reported for raw donkey milk.

Immunoglobulins (IgGs) of donkey milk show a high content in comparison with human and bovine counterparts since they are supplied to the foal only after parturition to fortify the natural immunopassive system of the neonate. The presence of IgGs in colostrum and then (in lower amount) in mature milk is still a matter of debate for attributing health beneficial effects to a given milk type or for consuming raw milk. Donkey lactoferrin is an 80-kg/mol iron-binding multifunctional glycoprotein that exerts several biological activities ; it is generally associated with antimicrobial, antiviral, immunomodulatory, and anti-carcinogenic activity , although its content in donkey milk is relatively low compared to lysozyme. Finally, lactoperoxidase , an oxidoreductase enzyme with protective function against microorganism infections, is found at a small concentration in fresh donkey milk. Lactoperoxidase is known to be inactivated by high temperature but this enzyme could be of significant nutritional interest in raw-fresh milk, because working in synergy with lactoferrin and lysozyme could contribute to enhance the natural preservative action of donkey milk.

4. Digestibilty of donkey's milk

Digestibility of donkey milk proteins was firstly assessed in a simulated gastrointestinal digestive process using human gastric and duodenal juices; donkey caseins proved to be rapidly digested since after 1 hour of digestion only about 7% remained intact. The acid coagulum observed in the acidic conditions of gastric digestion (pH ~2) was very fine and the formation of a soft precipitate was also reported in equine and human milk, which is physiologically more suitable for infant nutrition than the firm coagulum formed by bovine milk. Casein micelle size of donkey milk (about 298 nm) was found to be much larger than the one of human milk (64 nm), as it is inversely related to the k-casein content ; this condition, together with the relative abundance of β-casein, may be the reason for the high susceptibility to hydrolysis by gastrointestinal enzymes . Certainly the low protein and casein content of donkey milk might favour the fast digestible caseins compared to high casein predominant milk of other species.

Regarding the whey proteins, β-lactoglobulins showed to be quite resistant to gastric enzymes (mainly pepsin) but were highly degraded by human duodenal juice (~30% remained undigested) contrarily to what was reported from cow and goat milk . Digestibility of β- lactoglobulins could be even enhanced in the individual milk of donkeys lacking β-lactoglobulin type II, achieving a higher rate of degradation;

this is nutritionally relevant since human milk is typically devoid of β-lactoglobulins. Donkey α-lactalbumin is the most resistant protein, since the 95% was found undigested after 1 hour of in vitro digestion, so that it reaches the gut relatively intact as already reported for milk of other species. Similarly, lysozyme was quite resistant to human gastrointestinal enzymes, although at a lower extent (~75%) compared to α-lactalbumin, and was also found to be thermal stable after high pasteurisation treatment . Particularly interesting is the high digestibility of Donkey Lf by gastric and duodenal juice . This evidence suggests that lactoferrin might play a further biologic role directly in the gut as well as through its bioactive peptides, called lactoferricin and lactoferrampin , as already observed in cow milk. The presence of these proteins and the peptides derived (so far unidentified) during digestion could still inhibit sensitive bacteria in the intestine as the antimicrobial activity exhibited by the digested donkey milk was even enhanced.

Nutritional value and potential applications of Donkey's milk

Nutritional use

Natural hypoallergenic milk for infants with CMPA

Donkey milk is used as natural hypoallergenic milk because it is tolerated by about 90% of infants with food allergies, e.g., cows' milk protein allergy (CMPA), a common food allergy in childhood with a prevalence of approximately 3% during the first 3 years of life. However the infants tolerance of donkey milk must be evaluated first subjectively, under medical supervision and after carrying out specific allergy tests. Donkey's milk is similar of human milk for its lactose, proteins, minerals, and omega-3 fatty acid content. In terms of energy despite the high lactose content of donkey milk the average fat content is lower. When used in infant nutrition, donkey milk is usually supplemented with vegetable oil (4 mL per 100 mL milk) to mimic human milk energy. Donkey milk contains immune-enhancing compounds (in particular lysozyme and lactoferrin) to help protect infants from infection and disease. In addition, the flavour and appearance of donkey milk have been found to be attractive to children.

Fermented donkey milk

Equid (donkey and horse) milk can be considered a suitable substrate for probiotic beverage production.

Koumiss

The use of fermented equid milk is an ancient tradition in central Asia, like koumiss or airag, a fermented mares milk very popular in Asia and Russia; but there are also traditional variants made from donkey milk.In Mongolia, where koumiss is the national drink, people have a saying that 'kumys cures 40 diseases'.

Cosmetic use

It is said that Cleopatra, Queen of Ancient Egypt, took baths in donkey milk to preserve the beauty and youth of her skin. Legend has it that no less than 700 donkeys were needed to provide the quantity of milk necessary for her daily bath. This was also the case of Poppaea Sabina (30 – 65), second wife of Roman Emperor Nero, who is referred to in Pliny's description of the ass milk virtues for the skin:

"It is generally believed that ass milk effaces wrinkles in the face, renders the skin more delicate, and preserves its

whiteness: and it is a well-known fact, that some women are in the habit of washing their face with it seven times daily, strictly observing that number. Poppaea, the wife of the Emperor Nero, was the first to practise this; indeed, she had sitting-baths, prepared solely with ass milk, for which purpose whole troops of she- asses used to attend her on her journeys".

Cosmetics with donkey milk

In recent years, the cosmetic industry is mainly focused towards products made with natural ingredients and it is oriented to a sustainable consumption.

The effectiveness of donkey milk components like proteins, minerals, vitamins, essential fatty acids, bioactive enzyme and coenzyme which allow the skin a balanced nourishment and a proper hydration. In particular vitamin C content in donkey milk is almost 4 times more of cow's milk. Donkey milk contain more lactoferrin of cow milk and a considerable mounts of lysozyme, from 1.0 mg/mL to 4 mg/mL (depending on the analytical method used: chemical or microbiological), instead cow's milk only traces. For this reason have the potentiality, when properly formulated, to reduce problem skin with eczema, acne, psoriasis and herpes and properties in calming the irritation symptoms as reported by some authors.

Today, donkey milk is still used in the manufacture of soaps and creams with donkey's milk

Donkey's milk soap benefits

- Donkey milk adds creaminess to the soap and the sugars in the milk add bubbly lather.
- Hydrates and softens skin. Donkey's milk has a pH level very close to the pH level of human's skin, it helps to moisturize and keep the skin's oils in balance.
- Reduces skin irritations. It is especially high in Vitamin A, which is crucial in repairing damaged skin tissue and maintaining healthy skin
- Erases wrinkles in the skin. The product possesses a varied anti-wrinkle effect, eliminates wrinkles and prevents these from appearing product of the passing of time in the skin, face and neck.
- Regenerates skin. The soap of donkey milk is regenerative for the skin because of high levels of protein, phospholipides and ceramides, which in turn confer it with both soothing and restructuring properties.
- Provides a natural anti-aging skin care. The rich composition of donkey milk with high protein levels of phospholipids and vitamins A, B, C, D and E make it excellent for anti-aging, wrinkle treatment, restructuring and regenerating facial with excellent results. It protects from the ever-present danger of bacterial infections
- It helps people with eczema, neurodermatitis or psoriasis.
- It helps yang people with skin allergies or acne. Acne is a nightmare for yang people but not anymore after using the donkey milk soaps.
- Alternative to cow's milk for children with milk protein allergy. More recently, studies show that donkey milk could serve as an alternative to cow's milk for children with milk protein allergy.

CONCLUSIONS

To be successful as a substitute for human milk in infant nutrition, donkey milk must

be capable of performing many biological functions associated with human milk.The caseins found were mainly αs1- and β-caseins, which showed a considerable heterogeneity.Lysozyme, lactoperoxidase and lactoferrin have been recognized as antimicrobial and bacteriostatic agents and could be useful to prevent intestine infections in infants. Their action may extend the conservation of fresh donkey milk and the relative potential commercial supply. Donkey milk showed a very high content of lysozyme, while lactoperoxidase was found in a low amount. On the basis of results obtained donkey milk may be considered suitable for feeding young children affected by severe cow's milk allergy. In the past it has been widely used to replace human milk because its chemical composition and particularly protein content are close to that of human. Great attention must of course be given to the hygienic characteristics of donkey milk production, in order to consider this milk a valid substitute of hydrolyzed proteins or soy-bean derived formulae in the treatment of infants with cow's milk protein allergy.

Laser Land Leveling For Enhancing Agricultural Input Use Efficiency

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Unevenness of fields leads to inefficient use of irrigation water. Proper land leveling in areas irrigated by canals is an essential prerequisite for judicious use of scarce irrigation water because water is precious and scares resource and per capita availability of this resource diminishing day by day. Nowadays determining the optimum crop water requirements is considered one of the most important factors affecting plant productions, especially, with scarce water resources. Declining water table, poor quality of irrigation water, uneven land and degrading soil health are the major concerns for the current growth rate. Thus, it is essential to precision land leveling and proper management of irrigation water usage for adequate growth of agriculture. Land leveling enables efficient utilization of scarce water resources through elimination of unnecessary depression and elevated contours (Naresh et al., 2011). It has been noted that poor farm design and uneven fields are responsible for 30% water losses (Asif et al., 2003). Precision land leveling is the need of the hour for increasing the food production for growing population in our country. Traditional methods of leveling lands are not only more cumbersome and time-consuming but also more expensive.

LASER LAND LEVELING

Laser land leveler is one of the most effective tools for precision leveling and smoothening the agricultural land surface. Laser leveling is to use a laser guidance system to raise and lower the blade of the grading implement automatically. Laser land leveling equipment has marked one of the most significant advances in surface irrigation technology. It does not only minimize the cost of leveling but also ensures the desired degree of precision. It helps in improving resource use efficiency under surface irrigation systems by uniform distribution of irrigated water as well as resource conservation without adverse effect of environment. This technique is very helpful for achieving higher levels of

accuracy in land leveling and offers great potential for water savings and higher grain yields. Effective land leveling reduces the work involved with crop establishment and crop management.

COMPONENTS OF LASER LEVELING SYSTEM:

A laser-controlled land leveling system consists of the following five major components:

(i) Drag Scrapper/bucket:

The drag bucket can be either 3-point linkage mounted on or pulled by a tractor. This system is preferred as it is easier to connect the tractor's hydraulic system to an external hydraulic by the 3-point-linkage system.

(ii) Laser transmitter:

The laser transmitter mounts on a tripod, which allows the laser beam to sweep above the field.

(iii) Laser receiver:

The laser receiver is a multi-directional receiver that detects the position of the laser reference plane and transmits this signal to the control box.

(iv) Control box:

The control box accepts and processes signals from the machine mounted receiver. It displays these signals to indicate the drag buckets position relative to the finished grade.

(v) Hydraulic system:

The hydraulic system of the tractor is used to supply oil to raise and lower the leveling bucket.

WORKING PROCEDURE OF LASER LEVELER

The laser leveler contains of laser transmitter unit mounted on a high platform which emits an infrared rotating beam parallel to the required field over the working area and receiver unit senses the infrared beam which is fitted to a tractor towards the scraper unit. The signal received is converted into electrical signal. The electrical signal is directed by a control box to activate an electric hydraulic valve and the corresponding changes in the scraper level are carried to cut and fill level adjustment automatically by a hydraulic control system. The scraper guidance is fully automatic. Laser transmitters create a reference plane over the work area by rotating the laser beam 360 degrees. The receiving system detects the beam and automatically guides the machine to maintain proper grade without the operator touching the hydraulic controls and elements of operator error are removed allowing consistently accurate land leveling.

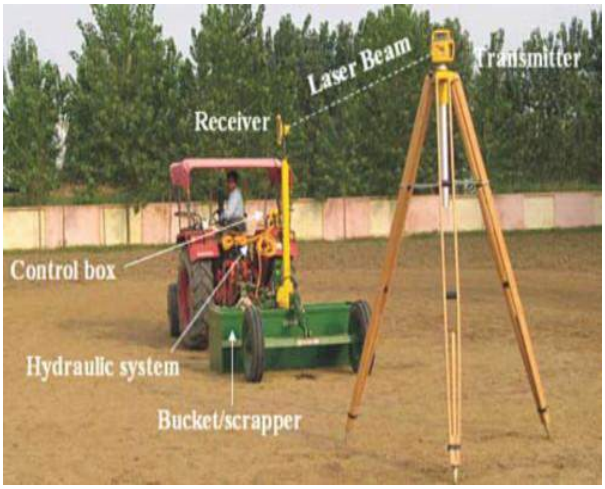

Fig.1 Laser leveler and its components

IMPORTANCE OF LASER LEVELER

Lesser leveling reduced irrigation timing up to 20-25 percent, with an adequate reduction in water use. Bhatt and Sharma

(2009) reported that around 25-30 per cent of irrigation water could be saved through this technique without having any adverse affect on the crop yield. It minimize in time and water required to irrigate the field, more uniform distribution of water in the field, consistent moisture environment for crops, more uniform germination and growth of crops, fertilizer, chemicals. It increases yield, improves uniformity of crop maturity and reduces weeds, enhance water use efficiency and the amount of water needed for land preparation. Laser land leveling when applied under various crops and cropping patterns has resulted in water savings up to 15-30 %. Precision land leveling (PLL) facilitated application efficiency through even distribution of water and increased water-use efficiency that resulted in uniform seed germination, better crop growth and higher crop yield (Jat et al., 2006). Tarun Kumar and Maheshwari (2005) reported that the reduction from 21 to 5 labour-days per hectare was achieved using laser leveler for land leveling. They concluded that laser leveling was 500% more efficient and time saving than the traditional system of land leveling. Thus Land leveling through laser leveler is a technology that is suitable for all crops and highly useful in conservation of irrigation water and enhancing productivity.

LIMITATIONS

Limitation behind the adoption of laser leveling is high cost of the equipment/laser instrument need for a skilled operator to set/adjust laser settings, operate the tractor, and restriction to regularly shaped fields. It may be less efficient in irregular and small sized fields.

CONCLUSION

- Better crop establishment, water savings and enhanced input use efficiency as compare to traditional land leveling.
- Evenly distributed irrigation water on laser-leveled field and reduce the weeds in the cropped field.
- Achieved higher accuracy in land leveling through laser land leveler within shorter duration.
- Reduce farm operating time, Saves labor costs and increase productivity

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Spoilage of Egg and Its Prevention: A Strategic Approach

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The increasing consumer awareness about different food safety issues has changed the mind of people towards more thinking about the microbial characteristics and quality in addition to the shell cleanliness and physical properties of eggs. Microorganisms can contaminate eggs at different stages, from production point to processing, preparation and consumption. Most of the contaminants are of extra genital in origin and come in contact with egg shell at ovi- position as because at this time cuticle and pores of egg shell are wet. Microorganisms causing spoilage are called as rot and are of gram negative in nature. They have to pass a series of barriers in the egg like shell, shell membrane, the albumen before reaching the yolk. Two types of contamination usually occur in egg i.e. (a) Trans-ovarian or (b) vertical transmission. Horizontal transmission occurs when eggs are subsequently exposed to a contaminated environment and microorganisms penetrate the eggshell. Vertical transmission of microorganisms occurs when eggs are infected during their formation in the hen's ovaries.

Most of the contamination occurs due to horizontal Transmission. The contamination of the contents of whole intact eggs with *Salmonella enteritidis* is mainly due to infection of the reproductive tissue. Some studies reported the direct relationship between the eggshell quality and bacterial eggshell penetration. Many researches were primarily focused on the penetration of pseudomonas and various salmonella's species. Pseudomonas have been shown to more readily penetrate into whole eggs of poor shell quality, whereas whole eggs with low specific gravity or low shell quality were more likely to be penetrated by Salmonella. Egg weight, specific gravity, conductance and flock age are also having significant influence on the ability of Salmonella to penetrate the shell.

Table 1: Types of spoilage of eggs

Type of rot	Changes in egg	Organisms associated
Spoilage by bacteria sp.		
Green rot	Albumen becomes green	Pseudomonas fluorescence
Black rot type 1	Black yolk with faecal odour	Proteus sp,
Black rot type 2	Green albumen , yolk is black	Pseudomonas sp.
Red rot	Albumen stained by custard like material	Serratia sp.
Colourless rots	Odourless, fruity or highly offensive, yolk shows white incrustation.	Pseudomonas alcaligenes
Pink rots	Pinkish precipitate on yolk and white	Pseudomonas sp.
Spoilage of eggs by fungi		
Pin spot moulding	Pin type spots of mould growth appear on shell and it is early growth.	Pencillium (Yellow r blue spot), Cladosporium (green or black spot).

Spoilage due to pseudomonas

The pseudomonas sp. enters the egg after it has been laid. Most workers agree that the washing of dirty eggs creates more incidence of spoilage of shell eggs from this cause, because the bacteria enter the shell more quickly when it is wet and when the water temperature is lower than the egg. The presence of more than about 1 per cent fluorescent eggs in a batch indicates the probability either that the batch was dirty or that it was washed, or both. Thus a lot of eggs with a low incidence of spoilage by pseudomonas sp. may develop a much higher incidence on further storage.

Off odours developed:

- Musty or earthy- Achromobacter
- Hey like- Enterobacter sp.
- Fishy – E. Coli
- Cabbage – Pseudomonas

Mechanism of spoilage:

a) Penetration of microorganisms through the egg shell and shell membrane.
b) Colonisation of microorganisms on the shell membrane
c) Overpowering of the antibacterial factors present in the albumen.

PREVENTION OF SPOILAGE

Decontamination of the egg surface can be carried out by processes such as (a) dry cleaning and (b) washing with water that usually contains sanitizing agents. The European Union does not allow washing grade A eggs (“fresh eggs” or “table eggs”) , while this process is authorized and carried out using on-line systems in the United States, Canada, Australia or Japan, followed by chilled storage. The major advantage of washing table eggs is the lessening of the microbial load on the surface of sanitized eggs from values of 1 to 6 log units. While, the major disadvantage is the severe damage to the cuticle which may favours trans-shell contamination with bacteria and moisture loss. Therefore instead of this process, superficial decontamination of eggs could be done by using light pulses which is a non-thermal technology. Egg pasteurization has been conducted mainly to control Salmonella (most often found

organism in eggs) and the minimal conditions reported by the USDA are 64 ^{0}C for 3 to 5 min. Pasteurization causes no major changes in nutritional quality of eggs, but the functional properties like (foaming, thickening, binding and emulsifying), flavour and colour may be affected. Strict quality control can be achieved with regards to spoilage prevention giving importance to following steps:

- First bacterial contamination occurs at part of oviduct as it spoiled by faeces. To lessen this poultry farms should provide hens with;
- A hygienic and less stress full atmosphere
- Pathogens free feed and water.
- Adopting good farm management, floating bacteria can be avoided by decreasing the use of air conditioning.
- Periodical washing of poultry feeders, waters, curtains, sterilisation and installation of air filters, use flame gun for the walls and cages should be must to decrease the occurrence secondary bacterial infection.
- Egg shells are generally washed to remove all dirt, including excrement adhering to shell and during this time water temperature should be taken care otherwise contamination can occur through shell cracking.
- Water for washing should be more than 30 degree centigrade followed by fast drying of the washed eggs and storage at a temperature of 5 degree centigrade or slightly lower is a better method to avoid spoilage.

PRECAUTIONS TO BE TAKEN CARE:

- Eggs should be collected 3 to 4 times a day results in less breakages.
- After collection, eggs should be shifted to holding room maintained at a temperature of about 18 to 20 degree centigrade and 70 to 80% RH at least for 12 hours.
- Eggs should be properly packed in filler flats with broad end up.
- Bulk packing should be done in fibre board cartons.
- Store eggs in appropriate on farm egg room with 70 ^{0} F and 75% humidity for less than 10 days.
- Keep egg room clean and tidy (bio-security)
- More emphasis should be given on the grading of eggs and their packing process.
- Carefully place eggs point down in setter trays
- Eggs should be moved to the marketing channel as soon as possible to reduce the period between production and consumption.

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Hygienic milk production: A step towards healthy living

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Milk is a nutritious food for all the classes of people. Milk can be consumed either fresh or in different forms such as fermented milk or made into other products such as yoghurt, mala, ghee, butter, cheese and cream. It also acts as an ideal growth medium for the microorganisms particularly bacteria. Contamination can occur at different levels; that may be at farm level, during collection and at processing centres. Food borne illnesses continue to pose a threat to human health. Foods of animal origin are usually acts as a vehicle for such illnesses. Good quality milk is essential for production of good quality dairy products and it should always be free from pathogens. Good quality dairy products cannot be made from milk having lower quality. Now a day consumers are more concerned about the safety issues of dairy products and the circumstances under which these are processing and produced. Clean milk production at the farm is the foundation of good quality milk. The hygiene level directly affects the production's economical result. Therefore it is critically important to produce good quality raw milk from healthy animals reared under good hygienic conditions to protect human health for a good living. Keeping the objective of clean milk production a farmer has to follow or give importance to the following steps.

HEALTH OF ANIMAL

The animals must be free from systemic diseases whose causative agents such as *Mycobacterium tuberculosis, Coxiella burnetti, Brucella abortus,* which can be transmitted to human being through milk. The animals should also be free from bacterial diseases such as salmonellosis, anthrax, shigellosis, enteropathogenic *Escherichia coli, Streptococcus,* and other bacterial infections and viral infections such as vaccinia, pseudo cowpox, Iouping ill (tick borne encephalitis), foot and mouth disease, etc. Udder shoud be wound free and mastitis free. If detected mastitis cow then milk that cow at the end of milking operation and at last milk from that cow should be discarded.

CLEANING OF ANIMALS

To prevent the entry of most common contaminants (dung, mud, bedding materials, and straws) into milk, routine grooming, brushing and washing should be carried out and washing of teat with towel soaked in bleaching powder (10mg/litre) or potassium permanganate (1%) should be adopted. The foremilk may contain the microorganisms and it should be collected in a small pail and removed from the cowshed.

ENVIRONMENT

Cow-shed and barns should be clean, properly ventilated and lighted enough. Good housing and manure disposal system should be maintained. Milk is often made unsalable due to feed or weed flavour. Feeds which are having bad flavour should be avoided. As the water supply is one of the most important sources of microbial contamination; the quality of water used at farm for different purposes should be of good quality. Cow shed should be cleaned easily after the milking and hence the floor should be made of hard washable surface and has a good drainage to ensure proper removal of dirty water.

MILKER'S HYGIENE

Absolute cleanliness of personnel is very much essential for clean milk production**.** Milker should not be suffering from diseases such as cough and cold, he should wear clean clothes, wash hands properly and cut nails periodically before milking. He should be free from different contagious diseases like cholera, typhoid, diphtheria and tuberculosis. Milker should avoid the wrong milking practice like knuckling and incomplete milking, which leads to multiplication of organisms in the left over milk.

PROPER MILKING TECHNIQUES

Take hold and squeeze the base of the teat with the thumb and forefinger and Close the other three fingers squeezing downwards in turn. The milk in the teat is squeezed downwards and pulling can cause mastitis. Milk quickly, quietly and evenly and make sure you empty the udder at each milking. Generally it takes 7 to 10 minutes to complete milking each cow. Maintain a calm regular routine even milking twice a day, make it ideally 12 hours.

PRE-MILKING PREPARATION

Generally the pre-milking udder preparation such as fore milking and teat cleaning has a direct mastitis-controlling effect as it decreases the number of pathogens. It also has an indirect mastitis-preventing effect as it lowers the risk of teat congestion and oedema to an effective teat-cup position, at the start of milking. Recent research confirms about drying of teat before milking. Wetting of the teats before the milking followed by drying provide low bacterial counts in the milk whereas washing of the whole udder should be avoided. Cotton towels were found to be superior to paper towels for reducing bacterial and spore counts in milk and one towel per cow should be used during milking. Besides this, cleaning for 20 seconds has been reported to be 50 per cent more efficient than cleaning for six seconds.

MILK INSPECTION

Before the start of milking operation of the individual cow, the milker should inspect the organoleptic test such as

(appearance, odour of the milk) and if any physical abnormality is detected, milk from the cow must be withheld from delivery and should be tasted in milk cup method first.

MILK EXTRACTION

Mechanical milk extraction should be accomplished keeping in view about the prescribed or provided standards of the machine manufacturing company. These machines should also be used within accepted milking routines on daily basis. Machine settings like milking vacuum and pulsation characteristics should be maintained as per the given rules which can give a good health and good udder health. However if over-milking and unsuitable pre-milking preparation are practised, or high frequencies of liner slip are not prevented then udder health can be negatively affected through increasing the number of new infections, or indirectly by affecting teat condition.

POST MILKING TEAT DISINFECTING

Research works were already carried out on application of disinfecting agent after milking. Teat dipping or spraying after milking is widely used today which is helpful in preventing environmental mastitis types. Frequency of mastitis arises during the dry period is an increasing issue at the present scenario and these infections may persist into lactation and cause clinical mastitis or elevated milk somatic cell counts. In such situations dipping dry cow's teats using a special teat seal with a long lasting effect, is an important tool for controlling such type of mastitis.

CLEANING OF MILKING EQUIPMENT:

The equipment used for milking should be cleaned immediately after milking. A rinse cycle should initially be followed, using tape water to remove residuals from the milk and soil. Cleaning using detergents should be completed within time and with the cleaning solution at the highest possible temperature. Cleaning should be finished by flushing the milking system with clean water then draining it, or by flushing it with clean air. The milking system should be dry before the next milking. Researchers reported that cleaning for less than three times a day may cause increased bacterial counts in the milk. Proficient cleaning of the cooling tank is also important. Cleaning with acid detergent may be required at frequent intervals, according to the quality (hardness of the water).

COOLING OF MILK

It is generally recommended that milk should be cooled down to a refrigerated temperature within a few hours after completion of milking and stored at 4 °C or below. To lower the lipolytic activity cooling of milk should be done shortly after evacuation of milk and also where frequency of milking is more observed. Freshly drawn milk has a temperature of 38 degree centigrade which is favourable for bacterial growth.

MONITORING AND RECORDING

On-farm monitoring, analysing and recording is becoming successively more important as herds become larger, plus various processes are automated and people involved become more specialised. Monitoring and recording is required for checking if operations are properly carried out, are under control and also for

trace free and mostly it is needed where the herd is more in numbers and more numbers of people are engaged in the full day operation in a dairy farm.

Table 1: Sources of contamination of milk and their control

Sl. no	Sources of contamination	Control measure
1	Interior of the udder	a-check for the mastitis b-discard pre-milk
2	Exterior of cow-udder and flank	a-ash and wipe udder b-clip udder and flank c-dry milking d-use small top milk pail
3	Barn air and dust	a-keep milk covered
4	Flies and other vermin traps	a-eliminate breeding places b-fly control with fly sprays, fly repellent etc
5	Milker	a-clean habits b-dry milking
6	Utensils before use	a-Clean sanitise and dry

Source: Outlines of dairy technology by Sukumar De(2003)

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Seed Priming: A Foremost Strategy to Mitigate Salinity Stress-A Review

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Different types of edaphic factors affect plant growth. Salinity is one of the most important stress factors which limits the growth and development of plants by altering their morphological, physiological and biochemical attributes. Soil salinity in agriculture soils refers to the presence of high concentration of soluble salts in the soil moisture of the rhizosphere. These concentrations of soluble salts through their high osmotic pressures affect plant growth by restricting the uptake of water by the roots. Salinity can also affect plant growth because the high concentration of salts in the soil solution interferes with balanced absorption of essential nutritional ions by plants (Tester and Devenport, 2003).

MECHANISMS OF SALT STRESS

Most crops do not grow well on soils that contain salts because a reduction in rate and amount of water that plant roots can take up from the soil. Also, some salts are toxic to plants when present in high concentration. The highly tolerant crops can withstand a salt concentration of the saturation extract up to 10 g L^{-1}. The moderately tolerant crops can withstand salt concentration up to 5 g L^{-1}. The limit of the sensitive group is about 2.5 g L^{-1}.

Some plants are more tolerant to a high salt concentration than others. Some of the negative effects of salinity have been caused mainly by Na^+ and Cl^- ions in plants and these ions produce the decisive conditions for plant survival by intercepting different plant mechanisms. Plant roots are generally affected due to Na^+ and Cl^- along with other cations present in the soils in different concentration.

However, the uptake of these ions depends on the plant growth stage, genetic characters and environmental factors like temperature, relative humidity and light intensity. Excessive amount of salt in cultivated soils retards the growth, limits economic yield and even lead plants to death. There are some points at which salt transport is regulated. These are: (i) selective uptake from the soil solution, (ii) loading of xylem, (iii) removal of salt from the xylem in the upper part of the plant, (iv) loading of the phloem and (v) excretion through salt glands or bladders (Munns *et al.,* 2002 ; Fig.1).

The toxic ions move into the plant with the water flow. The ions move from

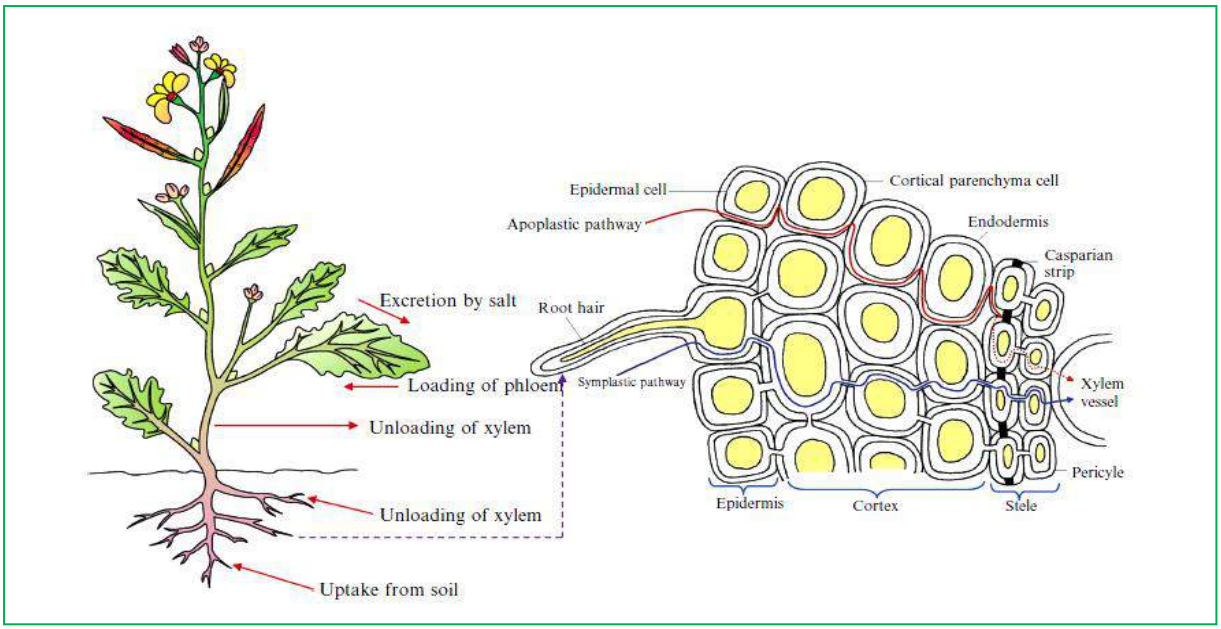

Figure 1: Transport and regulation of salt in soil-plant system

soil to the vascular system of the root by symplastic and apoplastic pathways. In symplastic pathway, water enters into the roots through plasma membranes of epidermis and further cell-to-cell movement occurs through plasmodesmata until the xylem becomes saturated. In apoplastic pathway, water enters through intracellular spaces to unload the salt in xylem (Fig.1). Differential osmotic potential is the dynamic force of energy driven pathways, i.e. symplastic, while apoplastic is a non-energy driven pathway. Hence, based on osmotic potential, plant can control the toxic ions like Na + to enter into the cell through energy driven pathway. The property of salinity tolerance depends on different physiological interactions, which are difficult to determine. The morphological appearance presented by the plant in response to salinity, may not be enough to determine its effect, so it is important to recognize other physiological and biochemical factors, including toxic ions, osmotic potential, lack of elements and other physiological and chemical disorders, as well as the interactions between these various stresses.

SEED PRIMING AND ITS CLASSIFICATION

Priming is a pre-sowing, controlled-hydration treatment in which seeds are exposed to an external water potential sufficiently low to prevent radical protrusion but stimulating physiological and biochemical activities (Bradford 1986, Khan 1992). This process may improve speed and uniformity of germination and germination percentage, especially under adverse conditions such as low and high temperature, salinity and matric stress (Nawaz *et al.,* 2013; Manonmani *et al.,* 2014).

In seed priming, the osmotic pressure and the period for which the seeds are maintained in contact with the membrane are sufficient to allow pre-germinative metabolic processes to take place within the seeds up to a level

limited to that immediately preceding radicle emergence.

SEED PRIMING TECHNIQUES

Seed priming have various techniques for improving the performance of the growth, emergence, and yield of the crop. There are some techniques which are used i.e. hydro-priming, halopriming, osmopriming and hormonal priming.

Hydro-priming, as proposed by Harris (1992), this is a low cost method with beneficial effects on many field crops. Hydro-priming involves soaking the seeds in water before sowing and may or may not be followed by air-drying of the seeds.

Halo priming refers to soaking of seeds in solution of inorganic salts i.e. NaCl, KNO_3 $CaCl_2$, $CaSO_4$, etc. A number of studies have shown a significant improvement in seed germination, seedling emergence and establishment, and final crop yield in salt affected soils in response to halopriming.

In osmo conditioning or **osmopriming** technique, seeds are soaked for a certain period in solutions of sugar, polyethylene glycol (PEG), glycerol, sorbitol, or mannitol followed by air drying before sowing.

Hormonal priming, the pre seed treatment with different hormones i.e. salicylic acid, ascorbate, kinetin, etc. which promote the growth and development of the seedlings.

SALINITY STRESS MITIGATION BY HYDROPRIMING

In recent years, the biochemical responses of plants to salt stress have been studied intensively. Information on the tolerance mechanism is useful for developing new cultivars that are adaptable in salinity environments. The use of exogenous priming agents under salt stress condition has been found to be very much effective to alleviate salt induced damages. The appropriate dose and duration of treatment of the exogenous protectants and the proper methods of application should be studied more precisely.

Rice seed treated with a mixed salt solution germinated more speedily than unprimed seed under salt-stress conditions (Chang-Zheng *et al.,* 2002). Seed germination is promoted by halopriming but also stimulate subsequent growth, thereby enhancing final crop yield. Bajehbaj (2010) evaluated the effects of NaCl priming with KNO3 on the germination traits and seedling growth of Helianthus annuus L. cultivars under salinity conditions and reported that germination percentage of primed seeds was greater than that of un-primed seeds.

Meriem *et al*. (2014) also reported that coriander seed priming with NaCl had diminished the negative impact of salt stress in all cultivars and primed plants showed better response to salinity compared to unprimed plants.

Farahbakhsh and Saiid (2011) conducted an experiment on maize seed priming by NaCl solution and exposing the seed in salinity treatments and showed that the effects of salinity and seed priming on shoot dry weight, shoot length, leaves number, leaf area and chlorophyll and ion leakage were significant.

SALINITY STRESS MITIGATION BY HALOPRIMING

The highest germination characteristics and seed reserve utilization was obtained by halo priming in control conditions. Aghbolaghi and Sedghi (2014) evaluated the effect of seed priming with NaCl and water on growth and seed reserve utilization of millet seeds under salinity stress. With increase in salinity stress, germination components such as germination percentage, germination index, mean time to germination, normal seedling percentage, seedling length, seedling dry weight of utilized (mobilized) seed and seed reserve utilization efficiency decreased, but seed priming showed lower reduction.

Prior to radicle emergence, seeds are dried to initial (pre-primed) moisture content for storage prior to sowing. One such technique involves the spraying of a water mist over the seeds and allowing the moisture to equilibrate. Seeds can also be soaked in water and then exposed to air maintained at near 100 % relative humidity.

Rafiq *et al.,* 2006 reported that seed priming reduces the effect of salinity on the morphological parameter of the plants. Some researchers have considered hydro-priming a key technology that is simple and cost effective, the impact of which is very high in terms of enhanced yield (Ashraf and Foolad, 2005).

Hydro-priming plays an important role in the enzymatic activities of the wheat, maize, rice, and other vegetable seeds. In seed of some plant species, trypsin-like proteolytic enzymes, which are produced during seed development, are important during germination. When the seeds were primed and sown in the field, they showed a faster and more uniform germination comparing to non-primed seeds under salinity stress.

Hydro-priming of cereal rye and perennial ryegrass can significantly increase the rate percentage of germination (Snap *et al.,* 2008). Giri and Schilinger (2003) showed that the effect of hydro-priming with water is equal, and in some cases even more significant, than other priming environments. Effects of hydro-priming on water potential, the driving force for water uptake during imbibition, and the activity of α-amylase were examined in wheat and rice kernels (Andoh and Kobata, 2002).

SALINITY STRESS MITIGATION BY OSMOPRIMING

Osmo-priming is the most common type of seed priming in which seeds are soaked in aerated low water potential solution. It has been observed that physiological and biochemical changes take place during the seed treatment, which could allow seeds to begin the germination sequences before sowing. Osmo-priming, sometimes referred to as osmo-conditioning, is similar to hydro-priming. However, various osmotica are added to the water during the imbibitions period to prevent full hydration of the seeds. These osmotical include sugars, salts, PEG, and mannitol.

Jafar *et al.,* 2012 established the potential of seed priming techniques to improve the performance of wheat varieties in a saline field. Wheat Seed osmopriming with $CaCl_2$ followed by ascorbate priming improved the leaf K+ contents with simultaneous decrease in Na+ concentration. Similarly, maximum

total phenolic contents, total soluble proteins (TSP), alpha -amylase and protease activities were observed in osmoprimed (with $CaCl_2$) seeds followed by ascorbate priming.

Enzymes such as amylases, proteases, and in some cases, lipases, play vital roles in the early growth and development of embryo. Any increase in the activity of these enzymes may result in early vigorous growth and good crop establishment. It has been demonstrated that osmo-priming affects the activity of these enzymes in the germinating seed of different plant species.

In muskmelon (*Cucumis melo* L.) seed osmo-conditioned with PEG-6000 showed enhanced activity of dehydrogenase and amylase and improved germination under non-saline conditions (Srinivasan *et al.,* 1999).

In oilseed crops, the glyoxylate pathway, which converts lipids into sugars, plays an important role in the early development of embryo.Up or down regulation of any of the enzymes involved in this pathway may affect embryo growth. Osmo-conditioning also enhanced the activity of ATPase in the germinating seed of peanut primed with PEG. Furthermore, acid phosphatase and RNA syntheses were significantly higher in embryonic axes and cotyledons of osmo-conditioned seed compared to control seed. Thus, osmopriming may contribute to improved germination rate in part by increasing various enzyme activities.

SALINITY STRESS MITIGATION BY HORMONAL PRIMING

Seed priming with GA_3 slightly improved salt-induced reductions in growth, anthocyanin and chlorophyll contents of the seedlings. Salt stress induced pronounced increases in Na^+/K^+ ratio, proline and H_2O_2 contents, particularly in the sensitive cultivar. The levels of these salt sensitivity physiological indicators tended to be mitigated by priming with GA_3 (Chunthaburee *et al*., 2014). Shahzad *et al.*, 2014 reported that overall seed priming in GA_3 enhanced seed germination and prevented the adverse effects of salt stress in sponge gourd. However, seed priming with GA_3 10^{-4} M has significantly minimized days to germination, increased plant height, root length, and root fresh weight with and without salinity stress.

Younesi and Moradi (2014) proved that in *Medicago Sativa* 'Bami', GA_3 priming reduced this adverse effect of Salinity. The germination percentage and dry weight were higher within the seedlings from seeds primed with GA_3 than in non-primed ones. Farahmandfar *et al*. (2013) cited that Fenugreek seed priming improve the dry weight and length of plumule and radicle in plants under stress. In between priming treatments, the role of salicylic acid and gibberellic acid was more evident.

Hormonal priming has reduced the severity of the effect of salinity but the amelioration was better due to 50 ppm Salicylic Acid and 50 ppm ascorbic acid treatments as these showed best results on seedling growth, fresh and dry weights under non-saline and saline conditions (Afzal *et al.,* 2006).

Noman *et al.* (2011) invasiged the effects of seed soaking with salicylic acid or ascorbic acid on pumpkin seedlings growth under saline conditions. Seedlings fresh weight, protein contents, protease and nitrate reductase activities were

significantly affected by 15 and 30 mg L^{-1} salicylic acid and 30 mg L^{-1} ascorbic acid priming treatments, under both normal and saline conditions.

Seed priming with Salicylic Acid and Kinetin improved salt tolerance in wheat cultivars by the activation of antioxidants, i.e. superoxide dismutase (SOD) and catalase (CAT) to counterbalance the oxidative damage(Afzal *et al.,* 2005).

CONCLUSION

It is clear from these results that priming improves germination and growth of many crops and showed significant differential response of priming to salinity treatments. Reduction in germination parameters and seedling growth was more profound in control seeds than primed seeds. Priming increased the tolerance of seeds to salinity stress, therefore it can be concluded that priming is a simple, cheap and unsophisticated tool that has a practical importance and thus, the priming may be an effective method to meet the demands of farmers during the installation of the culture in the field and especially in conditions of salt stress. For this reason, further studies are needed to assess the efficacy of seed priming during the later stages of the culture.

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Innovative Techniques in Food Processing

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Food processing is the transformation of raw ingredients, by physical or chemical means into food, or of food into other forms. Food processing combines raw food ingredients to produce marketable food products that can be easily prepared and served by the consumer. Traditional food processing relies on heat (thermal) to kill foodborne pathogens (bacteria, viruses, and parasites) to make food safe to eat. For many foods, heating is an effective way to treat foods. The use of heat through thermal processing operations, including pasteurization, sterilization, drying and evaporation, is used as a common practice by many food industries in order to guarantee the microbiological safety of their products. The main problem with the thermal processing of food is loss of volatile compounds, nutrients, and flavour. Researchers have been studying on various non-thermal processing methods (methods that do not use heat) which inactivate pathogens and ensure foods safe for consumption, retaining the sensory attributes and nutrient content similar to raw or fresh products.

NON THERMAL PROCESSES

Novel non-thermal technologies such as pulsed electric fields (PEF), pulsed light treatment (PLT), high pressure processing (HPP) and ionizing radiation (IR) among others have the ability to inactivate microorganisms at near-ambient temperatures avoiding thermal degradation of the food components and consequently preserving the sensory and nutritional quality of the food products.

1. Pulsed Electric Fields (PEF)

PEF is a non-thermal food preservation technology that involves the discharge of high voltage electric pulses (up to 70 kV/cm) into the food product, which is placed between two electrodes for a few microseconds. It is generally accepted that PEF leads to the destruction of microbial membranes. An external electric field is used to exceed a critical transmembrane potential of one volt. This result in a rapid electric breakdown and conformational changes of cell membranes, which leads to the release of intracellular liquid, and cell death. PEF treatment shows changes in tissue structure leading to weight increase and greater water holding capacity and less loss during cooking.

Applications:

PEF is used in processing of apple juice, orange juice, processing of milk, liquid

whole eggs, baking applications and processing of green pea soup.

Advantages:

- Kills vegetative cells
- Colours, flavours and nutrients are preserved
- Short treatment time

2. Pulsed Light Treatment (PLT) (OR) High Intensity Light Technology (HILT)

PLT or HILT can be used for the rapid inactivation of micro organisms on food surfaces, equipments and food packaging materials. High intensity white light and UV light food preservation methods employ light wave lengths ranging from ultra violet to near infra-red in short intense pulse. Pulses of light used for food processing applications typically emit one to twenty flashes per second of electromagnetic energy. The principle involved in generating high intensity light is that a gradual increase of low to moderate power energy can be released in highly concentrated bursts of more powerful energy. The key component of a Pulsed Light unit is a flash lamp is filled with an inert gas. A high-voltage, high-current electrical pulse is applied to the inert gas in the lamp, and the strong collision between electrons and gas molecules cause excitation of the latter, which then emit an intense, very short light pulse. It is generally accepted that UV plays a critical role in microbial inactivation. The treatment is most effective on smooth, nonreflecting surfaces or in liquids that are free of suspended particulates. In surface treatments, rough surfaces hinder inactivation due to cell hiding.

Applications

- Used in decontamination of vegetables, dairy products, eggs, food powders, chicken, ready to eat meat products
- Also used in microbial inactivation of water and fruit juices, sanitation of packaging materials and disinfection of equipment surfaces

Advantages

- The intensity of light that lasts for only a second is 20,000 times brighter than sunlight, but there is no thermal effect, so quality and nutrient content are retained.
- Pulsed white light is not strictly non-thermal, but the thermal action, due to its very short duration, it does not show much adverse effect on the nutrients

3. High Pressure Processing (HPP)

High pressure processing (HPP) is also known as "High Hydrostatic Pressure" or "Ultra High Pressure" processing. HPP uses up to 900 MPa to kill many of the microorganisms found in foods, even at room temperature without degrading vitamins, flavour and colour molecules in the process. When high pressures up to 1000MPa are applied to packages of food that are submerged in a liquid, the pressure is distributed instantly and uniformly throughout the food. Typically a pressure of 350MPa applied for 30min or 400MPa for 5 min will cause a tenfold reduction in vegetative cells of bacteria, yeasts or molds. High pressure processing has no heating or cooling periods and there is a rapid pressurization/depressurization cycle, thus reducing processing times compared to thermal processing.

Applications

- Sterilization of heat sensitive ingredients like shellfish, flavorings, and vitamins
- Sterilization of fruits and fruit products, sauces, pickles, yoghurt, pasteurization of meat and vegetables, decontamination of high risk products, high value products

Advantages: Reduced processing time, uniformity of treatment, low energy consumption, elimination of chemical preservatives.

4. Ionizing Radiation (IR)

Radiation is one of the latest methods in food preservation. Radiation technique makes the food safer to eat by destroying bacteria which is very much similar to the process of pasteurization. In effect, radiation disrupts the biological processes that lead to decay and the ability to sprout. Being a cold process, radiation can be used to pasteurize and sterilize foods without causing changes in freshness and texture of food unlike heat. Further, unlike chemical fumigants, radiation does not leave any harmful toxic residues in food and is more effective and can be used to treat packaged commodities too.

Applications

Radiation processing can be used for disinfestations of pests and disease-causing organisms from a range of products including fruits and vegetables.

Advantages

- In comparison with heat or chemical treatment, irradiation is more effective and appropriate technology to destroy food borne pathogens.
- Radiation technique makes the food safer to eat by destroying bacteria which is very much similar to the process of pasteurization.

CONCLUSION

Non-thermal processes have gained importance in recent years due to the increasing demand for foods with high nutritional value and fresh characteristics, representing an alternative to conventional thermal treatments. The sensory attributes of food samples of various kinds treated with non-thermal processing methods are meant to be well preserved and of extended shelf life. Yogurt drinks, apple sauce, and salad dressing have also been shown to retain the freshness with extended shelf life after processing. Food preservation technologies are based on the prevention of microbial growth or on the microbial inactivation.

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Cryogenic grinding technology for spices

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Spices are essential ingredients imparting taste and flavour to various food preparations. India is the leading producer and exporter of various spices i.e. fenugreek, turmeric, black pepper, coriander, and cinnamon etc. Grinding is an important unit operation in which the size of the particle is reduced and their surface area is increased. When increasing surface area of particles, it means the availability of constituents (such as oil inside the cells, fragrance and flavouring components) that are available in the material is increases. Grinding is the most power consuming operation because only 1% of the energy imparted into the material is utilized loosening the bond between particles, whereas almost 99% of input energy is dissipated as heat, rising the temperature of the ground product etc. In spice grinding temperature rises to the extent of 42 - 93^0 C and this causes the loss of volatile oil and flavouring constituents; for high oil bearing material, oil comes out from oil bearing material during grinding, which makes ground product gummy, sticky and results in chocking of sieves through which the product passes.

Thermal damage is one of the main limitations of the conventional grinding process, so it is especially important to perform the grinding under controlled temperatures conditions. To control the high temperatures during grinding, researchers developed a new technology called cryogenic grinding. Using liquid nitrogen or liquid air as the cryogen, all of thermo-sensitive herbal medicines, spices and important food commodity can be ground below their brittle temperature. The colour and other properties of the products of cryogenic grinding will not be changed and their flavour and nutritional value will not be lost. The application of cryogenic technology for grinding of spices has been scientifically proved to be suitable technique with less loss of volatile oil content, improved colour and grinding operation. The high quality ground product would have domestic as well as international market.

CRYOGENIC GRINDING

The word "CRYOGENICS" originates from the Greek word "cryo", which means creation (or) production by means of cold. It deals with low temperatures as low as below **−150 °C or 123 K** to **absolute zero.** Cryogenics is the study of low temperatures and behavior of materials

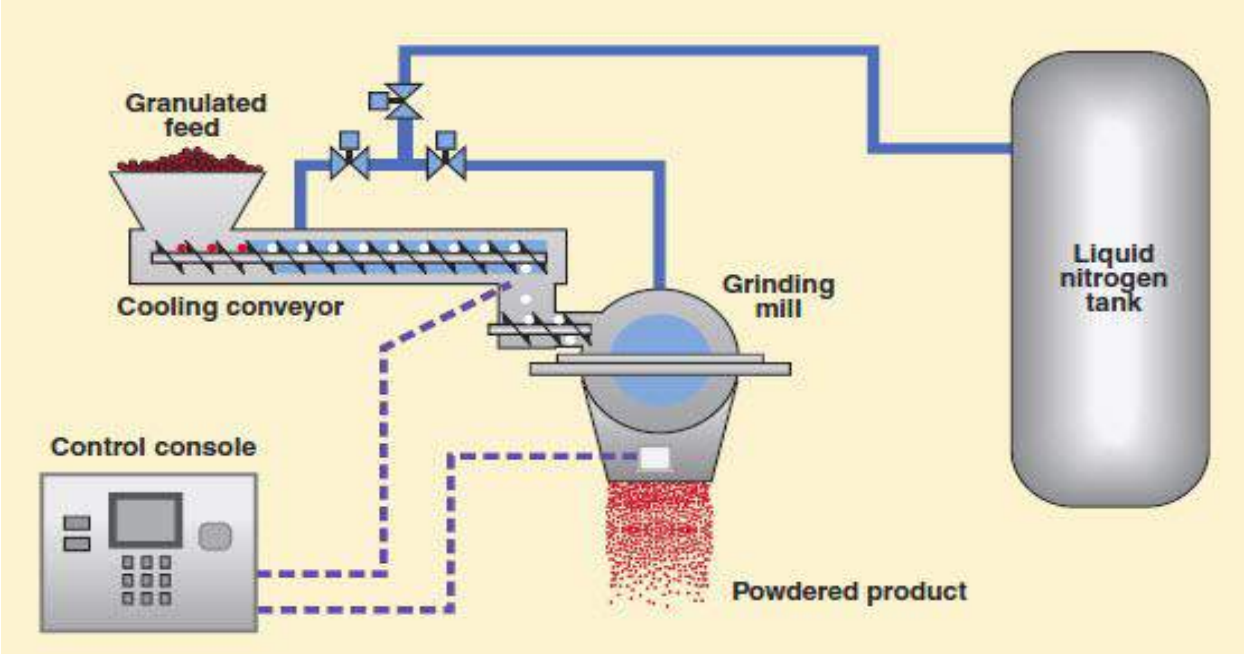

Figure 1: Cryogenic apparatus

under these low temperatures. The extremely low temperature is produced by using substances called "cryogens" such as liquid nitrogen and liquid helium etc.

Cryogenic grinding is also known as freezer milling/ freezer grinding / cryomilling. The act of cooling/chilling a material and then reducing it to smaller particle size. Pre-cooling of the raw spice and the continuous low temperature maintenance within the grinder reduces the loss of volatile oils, color and moisture thereby retaining most of the flavor strength per unit mass of spice. All materials embrittle when exposed to low temperature. Utilizes the cooling effect of cryogen to embrittle materials prior to and or during the grinding process. Cryogenic grinding process does not damage or alter the chemical composition product.

The cryogenic grinding system consists of two main units, namely;

1) Pre cooling unit and
2) Grinding unit.

Pre cooling unit

- ✓ The cryogenic precooler is a cooling device made up of a screw conveyor and a system to introduce cryogens.
- ✓ It consists of a screw conveyor assembly, an air compressor, a cryogen dewar, a power transmission arrangement and control panels.
- ✓ Reduce the temperature of the seed below its brittle point as well as the freezing point of its oil, before it enters the grinder.
- ✓ The temperature of the precooler and the feed rate to the grinder are control to minimise the loss of quality of the final powdered material.
- ✓ Consumption of cryogen and the operating cost are important considerations and matters of concern for a cryogenic pre cooling system.
- ✓ The cryogen losses can be minimized to a great extent by proper consideration of the design and insulation of the precooler.

Grinding unit

- ✓ The operation of grinding was performed by impact and attrition.
- ✓ The grinder was operated by an electric motor.
- ✓ The ground powder was collected in the collector pan from an outlet and the cryogen vapour let out.

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Table: Comparison of traditional and cryogenic grinding system

S.No.	Traditional Grinding System	Cryogenic Grinding System
1	The heat is developed inside the grinding mill	Temperature below 0^{o}C inside the grinding mill
2	The heat, which is developed during grinding, leads on one hand to evaporation of the essential oil and on the other hand, heat sensitive fats are melted.	Negligible loss of volatile component
3	This in turn can lead to the grinding elements become greasy (oily) and even harms the machine by blocking it.	Not in Cryogenic process
4	High energy consumption	Low energy consumption
5	High capacity motors are required to grind the material	Low capacity motors are required to grind the material

Biodiversity: What is it, where is it, and why is it important?

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Biodiversity refers to the variety of all forms of life on earth, including the different plants, animals, micro-organisms, the genes they contain and the ecosystem they form. In general, it refers to the variety of all forms of life on earth. The different plants, animals, micro-organisms, the genes they contain and the ecosystem they form. The manifestation of biodiversity is the biological resources (genes, species, organisms, ecosystems) and ecological processes of which they are part. Biodiversity is therefore considered at 3 major levels: 1) Genetic diversity, 2) Species diversity and 3) Ecosystem diversity

1. Genetic diversity: This is the variety of genetic information contained in all of the individual plants, animals and microorganisms occurring within populations of species. Simply it is the variation of genes within species and populations.

2. Species diversity: This is the variety of species or the living organisms.

i.*Species Richness* - This refers to the total count/number of species in a defined area. Various indices are used including the Mangalet index and Menhink index.

ii. Species Abundance - This refers to the relative numbers among species. If all the species have the same equal abundance, this means that the variation is high hence *high diversity*, however if the one species is represented by 96 individuals, whilst the rest are represented by 1 species each, this is *low diversity*.

iii. Taxonomic or phylogenetic diversity - This considers the genetic relationships between the different groups of species. The measures are based on analysis, resulting into a hierarchical classification representing the phylogenetic evolution of the taxa concerned.

3. Ecosystem diversity

This relates to the variety of habitats, biotic communities and ecological processes in the biosphere.

IMPORTANCE OF BIODIVERSITY

1. Ethical and moral values

Every form of life on earth is unique and warrants respect regardless of its worth to human beings; this is the ecosystems right of an organism. Note that every organism has an inherent right to exist regardless of whether it's valuable to human beings or not. The well being of all future generations is a social

responsibility of the present generations, hence the existence of an organism warrants conservation of the organism.

2. Aesthetic value

Human beings derive great enjoyment from natural environment. The shapes, structure and colour stimulate our senses and enrich our culture. This is illustrated majorly in thepopularity of biodiversity conservation measures and the myriad of the many organizations which fight for the protection of different organisms. A lot of money is paid to conserve wildlife for their value in nature through so many organizations. Wild species enhance our appreciation and enjoyment of the environment through:

• Leisure activities e.g. bird watching and nature trailing;

• Spotting activities e.g. spot hunting, spot fishing, diving and mushroom picking;

• Hearing, touching or just seeing wildlife;

• Enjoyment as seen in art and culture e.g. dolls and teddy bears

3. Utilitarian values

These contribute to our material well-being, besides our feelings and emotions, they are things that will give us satisfaction and include conservative and productive materials from biodiversity e.g. agricultural materials or food sources, medicine, industrial raw materials, educational values and scientific research.

4. Ecological values

Biodiversity maintains the integrity of the environment through:

(i).Maintaining CO2/O2 balance. It is through biodiversity that sequential balance of CO2 and O2 is maintained. The greenhouse effect is as a result of CO2 accumulation in the atmosphere, ozone layer depletion also occurs overtime making the earth warmer and more prone to natural calamities.

(ii) Regulation of biochemical cycles e.g. O2, hydrological cycles etc. Biological resources areimportant media in biochemical cycles, without which the cycles are not complete.

(iii) Absorption and breakdown of pollutants and waste materials through decomposition, e.g. infood webs and food chains where the flow of energy goes through production consumption decomposition without which breakdown and absorption of materials will not be complete. In an ecosystem there is no waste as decomposition will take place to purify our environment by transforming the waste to other forms of biodiversity.

(iv) Determination and regulation of the natural world climate whether local, regional or microthrough influencing temperature, precipitation and air turbulence.

(v) Acting as indicators of environmental changes e.g. the green house effect as a result of globalwarming causes changes in weather seasonality and also affects crops among others.

(vi) Protective services, e.g. protection of human beings from harmful weather conditions by actingas wind breaks, flood barriers among others.

LOSSES IN BIODIVERSITY

Today's threats to species and ecosystems are the greatest recorded in recent history and virtually all of them are caused by human mismanagement of biological resources often stimulated by misguided economic policies and faulty institutions.

Principal threats to biodiversity

A threat by definition refers to any process or event whether natural or human induced that is likely tocause adverse effects upon the status or sustainable use of any component of biological diversity.

a) Habitat alteration / destruction

Increased insatiable demand for resources results to land use changes hence loss to genetic diversity, species reduction and increased ecosystem changes such as random population changes, disease outcrops, habitat fragmentation among others resulting in biodiversity losses.

b) Overharvesting / over-exploitation of biological resources

This results when individuals of a particular species are taken at a higher rate than can be sustained bythe natural reproductive capacity of the population being harvested. This can be through hunting, fishing, trade, food gathering etc. Overharvesting will lead to extinction of resources or the biological resources, eventually leading to loss of species. For species that are protected by the law and overharvesting occurs, this is known as poaching, if the law allows for harvesting of a resource, this is known as cropping.

c) Pollution

Chemical or thermal pollution is a threat to biodiversity. Species in habitats are increasingly being harmed by industrial activities and pollution from excessive use of agro-chemicals such as DDT, oil spills, acid precipitation etc.

d) Introduced species / biological invasions

This can be intentional or accidental. Species introduced in an ecosystem will cause changes in theecosystem. Introduced species are organisms arising in areas/ habitats in which they were previously not native. Such introduced species are usually referred to as biological pollutants. Some of the ecological impacts of the invasion include hybridization, out competition, disruption of original ecosystem, plant pathogenic influences, disease transmission, disruption of foodwebs and to some situations extinction. Species may be introduced intentionally for:

- Ornamental concerns;
- Agriculture;
- Hunting and spotting activities;
- Biotechnology for scientific research;
- Trade.

e) Climatic changes

This is of great concern especially when global CO2 increases in the atmosphere resulting to globalwarming. Most species originate within a very narrow physiological limit; hence nature has a range of tolerance maintained for ecosystem stability. Changes may be gradual or abrupt such that if the limit is exceeded the upper or lower species suffers extinction.

f) Population

As the human population is increasing, there exists insatiable demand for raw materials which isbound to cause changes in biodiversity. It is therefore vital to control human population which will result in biodiversity conservation.

g) Institutional / policy failure

Some institutions are created to manage biological resources. However, the institutions/policy fail to internalize the values of biodiversity within the decision making process of their Nations and individuals. Such institutions/policies in place should have a holistic approach

towards biodiversity conservation rather than part conservation.

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Parasitic Disease Control Strategies in Poultry Sector

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The purpose of a parasitic disease control strategy is to keep the parasitic challenge (especially in young birds) at a minimum rate to avoid clinical symptoms and production losses. Total eradication from a geographical region is unlikely for most parasites due to the enormous numbers of eggs passed with the faeces and the high persistence of the infective stages in the environment. It is seen that while backyard poultry may theoretically harbour all existing parasite species, commercial free-range management may eliminate those parasites whose transmission depends on intermediate hosts. The most efficient way to control poultry parasites is to improve the management and hygiene of the flock. Therefore, the following managemental parasitic control programmes are mandatory for efficient production.

(I) Stocking rate

The density of birds (stocking rate) in any poultry production system should not be too high. Overstocking will force the birds to come in a closer contact with material contaminated by faeces and may result in the consumption of a higher number of infective parasitic eggs.

(II) Flock structure

Studies have shown that the susceptibility and occurrence of parasitic diseases vary between different age groups of poultry. Older animals may be carriers of a range of parasitic diseases without showing clinical signs, e.g, *Eimeria* spp., *Ascaridia* spp, *Tetrameres* spp. etc.. Therefore, it may be beneficial to separate different age groups vis-a-vis the "**all in - all out**" principle.

(III) Alternate use of pens

As poultry have few parasites in common with other livestock, management may include mixed use of pens (i.e., poultry scavenging together with other livestock) or alternate use of pens (poultry alternating with other livestock in the same pen). However, when chickens scavenge in a pig parasite contaminated area, there is the risk of liver and lung lesions caused by migrating *Ascaris suum* larvae. Some parasitic species with indirect life cycles (tapeworms and flukes may be controlled simply by avoiding contact with freshwater where the intermediate hosts live.

Management of the pens may also include alternating plant crops with poultry production as this will reduce the contamination in a field considerably, although it should be recognized that

infective eggs of especially the nematodes may survive for years under favourable conditions. The development of such alternating programmes requires a thorough knowledge of the parasites' seasonal development and survival in the particular area. As an example, in the temperate regions, the eggs of *Eimeria* spp., *Ascaridia* spp., *Heterakis* spp. and *Capillaria* spp. Cannot embryonate and develop to infectivity during the winter (i.e. below 10-15°C).

(IV) Hygiene of pens

When poultry are kept in concrete pens (outdoor or indoor), the litter should be removed frequently (i.e., weekly or more often) to reduce the large majority of parasitic eggs before they become infective. Furthermore, the floor should be kept as dry as possible, as external stages of all parasites require nearly 100% relative humidity to develop. The draining capacity, and thus the dry microclimate at floor level, may be the main reason why slatted floors in intensive systems seem to be rather effective in reducing parasitic transmission indoors.

Disinfectants are generally not active against parasite eggs, but should be incorporated into the general action in order to minimize viral and bacterial infections. After mechanical removal of the litter and disinfection (steam, burning and chemical disinfectants), lime-wash should be applied and allowed to dry.

The effects achieved by this procedure are:

1) The drying effect of lime decreases the survival of parasite eggs, and

2) The pH - level exceeds 8, which also decreases the survival of parasite eggs. After application of lime, the house should be left empty for 2 - 4 weeks before new animals are introduced.

(V) Dose and move

As mentioned before a general management practice in poultry production is the "all in - all out" principle. Before animals are moved to safe areas (outdoor, indoor), they may be dosed with an anthelmintic to remove any worms present in order to keep the environment free of contamination for as long as possible (dose and move). This principle has been shown to be rather effective, although unfortunately it also increases the risk of development of anthelmintic resistance.

(VI) Routine deworming

Routine deworming programmes often appeal to farmers for reasons of convenience, and as a result worm treatments are generally the only control measure carried out. However, the effect of each treatment will be rather transitory if the poultry are re-infected continuously, while the effect is considerably prolonged if the transmission rate is low. Each treatment with a drug will increase the selection pressure in the helminth population for development of anthelmintic resistance and therefore parasitic control programmes should reduce the number of treatments to a minimum and rather increase other control measures.

Several programmes for routine deworming of poultry have been worked out, and most are adjusted to the age or the reproduction cycle of the poultry. The standard procedure is treatment of hens shortly before the commencement of laying, followed by a move to a clean stable unit. The objective is to eliminate the worms from the hens thus reducing

production losses and to prevent contamination of the environment. The choice of drug should partly depend on the worm species present. Furthermore, it is important to alternate between drugs with different modes of action in order to reduce the risk of developing anthelmintic resistance, and to avoid drugs against which resistance has already developed.

(VII) Adequate nutritional level

The overall effect of helminth infections may be reduced by ensuring an adequate level of nutrition (especially proteins), although this should be no substitute for a sound parasite control programme. It seems though that protein levels above 14 - 16 % may favour the establishment of certain nematodes in the intestine. But generally scarce information is available on this subject.

(VIII) Genetic resistance

Little is known about genetic resistance to parasitic infections in poultry, although a difference in infection levels between two breeds has been described. Especially in sheep, genetic differences in susceptibility have been documented within and between breeds, and it is likely that such differences may exist in poultry as well.

Unilateral frequent milking model demonstrate the importance of frequent in milking at early lactation: a Review

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Abstract

Milking of dairy cows is an utmost step for optimum milk production and economics of herd. The animal selected from superior germplasm providing well-balanced ration does not mean dairy cow give maximum production, it is time bounded with frequently managerial collection process not automatically given by cow. The unilateral frequent milking model demonstrates the importance of frequent milking and factors involve in higher milk yield. This model explained the epigenetic modification in udder at early lactation period due to increase in the frequency of milk yield that increases cells activity, increase in milk production and persistency in milk yield. So, frequent milking at early lactation is a valid management tool for higher productivity.

Key words: Unilateral frequent milking model, Milking frequency, early lactation

INTRODUCTION

The milking management is an important tool for improvement of milk yield. Earlier several studies reported that milking frequency more than 2 times per day increased milk yield upto 10-21 % (Bar-Peled *et al*., 1995; Klei *et al*., 1997; Smith *et al*., 2002). It was observed at the early lactation phase, milking 3 times per day increased production that persists even milking switched to 2 times daily (Hale et al., 2003; Dahl et al., 2004; Wall & McFadden, 2007a; Wright *et al*., 2013) but decreasing milking frequency from 2 times to 1 time daily has a negative effect on milk yield (Phyn *et al*., 2011). This implies that the mammary gland is very much sensitive during early lactation to meet the demand of offspring. The mechanisms are not well understood till date , however experiments in both rodents and ruminants showed changes in milking frequency can influence mammary cell numbers and their activity (Wall and McFadden, 2008) whereas increase in milking frequency (IMF) did not change the epithelial cell proliferation or apoptosis (Wall et al., 2013). The role IMF in between animals did not a clear role of milking management, so researchers moved to unilateral frequent milking (UFM) models, where cows milked with different frequency level between the right and left udder half of the same cow for withstanding the different variability like genetic factors, the environment, or nutrition. For that UFM became popular for the powerful statistical model in recent research which is also known as

the half-udder model for elucidating the factors that increase milk yield avoiding of individual variation.

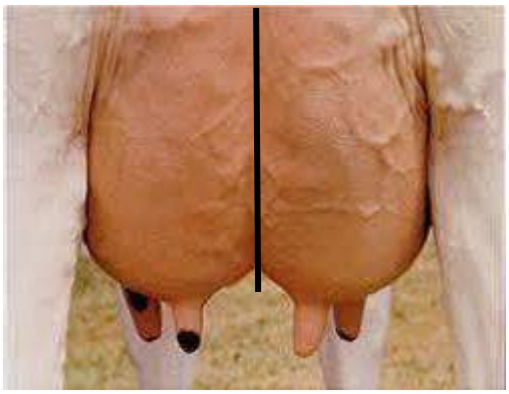
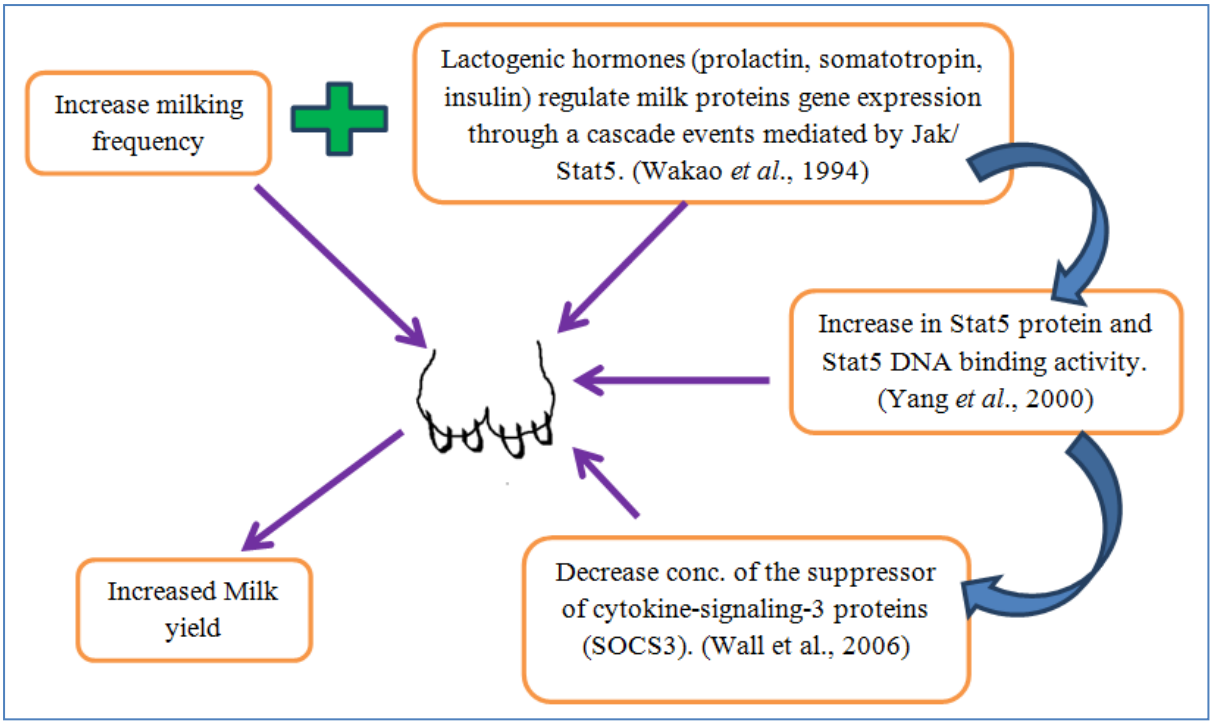


Fig: Unilateral frequent milking Model

In the UFM, the whole udder exposed to same systemic factors but it is helpful to isolate different milking frequency responses to local regulation at the mammary tissue level. The UFM help to determine whether acute and persistence milk yield responses are locally regulated at mammary tissues level vs. systemic hormones and the effect of IMF in mammary epithelial tissues proliferation, apoptosis, and gene expression.

The Unilateral Frequent Milking on milk yield-The milk yield response to changes in milking frequency is regulated by local factors within the udder that demonstrated by UFM (Wall and McFadden, 2007a). Wall and McFadden (2007a) assigned Ten multiparous Holstein cows for UFM study for the first 21 days of lactation. The experiment was that the left udder milked 2X times while the right udder milked 4X times for initial 21 days of lactation and thereafter from 22 days in milking (DIM), both udder halves milked 2X upto the end of lactation stage. During the experiment, the right half produced 3.5±0.2 kg/day more milk than left udder half and the carryover effect seen in right udder half for the remaining lactation stage from 22 DIM, produced 1.8±0.2 kg/day more milk than the left udder half. Wright *et al*. (2013) conducted a studied on sixteen primiparous Holstein Heifers cows for UFM model that cows milking twice daily for the left udder half and four times daily for right udder half for first 21 days of lactation and reset of lactation milked 2X daily for both udder halves. The difference in milk yield was higher 2.8±0.3 kg/day in right udder half during experiment period and after withdrawal of UFM, cows continued to produce more milk and Avg 0.8±0.3 kg/day from right udder half throughout 270 days of lactation. Murney *et al*. (2015) executed an experiment on 17 multiparous Holstein-Friesen and Holstein-Friesen × Jersey cows in UFM at early lactation on pasture fed dairy. The 4x udder halves produced 80 % more milk during experiment compare to 1x udder half and Milk yield increased by 12% across remainder lactation period (55- 200 DIM), where milking was done 2 times daily. So, the immediate and persistent increase in milk yield observed in those above study. The Mammary Epithelial Cell (MEC) dynamics in early lactation through IMF has powerful adaptability and locally regulated physiological implications in the mammary gland with an expression of the genes encoding the major milk proteins.

Mammary cells dynamics with UFM- The biopsied mammary tissue during and after UFM found no differentiation in mammary epithelial cell proliferation and apoptosis between 2x and 4x udder halves (Wall et al., 2008; Wall and McFadden, 2010) But Bernier-Dodier et



al. (2010) reported an increase in proliferation as well as apoptosis in mid lactation when 1x compare to 3x milking daily by UFM model. Another interesting evidence showed the proliferation of mammary cells were significantly higher but not apoptosis of mammary cells in UFM treatment when 4x milking compare with 1x milking daily that result carryover effect of milk yield due to more number of secretory cells in 4x udder half (Murney et al., 2015).

The UFM effect on mammary gene expression-

Wall et al. (2013) reported that Change in gene expression on a total 75 genes between 4x milking udder half to 2x milking udder half as well as there was a no significant effect on apoptosis or proliferation and tissues architecture. They reported that 64 genes out of 75 differentially expressed genes were down-regulated in response to 4× versus 2× milking and it suggests IMF may trigger an epigenetic mechanism that helps in adaptation for increased mammary output. They also observed that differential expression of 29 of the 75 previously noted genes after cessation of UFM (4× Vs.2× milking) at 19th day.

CONCLUSIONS

The UFM model gave clear evidence that IMF in early lactation improved milk yield and persistency due to local factors involvement within the treated mammary gland by epigenetic response along with autocrine up-regulation. Finally, the dairy farmers can use this information for modification of milking management practice and increase milk yield.

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Pitcher Irrigation System: A Water Saving Approach

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Abstract
Pitcher irrigation is an ancient, but very efficient irrigation system used in many arid and semiarid regions. Among traditional irrigation systems, pitcher irrigation is one of the most efficient and well suited for small farmers in many areas of the world. Efficient water management using pitcher irrigation offers a solution to looming water crisis and would help bring more and more of the un-irrigated area under the irrigation in the country. Small pitchers are often used because they are less expensive than large ones. Water seeps out of a buried pitcher due to the pressure head gradient across the wall of the pitcher directly into the root zone of the irrigated crop. It has proved useful for land restoration in very arid environment. The pressure gradient results from positive pressure head inside pitcher and negative pressure head at the outer surface of the pitcher which is in contact with soil.

Key words: Pitcher irrigation, Efficient irrigation, Water resources, Small land holdings.

Water resources are decisive for human consumption, agriculture and industrial development; they have been and will stay as very important commodities for human survival and economic development. Pitchers gradually release water through their porous walls into the root zone by the action of static pressure and soil suction pressure. Pitcher irrigation is claimed to be a self regulative system with a very high water saving potential and good capabilities for irrigation of various types of crops (Mondal, 1978; Chigura, 1994). The authors of this work believe that the saturated hydraulic conductivity of clay pots is the key factor controlling the success of this irrigation method in the field. Pitcher irrigation systems use clay pots which are baked at high temperature to produce walls of the desired porosity. The porosity of pitcher wall depends on the manufacturing materials, usually a mixture of clay and sand at a ratio of 4:1; it also depends on baking temperature. Pitchers are buried up to their neck in the soil and filled with water at various time intervals to keep soil water at a level favourable to plant growth.

Despite its apparent simplicity, factors affecting the system performance have not been well described and analyzed in the literature (Stein, 1990). Water gradually seeps out into the root zone in the soil due to the pressure head gradient across the wall of the pitcher resulting from the positive pressure head inside the pitcher and the conditions on the outside. Daka (1991) found that using clay pots can save up to 70% of water compared to watering with buckets and sprinkler irrigation. Pitchers have also been used to establish deserts shrubs (Bainbridge et al., 1998). There is a need to adopt traditional methods of irrigation that could have similar efficiency to that of drip irrigation but with less cost (Batchelor et al., 1996). Developing traditional, low input and water-saving technologies for sustainable crop production, particularly in semi-arid and arid areas, is one of the major challenges to scientists, one which has been ignored by most international developmental programs (Bainbridge, 2001). One of these neglected methods is pitcher irrigation. As soil water decreases due to evapotranspiration, soil water pressure head also decreases resulting in an increase in the hydraulic gradient and seepage rate across the wall of pitchers. Therefore, the influence of soil water pressure head that results from evaporation and transpiration on seepage rate of pitchers must be evaluated properly.

Thus far, little research has been carried out on the performance of pitcher irrigation systems, including the various factors affecting water seepage out of the pitchers. Water is distributed from unglazed baked earthen pitchers buried in the soil. The rate of water flow seeping out of a pitcher and thus the number of plants that can potentially be irrigated by the pitcher are affected by, among other things, the saturated hydraulic conductivity of the pitcher material, pitcher wall thickness, pitcher surface area, soil type, crop type, and the rate of evapotranspiration. Hydraulic conductivity of the pitcher material was the most important of three design factors influencing the flow of water through the pitcher wall, followed by the surface area of the pitcher and the wall thickness. For successful design, installation, and operation of pitcher irrigation systems in arid and semiarid regions, pitchers should be placed at suitable distances from each other so that the wetted areas do not needlessly overlap, while at the same time ensuring that areas of the soil root zone are not unintentionally left dry.

HISTORY OF PITCHER IRRIGATION

Pitcher irrigation is an ancient technique that has been practiced in many parts of the arid world including Iran, India, African and South American countries (Mondal, 1974; Stein, 1997). The technique is simple, cheap and could have large water-saving potential (Mondal, 1978; Bainbridge, 2001). Pitcher irrigation has been mentioned in a book written some 2000 years ago in China (Sheng, 1974). The method reportedly has been used to irrigate watermelons in India and Pakistan (Mondal, 1974; Soomro, 2002); horticultural crops in Brazil, Germany, and Indonesia (Stein, 1997; Setiawan et al., 1998); and corn, tomato, and okra in Zimbabwe (Batchelor et al., 1996). A few researchers have indicated that pitchers could have self regulative capability in conditions where

seepage is controlled by the soil water pressure head, which is, in turn, a function of the soil water content around the pitcher (Chigura, 1994).

ADVANTAGES OF PITCHER IRRIGATION

- Pitcher irrigation is still used on a limited basis in the dry lands of India.
- It has been successfully used for a wide range of annual and perennial plants including many vegetables and fruits.
- It is especially useful in difficult conditions of high salinity, extreme aridity, limited water supply and limited resources.
- The water use efficiency of irrigation systems depends on many factors including soil type, crop type, weed competition and microclimate.
- The experimental test have been suggested of pitcher irrigation may use as little as 10% of the water used in conventional surface irrigation.
- The controlled water delivery may reduce problems of water logging and rapid drying. Pitcher irrigation facilitated rapid establishment and faster growth of plants.
- It can be used to establish plant on steep slopes and fast draining areas where conventional irrigation is impractical.

CONCLUSIONS

Pitcher irrigation is one of very efficient traditional methods of irrigation. It has been used successfully for more than 2000 years and would be much more widely used if farmer were familiar with its many favorable attributes. It is especially useful in difficult conditions of high salinity, extreme aridity, limited water supply and limited resources. Pitcher irrigation as an alternative to drip or sprinkler irrigation can be a viable option for water scarce area particularly for farmers those are looking to eke a living out of their small holdings of land.

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Formal Sources of Capital for Livestock and Poultry Based Ventures in India

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Our lives are becoming easier day-by-day, thanks to the growing technology. People are relying on various businesses to make money. There is no need to worry about when you don't have enough money to start the business of your choice because there are several banks in the country which are offering loans at reasonable interest rates. Even there are banks which are exclusive for certain kinds of business. People in the country depend upon various businesses and their business depends upon their family background. Some people make money by doing agriculture and some do goat farming and some do cattle farming. All these kinds business needs a lot of money. It is known fact that these business needs lot of seed money. Here is some information about the kind of credit and loans provided by public sector banks for livestock enterprise.

Banks

For the past three decades India's banking system has several outstanding achievements to its credit. The most striking is its extensive reach. It is no longer confined to only metropolitans or cosmopolitans in India. In fact, Indian banking system has reached even to the remote corners of the country.

National Bank for Agriculture and Rural Development (NABARD):

Dairy Entrepreneurship Development Scheme (DEDS)

Eligibility:

Farmers, individual entrepreneurs, NGOs, companies, groups of unorgainsed and organized sector etc. Groups of organized sector include self-help groups, dairy cooperative societies, milk unions, milk federations etc. An individual will be eligible to avail assistance for all the components under the scheme but only once for each component

Pattern of Assistance:

a) Back ended capital subsidy @ 25% of the project cost for general category and@ 33.33 % for SC/ST farmers. The comporient-wise subsidy ceiling will be subject to indicative cost arrived at by NABARD from time to time.

b) Entrepreneur contribution (Margin) for loans beyond Rs.1 iakh -10% of the project cost (Minimum)

S.No	Component	Unit Cost	Pattern of Assistance
i	Establishment of small dairy units with crossbred cows/ indigenous descript milch cows like Sahiwal, Red Sindhi, Gir, Rathi etc / graded buffaloes upto 10 animals	Rs 5.00 lakh for 10 animal unit – minimum unit size is 2 animals with an upper limit of 10 animals.	25% of the outlay (33 .33 % for SC / ST farmers,) as back ended capital subsidy subject to a ceiling of Rs 1.25 lakh for a unit of 10 animals (Rs 1.67 lakh for SC/ST farmers,). Maximum permissible capital subsidy is Rs 25000 (Rs 33,300 for SC/ST farmers)for a 2 animal unit.
ii	Rearing of heifer calves – cross bred, indigenous descript milch breeds of cattle and of graded buffaloes – upto 20 calves	Rs 4.80 lakh for 20 calf unit– minimum unit size of 5 calves with an upper limit of 20 calves	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 1.20 lakh for a unit of 20 calves (Rs 1.60 lakh for SC/ST farmers). Maximum permissible capital subsidy is Rs 30,000 (Rs 40,000 for SC/ST farmers) for a 5 calf unit. Subsidy shall be restricted on a prorata basis depending on the unit size
iii	Vericompost (with milch animal unit .To be considered with milch animals and not separately)	Rs 20,000/-	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 5,000/- (Rs 6700/- for SC/ST farmers,).
iv	Purchase of milking machines/milkotesters/bulk milk cooling units (upto 2000 lit capacity)	Rs 18 lakh	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 4.50 lakh (Rs 6.00 lakh for SC/ST farmers).
v	Purchase of dairy processing equipment for manufacture of indigenous milk products	Rs 12 lakh	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 3.00 lakh (Rs 4.00 lakh for SC/ST farmers).
vi	Establishment of dairy product transportation facilities and cold chain	Rs 24 lakh	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 6.00 lakh (Rs 8.00 lakh for SC/ST farmers).

vii	Cold storage facilities for milk and milk products	Rs 30 lakh	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 7.50 lakh (Rs 10.00 lakh for SC/ST farmers).
viii	Establishment of private veterinary clinics	Rs 2.40 lakh for mobile clinic and Rs 1.80 lakh for stationary clinic	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 60,000/- and Rs 45,000/- (Rs 80,000/- and Rs 60,000/- for SC/ST farmers) respectively for mobile and stationary clinics
ix	Dairy marketing outlet / Dairy parlour	Rs 56,000/-	25% of the outlay (33.33 % for SC / ST farmers) as back ended capital subsidy subject to a ceiling of Rs 14,000/- (Rs 18600/- for SC/ST farmers).

Indicative subsidy ceilings under the component of `Entrepreneurship Development and Employment Generation' (EDEG)

Poultry Venture Capital Fund (PVCF)-EDEG		
S.No	**Component**	**Ceilling subsidy**
i	Breeding Farms for Birds of alternate species like turkey, ducks, Japanese quails, guinea fowl and geese	At 25% level subsidy- subsidy ceiling Rs. 7.50 lakh Varies depending on the species and unit size.
ii	Central Grower Units (CGU) - upto 16000 layer chicks per batch	At 25% level subsidy- subsidy ceiling Rs. 10 lakh for a unit of 16000 layer chicks per batch (three batches a year) - Varies with size.
iii	Hybrid Layer. (chicken) Units- uptyo 20000 layers	At 25% level subsidy- subsidy ceiling Rs. 2 lath for upto 20000 layers 2000 layer unit - Varies with the size.
iv	Hybrid Broiler (chicken) Units - upto 20000 birds. Can be weekly, fortnightly, monthly, all-in all-out batches. Bird strength at any point of time should not exceed 20000 birds	At 25% level subsidy- subsidy ceiling Rs. 0.56 lath for a batch of 1000 broilers - Varies with unit size
v	Rearing of Poultry like low- input technology variety of chicken and other alternative species like turkey, ducks, Japanese quails, guinea fowl and geese.	At 25% level subsidy- subsidy ceiling Rs. 5 lakh Varies with the species and unit size
vi	Feed Mixing units (FMU) - 1.0 ton per	At 25% level subsidy- subsidy ceiling

	hour Disease Investigation Lab (DEL)	Rs. 4 lakh
vii	Transport Vehicles - open cage	At 25% level subsidy- subsidy ceiling Rs. 2 lakh
viii	Transport Vehicles Refrigerated	At 25% level subsidy- subsidy ceiling Rs. 3.75 lakh
ix	Retail outlets - Dressing units	At 25% level subsidy- subsidy ceiling Rs. 2.50 lath
x	Retail outlets - marketing units	At 25% level subsidy- subsidy ceiling Rs. 3.75 lakh
xi	Mobile marketing units	At 25% level subsidy- subsidy ceiling Rs. 2.5 lakh
xii	Cold storage for poultry products	At 25% level subsidy- subsidy ceiling Rs. 5 lakh
xiii	Egg /Broiler Carts	At 25% level subsidy-subsidy ceiling Rs. 3750/-
xiv	Large Processing Units 2000-4000 birds per hour	At 25% level subsidy- subsidy ceiling Rs. 125 lakh
xv	Emu Processing units	At 25% level subsidy- subsidy ceiling Rs. 250 lakh
xvi	Feather Processing Units/ litter management	Varies with unit size-. The subsidy ceiling is Rs. 125 lakh
xvii	Technology upgradation/ innovations including waste disposal/ incinerators, mini- hatchers. egg vending machines etc.	Varies with the component. The subsidy ceiling is Rs 125 lakh. For new/ innovative projects EC may decide the subsidy/ value cap depending upon the scope and importance of the project.
Integrated Development of Small Ruminants and Rabbits (IDSRR)-EDEG		
i	Commercial Units of 10 ewe / does+ I ram / buck	At 25% level subsidy- subsidy ceiling Rs. 12,500/-
ii	Breeding farms with 100 ewe / does + 5 ram / bucks	At 25% level subsidy- subsidy ceiling Rs. 2,50,000/-
iii	Commercial rabbit -Angora units	At 25% level subsidy- subsidy ceiling Rs. 75,000/-
iv	Rabbit - Angora breeding Farms	Varies with unit size
Pig Development-EDEG		
i	Commercial rearing units (3 sows + I Boar)	At 25% level subsidy- subsidy ceiling Rs. 25,000/-
ii	Pig Breeding Farms (20 sows +4 Boars)	At 25% level subsidy- subsidy ceiling Rs. 2,00,000/-
iii	Retail Pork Outlets with facility for chilling	At 25% level subsidy- subsidy ceiling Rs. 3,00,000/-

Salvaging of Male Buffalo Calves -EDEG		
i	Mini Units: Rearing of male Buffalo calves upto 25 calves.	At 25% level subsidy - subsidy ceiling Rs. 6,250/-per calf. It would be implemented by the State Governments and subsidy would be channelized through NABARD. The beneficiary will ha.:e to avail bank loan to a tune of minimum 50% of project cost minus subsidy and prescribed beneficiary share.
ii	Commercial Units: Rearing of male Buffalo calves, more than 25 calves upto 200 calves at one location.	At 25% level subsidy - subsidy ceiling Rs. 1,50,000/-per 25 calves (at the rate of Ks.6,000/- per calf). It would be implemented by the State Governments and subsidy would be channelized through NABARD. The beneficiary will have to avail bank loan to a tune of minimum 50% of project cost minus subsidy and prescribed beneficiary share.
iii	Industrial Rearing Units: more than 200 calves upto 2000 Buffalo calves at one location.	At 25% level subsidy - subsidy ceiling Rs. 6,25,000/-per 200 calves (at the rate of Rs.3,125/- per calf). It would be implemented by the APEDA and subsidy would be channelized through NABARD. The beneficiary will have to avail bank loan to a tune of minimum 50% of project cost minus subsidy and prescribed beneficiary share.
Source:www.nabard.org *Note: For more information please visit nearest NABARD branch/regional office*		

IDBI Bank:

Dairy loans

- IDBI Bank grants term loan to farmer Small, Marginal and landless labourers for purchases of Bullock pair with Bullock cart. Credit for Individuals and group of farmers for Purchase of high yielding milch animals (Cattle: Indigenous breed like Gir, Tharparker, etc. and exotic breeds like Jersey, Holstein fresian, etc. and in case of Buffalows: Mehsana, Jafarbadi, etc.), Construction of cattle shed, Purchase of dairy equipments, chaff cutters, etc and expenditure incurred for transportation of animals where the animals are not purchased locally.
- IDBI Bank grants term loans of Rs. 50,000/- to Rs. 50 lakhs to individual / Group / Shepard co-op society /

Federation / Limited companies that are experienced and actively engaged in such activity
- IDBI Bank is providing loans to all activities of poultry farming i.e. Layer farming, Broiler farming and Hatcheries.

State Bank of India
- Dairy society plus for financing Dairy units (The loan is provided to dairy societies/ Individual farmers who are members of these societies) for modernization and creating infrastructures.
- Poultry loan

Axis Bank

Cattle Power: Scheme for providing cattle loans to farmers through dairies and co-operatives, for purchasing milch animals, construction of shed for keeping cattle.

Canara Bank
- Bullock/camel/cart loan
- Dairy loans
- Raising cross breed heifers
- Piggery loans

Bank of India:
- Financing for Draught Animal & Carts
- Poultry Development
- Dairy Development

Punjab National Bank
- Financing Rearing Of Good Quality Female Calves, Poultry Farming, Innovative Animal Husbandry Activities
- Dairy Vikas Card Scheme

Syndicate Bank: Animal Husbandry Scheme

Bank of Punjab: For construction of sheds &purchase of milking buffaloes/calves and construction of poultry sheds & poultry farming

Bank of Maharashtra: .Animal Husbandry

Indian Bank: Kamadenu Milk vendor Scheme

Andhra Bank: Dairy Agents

Other banks providing financial assistance for livestock enterprise
- Regional rural banks
- Co-operative banks (PACs, SACs)
- National Federation of State Cooperative Banks Ltd. (NAFSCOB),
- State cooperative departments and banks Cooperative socities (Dairy/Sheep and Goat)
- National Cooperative Development Corporation (NCDC)
- National Dairy Development Board (NDDB)
- Small Industries Development Bank of India (SIDBI),
- Regional rural banks (RRBs)

State Department of Animal Husbandry (SADH) in every state SADH will have schemes depends state and central government policy to encourage to livestock enterprise SC/ST and women have special financial assistance from SADH with central government assistance. (For further detail and current schemes please visit nearest veterinary hospital/ SADH).

Revitalizing Techniques for Saline Soils

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Accumulation of excess salts in the root zone resulting in a partial or complete loss of soil productivity is a worldwide problem. Soil salinity has caused heavy loss of national wealth in India. Out of 329 million hectares of land in the country, about 175 million ha (53 %) is suffering from degradation. The extent of this problem area as given by different sources varies from 8.56 M ha to 10.9 M ha. According to Central Soil Salinity Research Institute (CSSRI), Karnal, 1.7 M ha of land is affected by salinity among the 6.7 M ha of salt affected land. Some amount of salts always present in soil. When concentration of these salts is low, they are not harmful for the growth of plants. But, with the increase of salt content to high levels, plant growth is adversely affected, which further results in decreased agricultural productivity. The problems of soil salinity are most widespread in the arid and semi-arid regions where annual rainfall is not sufficient to leach down the salts to the deeper layers of soil. Soil salinity is also a serious problem in areas where groundwater of high salt content is used for irrigation (Ahmad *et al*. 2011).

DEVELOPMENT OF SALINE SOIL

There are several reasons for development of salinity in the soils such as:

1. Soils developed from the parent material i.e. acid and base magmatic rocks (granite, basalt, diabase etc.)
2. Excessive and uncontrolled irrigation
3. Accumulation of salts in the top layer due to evapo-transpiration in arid conditions
4. Water logging conditions in perennial river basins/ irrigation sources due to seepage

5. Excessive use of chemical fertilizers containing chlorides, sulfates etc.
6. Poor drainage conditions.
7. Salts blown out by wind

CHARACTERISTICS OF SALINE SOILS

Saline soils are rich in soluble salts such as chloride and sulphate of sodium, calcium and magnesium that leads to alkaline pH of soil *i.e.* 7 to 8.5. Since, these soils are rich in soluble salts electrical conductivity (EC) of these soil is higher *i.e.*EC > 4 dSm^{-1}. Also these soils are having considerable quantity of sodium but not as sodic soil that leads to low exchangeable sodium percentage (ESP)

and sodium adsorption ratio (SAR) *i.e.* ESP < 15 and SAR < 13.

EFFECT OF SALINITY ON CROP GROWTH AND DEVELOPMENT

Increased osmotic pressure of soil solution due to excessive salts therefore it become difficult for a plant to extract water and nutrients from the saline soils and under this situation plant cells continue to divide but not elongate. High concentration of soluble salts produces toxic effect directly to the crops and also caused root injury. Injury to plant can also occur due to the salinity induced cationic and anionic imbalance within the plants. Microbial activity also be checked and the soil becomes barren. But these soils are potentially productive soils and their potential can be improved by proper ameliorating techniques.

AMELIORATING TECHNIQUES FOR SALINE SOILS

The main objective of amelioration is reducing the quantity of soluble salts from saline soil. The following technologies can be followed to reclaim the saline soil:

1. Scraping: It is removal of the salts that have accumulated on the soil surface mechanically. It has limited success and may temporarily measure for improving the crop growth.

2. Leaching: This is the most effective management technique for removing salts from the root zone of soils. Stagnation of fresh water can dissolve the salts in the field. Now this water with dissolved salts can be drained out from the field. This way salts can be leached from the salt affected field. Leaching should preferably be done when the soil moisture content is low and the groundwater table is deep. Leaching during the summer months is less effective because large quantities of water are lost by evaporation. If adequate fresh water is not available, less saline water (EC 0.25 dS/m) also can be used.

Steps in Leaching programme-

1. Levelling of the field (field should be proper leveled so that water could be irrigated uniformly).
2. Deep ploughing to loosen the soil for better movement of soil within the soil.
3. Field should be divided in plots/sub-plots.

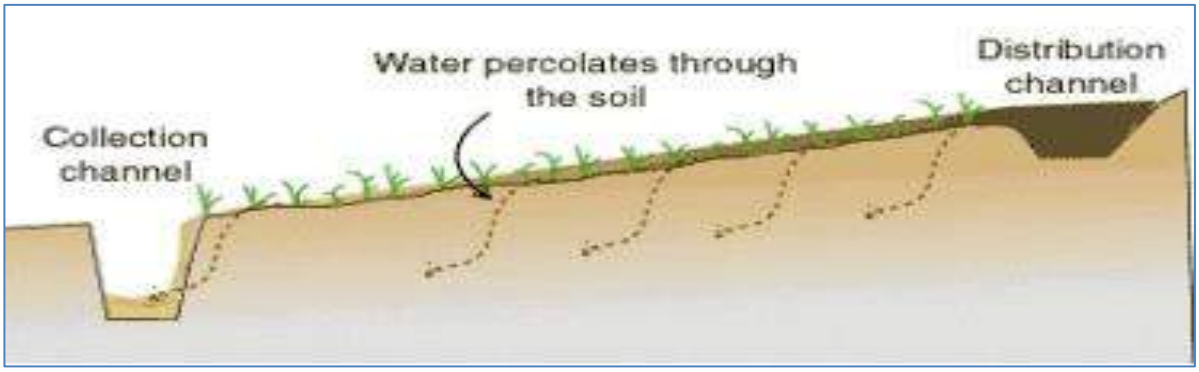
Time of leaching:

1. Select the period of low evaporative demands
2. Select period when water table is low
3. Select period just preceding the monsoon so that rainfall water can be used effectively

How much to leach?

1. Choose the cropping patterns and find out their tolerance to soil salinity. Initially more tolerant crop should be choosen.
2. Leach the soils as per the tolerance crop in the crop rotation. Use leaching curves or prediction model for leaching.

3. Drainage: Poor drainage condition leads to accumulation of rain water in low lying areas during rainy season. If it is not drained out properly the groundwater table is raised to less than 2 m within 5-10 years and result accumulation of salts due to evaporation from the surface. In general, the critical depth of water table ranges between 1.5 to 3.0 m to check the salinization. So drainage is necessary to prevent salinization.



4. Irrigation frequency: More frequent irrigations prevent the salt accumulation by keeping the soil at higher soil moisture content. So crops grow in saline soils must be irrigated more frequently.

5. Irrigation method: Sprinkler or drip irrigation is ideal method for irrigating frequently because it requires small quantity of water at a time. Leaching of soluble salts is also accomplished more efficiently when the water application rates are lower than the infiltration capacity of the soil and such a condition cannot be achieved by flood irrigation methods.

6. Proper use of irrigation water: Salt free or less saline (if salt free water is not available) water only to be used. One local/desi method generally adopted by farmers that they mix the tubewell water with cannal water while irrigating the field. Moisture should be kept at optimum field capacity to check the salt accumulation.

7. Management of soil fertility through proper fertilizer application: Generally saline soils are low in fertility status. Response of nitrogen is better when it is applied with green manures and green leaf manures such as dhaincha. However, excessive fertilization on a highly saline soil is of no value. Uses of acid forming fertilizer such as ammonical and amide form help to drop the pH level of soil.

8. Mulching: Soil salinization is particularly high when the water table is shallow and the salinity of groundwater is high. Mulching hinders the direct penetration of sun rays to soil surface and reduces evaporation and encourage downward flow of soil water there by check the accumulation of salts on soil surface.

9. Placement of seed or seedling: Salts tend to accumulate at the raised portion of soil. So planting or seeding at sides or shoulder of ridges help them to emerge in saline soil.

10. Growing salt tolerant crops: Tolerance and sensitiveness are varies with crops that are given in Table 1.Crop tolerance varies with their growing stages as shown in Table 2. Saline tolerant rootstocks and varieties are given in Table 3.

Table 1: Category of different sensitive or tolerant crops

Highly salt tolerant crops	Barley, sugarcane, sugar beet, oats, sesbania etc.,
Moderately salt tolerant crops	Wheat, rice, cotton, sorghum, maize, pearl millet, etc.,
Low salt tolerant crops	Pulses, peas, beans, sesame, radish, sunhemp, white clover, etc.,
Saline sensitive crops	Tomato, onion, potato, carrot etc.,

Table 2: Germination vs establishment stage of different crop in saline soils

Crop	Germination stage	Established stage
Barley	Very good	Good
Corn (maize)	Good	Poor
Wheat	Fairly good	Fair
Sugarbeet	Very poor	Good
Beans	Very poor	Very poor

Table 3: Rootstock of fruit trees resistant to salinity

Crops	Rootstocks
Citrus (*Citrus* spp.)	Rangpur lime, Cleopatra mandarin rough lemon, tangelo, sour orange, sweet orange, citrange.
Stone fruit (*Prunus*spp.)	Marianna, Lovell, Shalil & Yunnan
Avocado (*Perseaamericana*)	West Indian & Mexican
Grape (*Vitisvitifera*)	Salt creek and Dogridge
Crops	**Varieties**
Grape (*Vitisvitifera.)*	Perlette and Cardinal
Berries (*Rubus*spp.*)*	Boysenberry, Olallie blackberry & Indian summer raspberry
Strawberry (*Fragaria*spp.*)*	Lassen & Shasta

(Somani and Totawat, 2013)

CONCLUSION

Saline soils are barren but potentially productive soils. All the problematic soils are need to be rectified and made to be productive to ensure the food security of ever growing population. Soluble salts concentration of saline soil can be minimized by the above technique and made into productive. Tolerance of crops to be improved through salt resistant root stocks, genetic and molecular approach those further helps to get higher yield in saline soils.

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Rabbit Husbandry-A Global Scenario

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Rabbit has been reared and domesticated for long as a game animal followed by its rearing for meat and fur. Rabbit domestication dates back to late middle ages, which were discovered by Phoenicians on the shore of Spain. It were Romans who spread rabbits as game animal throughout. It all started with keeping rabbits in stone walled pens or parks called as *leporaria.* By sixteenth century several breeds of rabbits were developed through controlled breeding. It is during the same period that rabbit rearing and breeding spread to Italy, France and England. With beginning of nineteenth century rabbit rearing in hutches sprang up all over rural Western Europe and also reached Australia and New Zealand with European colonial expansion. During its initial stage of expansion rabbits were fed on green forage, hay, beetroots and grains. They were reared in backyard along with poultry for meat and fur.

Natural extension of the rabbit at the end of the Neolithic period
(Picture Courtesy: http://www.cuniculture.info)

2nd century Roman currency showing rabbit in its inscription
Picture Courtesy: http://www.cuniculture.info

TRADITIONAL FARMING TO COMMERCIAL PRODUCTION

Rabbit rearing which were limited to few pockets of Europe as a source of animal protein for household/domestic consumption saw an unprecedented growth in the rabbit population and also it's spread to other parts of world by late nineteenth and early twentieth century. The reasons were introduction of controlled breeding techniques, selection for growth and reproductive traits, improvement of management

practices, which saw a replacement from traditional *hutch* to cages, development of new breeds, and formation of breeders associations which laid down the guidelines for feeding standards and marketing. World war in one way increased the demand for animal protein which saw extensive use of rabbit meat as source of animal protein and also led to its expansion further. Extensive scientific research on management and breeding aspects of rabbit led to the formulation of guidelines for commercial rabbit rearing. Traditional methods of rearing rabbits were replaced- hutch with cages, forage & grains with pellet and balanced feed. New breeds were developed with selection intensified on growth and carcass yield. Improved management practices like automated water supply, provision of artificial lighting for breeding females, extensive breeding with 5-6 litters per year, provision of optimum temperature and humidity within the sheds, augmented commercial rabbit production and its economic viability

TRADITIONAL BACKYARD RABBIT FRAMING

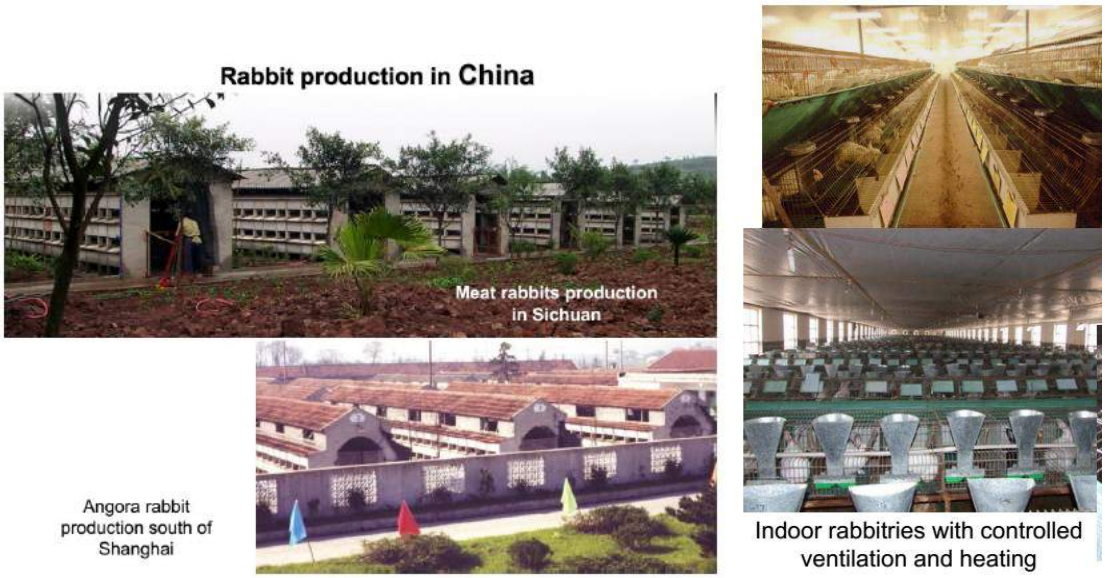
Traditional rabbit hutch

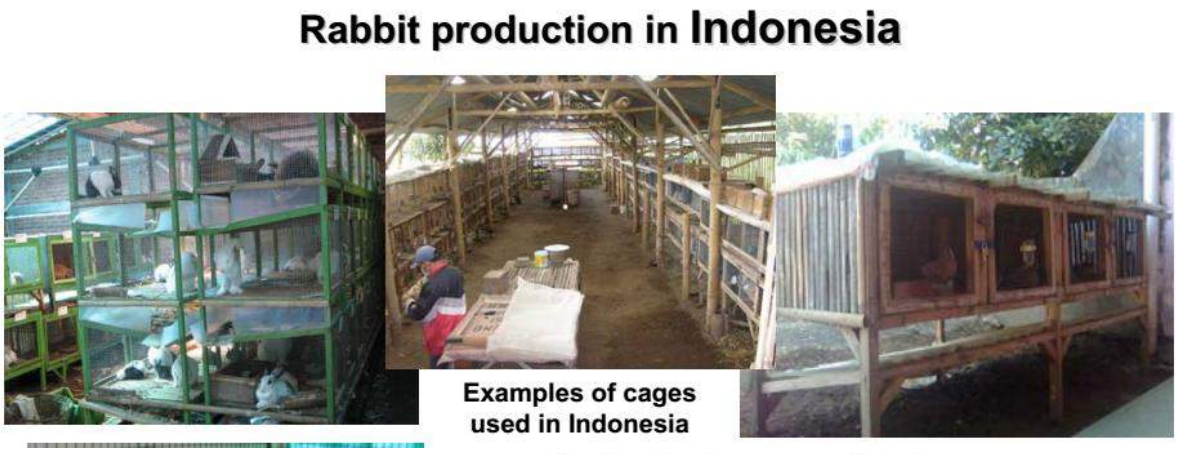
Traditional backyard unit in **Morocco**

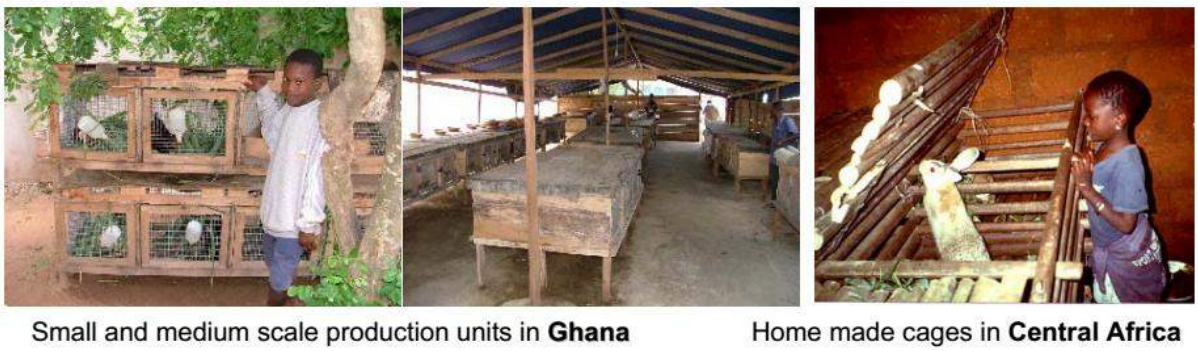
Source: Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009: by François Lebas

Source Courtesy: http://www.cuniculture.info

COMMERCIAL PRODUCTION SYSTEMS







Source: Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009: by François Lebas

Rabbit production in North America

In the **USA**, rabbit breeding is more oriented toward pet rabbits and presentation of beautiful rabbits in shows than to commercial production

Commercial unit of production

Rabbit production in North Africa

Public selection unit in **Algeria**

Private selection unit in **Algeria**

Rabbit production in South America

Outdoor production unit in **Brazil**

Source: Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009: by François Lebas

RABBIT MEAT & ITS COMPOSITION:

Rabbits are highly prolific, litter size ranges from 9-11 with 5-6 litters per year. They are excellent converters of fodder in to food, they efficiently convert plant protein of little use to people as food of high animal protein value. In comparison with other species rabbit can convert 20% of the protein they eat in to edible meat, whereas the value stand at 22—23% for broiler chicken, 16 to 18% for pigs and 8-10% for beef. Rabbit meat is rich in protein, vitamins, minerals and less in fat. Rabbit fat has less stearic and oleic acid and high proportions of essential polyunsaturated linolenic & linoleic acids.

Average performance of different animal species and energy cost of proteins they produce

	No. of young per breeding female per year	Live weight of breeding female (kg)	Live weight at slaughter (kg)	Slaughter yield (%)	Daily weight increase (g)	Daily weight increase $g/kW^{0.75}$	Fat content of carcass (%)	Food kcal per g of usable protein (kcal/g)
Broilers	100	3.0	2.0	63	31	30.5	13.0	80
Turkeys	60	10	10.1	79	65	19.2	13.0	87
Rabbits	40	4.5	3.2	60	32	22.3	6.8	105
Pigs	12	170	100	73	540	28.4	32.0	151
Sheep	1.4	70	50	50	220	18.2	36.0	427

Source: The Rabbit, FAO

The dressing % of carcass is about 58%, which is higher compared to small and large ruminants. The carcass presentation for rabbits differ with region to certain extent. They are electrically stunned before slaughtered, de-skinned, dressed. The gut, offal are removed and the edible meat are commonly presented as fore cut, mid cut and hind cut

VARIOUS FORMS OF RABBIT CARCASS PRESENTATION:

Classical presentation in France

In England

In North Africa

In Greece & Cyprus

In Vietnam, for traditional presentation, only the hair and the abdominal organs are removed.

Source: Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009: by François Lebas

Meat composition of different animal species

Values given per 100 g of meat

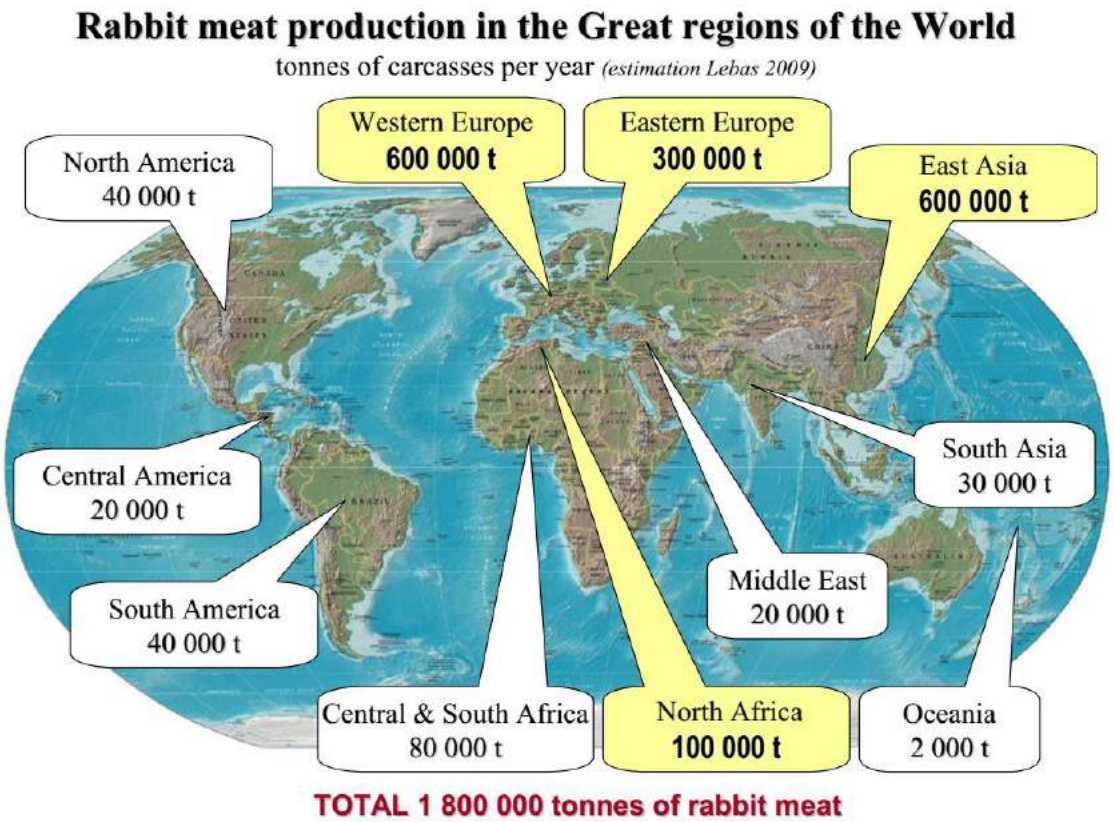
	Energy (kcal)	Water (g)	Crude proteins (g)	Crude fats (g)	Crude ash (g)	Calcium (mg)	Phosphorus (mg)	Potassium (mg)	Sodium (mg)	Iron (mg)	Vitamins					
											A (UI)	B_1 (mg)	B_2 (mg)	B_5 (mg)	Nicotinic acid (mg)	Calcium pantothenate (mg)
Beef																
Lean meat	195	66.5	20	12	1	12	195	350	65	3	40	0.10	0.20	1.5	5	0.45
Fatty meat	380	49	15.5	35	0.7	8	140	350	65	2.5	90	0.05	0.15	1.5	4	0.45
Mutton																
Lean meat	210	66	18	14.5	1.4	10	165	350	75	1.5	40	0.15	0.20	0.3	5	0.55
Fatty meat	345	53	15	31	1	10	130	350	75	1	80	0.15	0.20	0.3	4.5	0.55
Pork																
Lean meat	260	61	17	21	0.8	10	195	350	70	2.5	traces	0.85	0.20	0.3	4.5	0.50
Fatty meat	330	54.5	15	29.5	0.6	9	170	350	70	2.2	traces	0.70	0.15	0.3	4	0.50
Chicken	200	67	19.5	12	1	10	240	300	70	1.5	200	0.05	0.10	0.45	8	0.90
Rabbit	160	70	21	8	1	20	350	300	40	1.5	–	0.10	0.05	0.45	13	0.80

Source: The Rabbit, FAO

WORLD TRADE & MARKET:

As per FAO statistics 2011, world rabbit meat production stood at 16, 00,000 Tonne, which was higher than the production levels of 2000 by 35%. The production levels have been uniform throughout the decade, whereas the production of chicken and pig meat have increased substantially. There have been uncertainty in finding out the exact figure of production levels from different rabbit producing countries owing to no proper estimation of total export/import of meat fur and also because rabbits do rarely find place in the national livestock census. Nevertheless, the FAO estimates has been derived by procuring data from leading rabbit meat producing countries. The leading producers of rabbit meat are China, Italy, France and Spain. The other major rabbit meat producing countries are:

1. Asia: China, Indonesia, Vietnam, Philippines
2. North America: USA, Canada, Mexico
3. South America: Cuba, Brazil, Argentina
4. Africa: Egypt, Morocco, Nigeria, Ghana…
5. Europe: Italy, France, Spain, Belgium.



Source: Conference for promotion of rabbit production in Russia, Kazan, 30 October 2009: by François Lebas

China is the largest producer of rabbit meat in the world, the figures from 2000 to 2014 shows a growth of 51%, whereas for the same period the France and Spain show a decline of 58% and 62% respectively, while Italy registered an impressive growth of 21% (1). China has seen a growth in production of rabbit since 2003 and with introduction of commercial rabbit production techniques the growth has been quite good and diversified demand for meat, fur and skin has further augmented it. In China almost every province raises rabbit, the northern region raises mainly rabbits for wool, southern region for skins and southwest concentrates mainly on meat rabbits. China exports used to be around 30 % during 1996 (3) to European Union and United States of America and with ban on animal products from china by European Union, the share of exports from china has declined over the decade As per FAOSTAT (2012) the China exports only 1.2 % of the total rabbit meat produce. In USA, rabbits are mainly reared as pets than as source of meat. France as well as China appears to be appears to be the major producers of skin. About 60% (2)of poor quality skin are used as hair while the remaining are processed and used in tanning industry to produce gloves, linings and garments. Developing countries of south-east Asia with low labour cost also import pelts/skin for processing and are re-exported to developed countries like USA, Japan & Germany. Angora wool production is modest but value per unit of weight is high *.i.e* 40 to 50 times of greasy wool. The production of wool is mainly concentrated in China, France, Czech Republic, Slovakia. etc. The main end user being USA, Japan, Germany &

Italy. The per capita consumption of rabbit meat are considerably high in parts of Europe compared to other parts of world. The per capita consumption for rabbit meat varies form 10kg/year among French farmers to 15kg/year per capita in Italy, whereas in Egypt at stands at 0.27 kg and 0.78 kg per-capita in Morocco (2). On the global front the total world rabbit production for period from 2000 to 2014 had grown by 31%, with regions like Asia and Africa recording a growth of 53 % and 20 %, respectively. Whereas, Europe registered a decline of 2% in its total production(1).

Table:1. Rabbit meat production (Tonnes) leading four countries

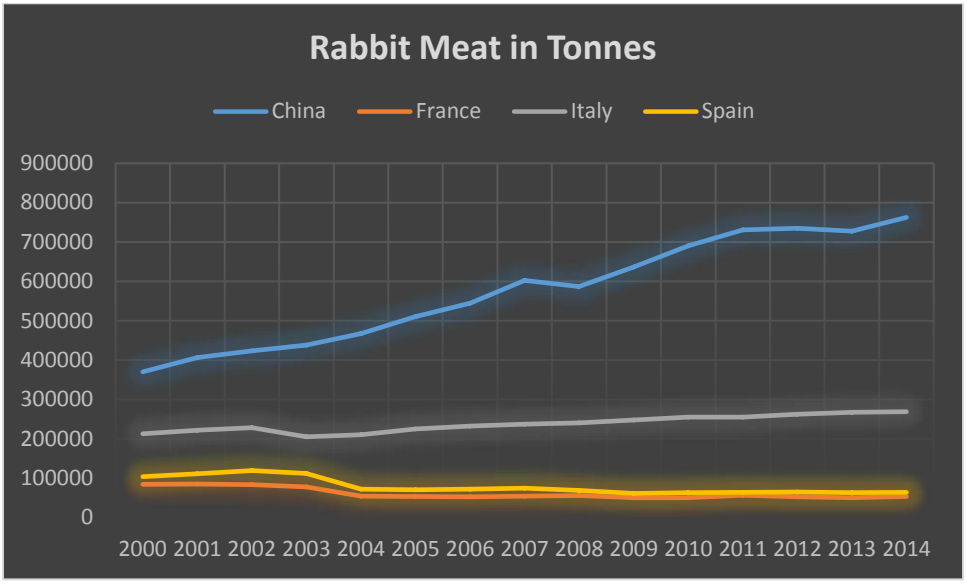
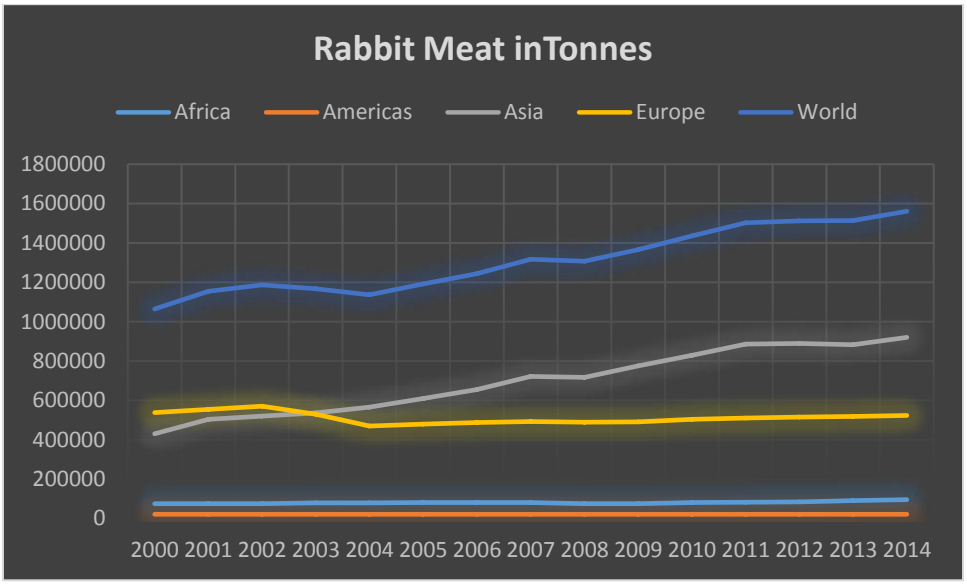


Table: 2. Rabbit meat production (Tonnes) region wise



CONCLUSION

Rabbits could prove to be the best alternative source of animal protein to mankind, provided with best of its nutritional credentials and low cost input rearing systems. Rabbit rearing on small scale could act as a source to mitigate poverty and to overcome

malnutrition among the most deprived states. The need of the hour is to propagate rabbit meat and create awareness about its advantage over the other source of meat, provide efficient marketing source, continue the research on breeding aspects and to evolve easy and diversified cooking methodologies for rabbit meat.

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www.cuniculture.info - A free site dedicated to the rabbit in general, and more particularly to its biology, its breeding and its use.