AGRICULTURAL IMPLEMENTS INDUSTRY KHANDWA

Madhya Pradesh  India 2012

Need Assessment Study by Industrial Designer

Amita Bhatnagar

Organized by FISME New Delhi

NID / MSME DESIGN CLINIC WORKSHOP SCHEME
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Khandwa - A Geo-Historic Analysis

Khandwa or East Nimar is in the Indian state of Madhya Pradesh. During the rise of Buddhism, the East Nimar region was included in Avanti Kingdom under Chand Pradyota Mahesana, which was later added to the growing empire of Magadha by Shishunaga. From the early 2nd century BC. to late 15th century AD, the Nimar Region (earlier a part of Khandesh) underwent the ruling of many emperors from many dynasties, which include Mauryas, Sungas, Early Satvahanas, Kardamakas, Abhiras, Vakatakas, Imperial Guptas, Kalchuris, Vardhanas (of Harsha Vardhana fame), Chalukyas, Rashtrakutas, Paramaras, Faruki Dynasty etc.

From the mid-16th century to the early 18th century, the Nimar region (including East Nimar), was under the rule or influence of Aurangzeb, Bahadur Shah(Mughals), he Peshwas, Sindhiya, Bawaniya, Holkar and Pawar(Marathas), Pindaris etc. Later from early part of the mid-18th century, the management of the Nimar region came under the British. The East Nimar district did not remain unaffected by the Great Uprising of 1857, which swept the country, against the British rule. In connection with the so called Riots of 1857, Tatya Tope had gone through the region of East Nimar district, and Khandwa. From late 18th century till 15 August 1947. During this time Khandwa was visited by Swami Dayanad Saraswatiof Arya Samaj fame, Swami Vivekanand, the great monk and founder of Ramkrishna Mission, Mahatma Gandhi in 1921, Lokmanya Tilak, and others.

Tilak visited the district during his whirlwind tour of the central province in 1918. The district took part in the non-co-operation movement. Civil Disobedience Movement of 1930 has also been participated by many people of the district. The Karmavir weekly was seized and its editor, Makanlal Chaturvedi was sentenced to two years. Editor of Swarajya S. M. Agarkar was also arrested and imprisoned. Khandwa is located on the Main Train Junction, with daily connections to Bombay, Pune, Delhi, Goa, Cochin, Kolkata, Indore, Bhopal, Patna, Allahabad, Lucknow, Jammu, Hyderabad, Bangalore. It also has an airstrip which is rarely used for occasional aircraft landings, located on Nagchun Road.

Khandwa is famous for its local crops of cotton, wheat (Khandwa2), soyabean and a variety of seasonal fruits and vegetables. Its wheat variety Khandwa2 is famous nationwide for its aroma, colour and quality.

Asia’s prestigious hydro power project Indira Sagar Pariyojna is located close to Khandwa and it is a pride to district and nation. Nepa paper mills, Mansingka oil mills, and Nimar textiles are a few well known names in industry which Khandwa possesses.
A Functional Analysis of Development of Indian Agricultural Implements

From at least 7000 BC the Indian subcontinent saw farming of wheat and barley, as attested by archaeological excavation at Mehrgarh in Balochistan.

One of the first harvesting tools of developing India was a **sickle** a hand-held **agricultural tool** with a variously curved **blade** typically used for harvesting **grain** crops or cutting **succulent forage** chiefly for feeding livestock.

![Sickle](image1)
![Hoe](image2)
![Bullock](image3)
![Cart](image4)

Irrigation
India's population passed the 500 million mark in the early 1970s, but its long-standing food crisis was resolved with greatly improved agricultural productivity due to the Green revolution. The Government sponsored modern agricultural implements, new varieties of generic seeds and increased financial assistance to farmers that increased the yield of food crops such as wheat, rice and corn, as well as commercial crops like cotton, tea, tobacco and coffee. Increased agricultural productivity expanded across the states of the Indo-Gangetic plains and the Punjab. Under Operation Flood, the Government encouraged the production of milk, which increased greatly, and improved rearing of livestock across India. This enabled India to become self-sufficient in feeding its own population, ending two decades of food imports. In 2000 May, India's population exceeded 1 billion.
Agricultural Implements manufactured in Khandwa

Khandwa Agricultural implements manufacturers offer a wide range of Soil levelers that find application for land leveling and for facilitating uniform irrigation. These rugged implements are used to directly fit to the tractors. land levelers Reversible leveler and single Plate land leveller synonymous to durability, high performance, excellent work efficiency and high strength. The levelers are available at reasonable prices, which is another important feature exhibited by the khandwa manufacturers products.

Manufacturers of Mounted disc plough, Agricultural Tractor Blade are backed by dexterous workforce, There are an array of Ploughs, Mounted disc plough are fabricated using premium grade raw material. These ploughs have special wear resistant bottoms with bar points for toughest ploughing jobs. Available in standard as well as customized options, these range of ploughs have special corrosion resistant and wear-resistant bottoms.
Khandwa Agricultural implements manufacturers are manufacturing highly efficient range of Multicrop Threshers, which work by separating the grain and the blades of threshing cylinder. It blows away the chaff and dust, along with other impurities from its blower and allows the collection of clean grains through sieves.

**Paddy Multicrop Thresher.** The Paddy Multicrop Thresher feeds the crop through the chute in the machine and the husk and grains are separated by the rooter. The full size husk is windowed away by the blower. Clean grains are collected through sieves.
Agricultural Equipment such as pick mattocks, cutter mattocks, Metal axes, agricultural hoes, fork hoes, splitting mauls, digging bars, and metal scrapers are also being manufactured in Khandwa.

Rotary Tillers is designed to suit every kind of soil for preparing fine seed beds for root crops, orchards, fodder crops and cash crops etc. only in one or two passes. It enhances the soil fertility by mixing the residue of crops like Cotton, Sugarcane, and Wheat etc. It can be applied in dry and wet soil and can be used for puddling.
The **Tipping type Tractor Trailers** as well as the **Non Tipping type** are offered with robust suspension which can sustain the load and the hiccups of the agricultural fields very well. It is ensured that the tractor trailer is manufactured out of quality material and is capable of high performance.

**Subsoiler** is a chisel plow and a tractor mounted implement which is used to loosen and break up soil at depths below. The sturdy and highly efficient subsoiler breaks the soil by cracking and lifting the layers. These subsoilers fluff the ground to trap more of the water in the ground for better crops and higher yields. The subsoiler is available at the industry's leading rates.

The **rigid Cultivator** possesses sturdy construction and are capable of withstanding tough working conditions at heavy soils. These can break up hard soil efficiently & perfectly, and uproot stubbles to leave the ground perfectly worked. Khandwa Industry offers Rigid Type Fixed Cultivators and Rigid Clamp Type Cultivators in varied grades.

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**An array of Tractor drawn Tools and Implements produced in Khandwa**
Raw Material

Carbon steels which can successfully undergo heat-treatment have a carbon content in the range of 0.30–1.70% by weight. Trace impurities of various other elements can have a significant effect on the quality of the resulting steel. Trace amounts of sulfur in particular make the steel red-short. Low alloy carbon steel, such as A36 grade, contains about 0.05% sulfur and melts around 1426–1538 °C (2599–2800 °F). Manganese is often added to improve the hardenability of low carbon steels. These additions turn the material into a low alloy steel by some definitions, but AISI's definition of carbon steel allows up to 1.65% manganese by weight.

Wrought iron is more corrosion resistant than steel. It has been almost completely replaced by mild steel for traditional "wrought iron" products and blacksmithing.

Mild steel corrodes more readily than wrought iron, but is cheaper and more widely available. Carbon steel contains 2.0% carbon or less, with small amounts of manganese, sulfur, phosphorus, and silicon. Alloy steels contain varying amounts of carbon as well as other metals. Their alloy content raises their cost, and so they are usually only employed for specialist uses.

Medium carbon steel

Approximately 0.30–0.59% carbon content. Balances ductility and strength and has good wear resistance; used for large parts, forging and automotive components and Agricultural implements.
Mild steel Rods

Mild steel Strips
Khandwa Agricultural Implements Industry Technology Overview

Drill Machine

Metal Sheet Cutting Machine

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800 kg Head Electrical Drop Hammer Machine
Electrical Metal Cutting Machine
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Design Consultant, Madhya Pradesh. June 2012

Electric Lathe
Vice
Grinder
Metal Lathe
Crank press

Lathe

Open Hearth Furnace

Hand Tools
Production

The manufacturing of the Agricultural products involves various manufacturing processes such as cutting of steel sections, fabrication, forging, welding, drilling, turning, making sub-assemblies, fitting and final assembly etc. where steel sections & other parts/components like tynes, springs & fasteners are sourced and purchased as per own design & specifications. The manufacturing also involves inspections at various stages till they are finally assembled as per their Quality assurance standards/plans.

The agricultural implements in Khandwa are mostly produced by the Hot metal forging method also known as smith forging. In open-die forging, a hammer strikes and deforms the workpiece, which is placed on a stationary anvil. Open-die forging gets its name from the fact that the dies (the surfaces that are in contact with the workpiece) do not enclose the workpiece, allowing it to flow except where contacted by the dies. Therefore the operator, needs to orient and position the workpiece to get the desired shape. The dies are usually flat in shape, but some have a specially shaped surface for specialized operations. For example, a die may have a round, concave, or convex surface or be a tool to form holes or be a cut-off tool.

Open-die forging lends itself to short runs and is appropriate for art smithing and custom work. In some cases, open-die forging may be employed to rough-shape ingots to prepare them for subsequent operations. Open-die forging may also orient the grain to increase strength in the required direction.

Cogging is successive deformation of a bar along its length using an open-die drop forge. It is commonly used to work a piece of raw material to the proper thickness. Once the proper thickness is achieved the proper width is achieved via edging. Edging is the process of concentrating material using a concave shaped open die. The process is called edging, because it is usually carried out on the ends of the work piece. Fullering is a similar process that thins out sections of the forging using a convex shaped die. These processes prepare the workpieces for further forging processes.
Red Hot Ingot being worked on

Hot Drop forging
*Designed Footwear and Safety clothing required
Using the Die after the initial formation
* Designed work stations required
Upset forging increases the diameter of the workpiece by compressing its length. Based on number of pieces produced this is the most widely used forging process. A few examples of common parts produced using the upset forging process are engine valves, couplings, bolts, screws, and other fasteners.

Upset forging is usually done in special high-speed machines called crank presses, but upsetting can also be done in a vertical crank press or a hydraulic press. The machines are usually set up to work in the horizontal plane, to facilitate the quick exchange of workpieces from one station to the next. The initial workpiece is usually wire or rod, but some machines can accept bars up to 25 cm (9.8 in) in diameter and a capacity of over 1000 tons. The standard upsetting machine employs split dies that contain multiple cavities. The dies open enough to allow the workpiece to move from one cavity to the next; the dies then close and the heading tool, or ram, then moves longitudinally against the bar, upsetting it into the cavity. If all of the cavities are utilized on every cycle then a finished part will be produced with every cycle, which makes this process advantageous for mass production.

The rules that are followed when designing parts to be upset forged:

- The length of unsupported metal that can be upset in one blow without injurious buckling is limited to three times the diameter of the bar.
- Lengths of stock greater than three times the diameter are upset successfully as the diameter of the upset is not more than 1.5 times the diameter of the stock.
- In an upset requiring stock length greater than three times the diameter of the stock, and where the diameter of the cavity is not more than 1.5 times the diameter of the stock, the length of unsupported metal beyond the face of the die must not exceed the diameter of the bar.

Manual formation processes along with the use of the Electric Drop hammer

* Better lighting and working conditions required

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The most common type of forging equipment is the hammer and anvil. Principles behind the hammer and anvil are still used today in drop-hammer equipment. The principle behind the machine is simple: raise the hammer and drop it or propel it into the workpiece, which rests on the anvil. The main variations between drop-hammers are in the way the hammer is powered; the most common being air and steam hammers. Drop-hammers usually operate in a vertical position. The main reason for this is excess energy (energy that isn’t used to deform the workpiece) that isn’t released as heat or sound needs to be transmitted to the foundation. Moreover, a large machine base is needed to absorb the impacts.

To overcome some shortcomings of the drop-hammer, the counterblow machine or impactor is used. In a counterblow machine both the hammer and anvil move and the workpiece is held between them. Here excess energy becomes recoil. This allows the machine to work horizontally and have a smaller base. Other advantages include less noise, heat and vibration. It also produces a distinctly different flow pattern. Both of these machines are used for open-die and closed-die forging.

Cultivator is an agricultural implement and a simple tool. It is fabricated from channel angle and flat section of mild steel. The size will depend on the type of land in particular area. The channel, angle and flats are cut to size and welded and fastened where required.
* Designing of Systems and planned working spaces for better efficiency required
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Raw material Store

Raw material being sized

Raw material being cut

Raw material ready for heating
Drop hot forging and hand forming in process
Forging dies are usually made of **high-alloy** or **tool steel**. Dies are impact resistant, wear resistant, maintain strength at high temperatures, and have the ability to withstand cycles of rapid heating and cooling. In order to produce a better, more economical die the following rules are followed:

- The dies part along a single, flat plane if at all possible. If not the parting plane should follow the contour of the part.
- The parting surface is plane through the center of the forging and not near an upper or lower edge.
- Adequate **draft** is provided; a good guideline is at least 3° for aluminum and 5° to 7° for steel.
- Generous fillets and radii is used.
- Ribs are low and wide.
- The various sections are balanced to avoid extreme difference in metal flow.
- Full advantage is taken of fiber flow lines.
- Dimensional tolerances are not closer than necessary.
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Micro Parameters

Agriculture sector affects every aspect of economy of the country. It contributes nearly 32 % of national income. Use of Implements and machinery plays a vital role in increasing the productivity of agricultural output.

The main manufacturing operations performed in Khandwa are press work, fabrication, welding, machining, forging, metal forming, heat treatment etc. The working style of SMEs in the cluster is almost traditional and family run business type. Modern management techniques are not popular.

Inter firm linkages and sub-contracting among SSIs in the cluster are almost non-existent. There are no hard networks (consortias). However there is a manufacturers association which takes up the matters of common concern with appropriate authorities.

Until the Industrial Revolution, the vast majority of the human population labored in agriculture. Pre-industrial agriculture was typically subsistence agriculture in which farmers raised most of their crops for their own consumption instead of for trade. A remarkable shift in agricultural practices has occurred over the past century in response to new technologies, and the development of world markets. This also led to technological improvements in agricultural techniques, such as the Haber-Bosch method for synthesizing ammonium nitrate which made the traditional practice of recycling nutrients with crop rotation and animal manure less necessary.

Presently there are no large organized manufacturers of Agricultural implements or products in the Madhya Pradesh state & there is a tremendous gap in demand & supply since most of the products are being supplied by the units in neighboring states. Therefore there is a very good market potential for the production of the Agricultural implements in the state.

The manufactured products –Tillers & Disc harrows are primarily the tractor drawn agricultural implements that are mainly employed for preparation of soil bed for sowing & burial of organic substances as well as loosening & aerating the soil in the agricultural fields. These are heavy duty & economical implements employed by the farmers all over the world for soil bed preparation. Since India is high in the Agriculture base there is a big demand of these implements in the entire country. Presently there is no organized manufacturer of these products in the state & there is a tremendous gap in demand & supply. Therefore there is a very good market potential for the production of the Agricultural implements.

The ever-increasing use of improved agricultural machines and implements has contributed to a noteworthy increase in the production of the agricultural produce by way of tapping the optimal agricultural potential of the country. Keeping in view the indispensability of animal power in the prevailing agro-climatic and socio-economic condition of the country, the Government has also laid emphasis on the promotion and popularisation of improved hand tools, animal drawn implements and some of the power operated machines among the farmers. During the year under report, it was targeted to provide subsidy ranging from 25 percent to 50 percent to the farmers for the purchase of about 2,28,000 manually operated/bullock drawn implements and power operated machines, 94700 plant protection equipment, 17,400 sprinkler sets, and 3970 power tillers under the various crop oriented schemes of the Department. As a result of the Government policy and programmes, fuel efficient tractors and other improved and quality farm machines and equipment are now available to the farmers. The Farmers and Manufacturers at Khandwa are largely unaware about these.
Design Analysis

The Agricultural implements manufactured in Khandwa cover ploughs, threshers, axes, powrahs, chaffcutter machine, cultivators, seed drills, etc. These implements are used for agriculture work to improve the efficiency and reduce the labour. A large variety of agricultural implements are also used as attachments to tractors. Cultivators and other implements are manufactured as per the design required in the market or the designs developed or recommended by agricultural institutions/universities of the region.

The industrial unit manufacture of Tractor drawn Agricultural Implements like Tillers/cultivators & Disc harrows etc. These implements are mainly employed for the preparation of soil bed for sowing & burial of organic substances as well as loosening & aerating the soil in the agricultural fields. Our national economy is primarily based on agriculture income. At present agricultural labourers/farmers prefer to use modern agricultural implements for both bullocks drawn and for tractor drawn. It is estimated that the demand for these implements will be increasing. 

No. Capacity Selling Price Availability of agricultural implements in tribal areas is a major issue. There is scope to set up units in leading commercial centres.

Agricultural practices such as irrigation, crop rotation, fertilizers, and pesticides were developed long ago, but have made great strides in the past century. The history of agriculture has played a major role in human history, as agricultural progress has been a crucial factor in worldwide socio-economic change. Division of labor in agricultural societies made commonplace specializations rarely seen in hunter-gatherer cultures. So, too, are arts such as epic literature and monumental architecture, as well as codified legal systems. When farmers became capable of producing food beyond the needs of their own families, others in their society were freed to devote themselves to projects other than food acquisition. Historians and anthropologists have long argued that the development of agriculture made civilization possible. The total world population probably never exceeded 15 million inhabitants before the invention of agriculture.
Design Intervention Areas

The Major areas for improvement are Machinery & Technology, Design, Quality Management systems, Human resources and Business Development Services. There is also scope for improving inter-firm linkages and inducing networks for common buying of Raw Materials and Consortia based exports. Enhancing their bargaining power in front of Raw Material suppliers as well as customers too.

As commercialization of agriculture grew in intensity in the mid-to-late 19th century the British Raj and the local legislatures and provinces began investing in agricultural development through support and establishment agricultural research farms and colleges and large-scale irrigation schemes yet the level of mechanization was low at the time of independence in 1947. The socialist oriented five year plans of the 1950s and 60s aggressively promoted rural mechanization via joint ventures and tie-ups between local industrialists and international tractor manufacturers. Despite this aggressiveness the first three decades after independence local production of 4-wheel tractors grew slowly. Yet, by the late 1980s tractor production was nearly 140,000 units per year and by the late 1990s with production approaching 270,000 per year, India overtook the United States as the world’s largest producer of four-wheel tractors with over 16 national and 4 multi-national corporations producing tractors today. Despite these impressive numbers FAO statistics estimate that of total agricultural area in India, less than 50% is under mechanized land preparation, indicating large opportunities still exist for agricultural mechanization.

Agriculture production depends not only upon land use, but also upon productivity i.e. the relationship between agricultural output and input. Research and development work in this field are being undertaken by various institutions all over the world. Along with providing irrigation facilities, and better techniques of farming, use of modern agricultural machinery and implements plays a vital role in increasing the productivity of agriculture output. Therefore with the increasing awareness and trend in scientific cultivation and mechanised farming, the use of modern agriculture implements has increased since the early years of independence i.e. with the advent of green revolution. It is required:

1. **To design, develop and adopt** farm tools, implements and machines for rainfed and irrigated farming, hilly and plain regions suitable for animate, mechanical and electrical power sources, with a view to increase crop production and land and labour productivity resulting also in reduced drudgery.

2. **To test farm equipment** in the laboratory and field for development of new machines and to conduct intensive and extensive trials on farmers’ fields for evaluation and refinement for finalization of design of new as well as existing farm implements and machinery.

3. **To establish linkages** with manufacturers by involving them in developmental process of farm machines and their production technology for manufacturing improved farm implements.

4. **To manufacture required number** of units in Prototype Manufacturing Workshop (PMW) of selected, improved and proven designs of farm implements and machinery for their multi-locational feasibility trials and promotional programmes.

5. **To conduct feasibility testing** on farmers’ field of prototypes of proven designs of farm implements and machinery, selected from different regions for adoption under local conditions with a view to bridge the identified mechanization gaps.

6. **To train village artisans** in the establishment of rural based service centres for distribution, repairs and maintenance and custom hiring service of improved farm implements and machinery.
Future Design & Development possibilities

The different groups of Agricultural Implements requiring Development and Design are:

I. Tillage implements

II. Land & Seed–bed Preparation implements

III. Sowing implements

IV. Plant Protection implements / equipments

V. Harvesting & Thrashing Machines

VI. Processing Machinery

VII. Transportation Equipments

All these implements or farm machinery may be manual, animal or tractor drawn / driven or motor driven.

I. Tillage Implements:

These are used for breaking up the ground, turning it up and cutting furrows in the soil. They include:

i. Different types of Cultivators

ii. Different types of Harrows

iii. Different types of Ploughs

iv. Different types of Rotary Tillers

II. Land / Soil Preparation Implements:

They are for leveling the fields, make partitions & seed beds etc. and include:

i. Bund Former
ii. Shrub Master

iii. Ridgers

iv. Dole Maker

v. Soil Scoops

vi. Levellers (Kraha)

vii. Tramplers

viii. Paddy Puddlers & Cage Wheels

III. Sowing Devices:

The following implements are used for sowing various crops:

i. Seed Drill Machine

ii. Seed-cum-Fertilizer drill

iii. Zero Tillage Seed-cum-Fertilizers drill

iv. Bed Planters

v. Potato Planters

vi. Sugarcane Planters

vii. Paddy Transplanters etc.

IV. Plant Protection Implements / Equipments:

These are used to protect the crops from (a) Weeds, (b) Pests, insects & disease etc.. They include:

i. Paddy weeders
ii. Hoes

iii. Insecticide / pesticide spray pumps of various types, like ----knapsack sprayers, foot operated / hand operated or engine operated etc.

iv. Insecticide / pesticide dusters

V. Harvesting & Thrashing Equipment:

Harvesting is the operation of cutting the crops in the field; it can be performed in three ways i.e. manually, using tractor driven mini-harvesters / reapers or using self propelled harvesting combine.

Thrashing is the process of taking out grains from the dry crop straw. It loosens the grain and separates it from straw. The commonly used harvesting & thrashing implements (tools) and equipments are ----

i. Sickles (manual tool)

ii. Mowers

iii. Reapers

iv. Straw Reapers

v. Threshers (Various types)

vi. Combine Harvester

VI. Processing Implements & Equipments:

These are used to treat / prepare farm products for use, storage & preservation.

The processes included for the purpose are chaff cutting, grain grinding, grain
crushing & grain drying etc. The following implements & equipments are generally used in processing of grains

i. Chaff Cutter Machine

ii. Grain Graders of different Types

iii. Sugarcane crushers

iv. Driers of different kinds

v. Paddy Processing machines i.e. Rice Shellers

VII. Transportation Equipment:

These are used to transport agricultural produce from farm / field to godown or marketplace. They include:

i. Bullock Cart

ii. Trolley for Tractor

Research and Development

Concerns have been raised over the sustainability of intensive agriculture. Intensive agriculture has become associated with decreased soil quality in India and Asia, and there has been increased concern over the effects of fertilizers and pesticides on the environment, particularly as population increases and food demand expands. The monocultures typically used in intensive agriculture increase the number of pests, which are controlled through pesticides. Integrated pest management (IPM), which "has been promoted for decades and has had some notable successes" has not significantly affected the use of pesticides because policies encourage the use of pesticides and IPM is knowledge-intensive.

Agriculture remains a hazardous industry, and farmers worldwide remain at high risk of work-related injuries, lung disease, noise-induced hearing loss, skin diseases, as well as certain cancers related to chemical use and prolonged sun exposure. On industrialized farms, injuries frequently involve the use of agricultural machinery. The most common cause of fatal agricultural injuries is tractor rollovers, which can be prevented by the use of roll over protection structures which limit the risk of injury in case a tractor rolls over. Pesticides and other chemicals used
in farming can also be hazardous to worker health, and workers exposed to pesticides may experience illnesses or birth defects.

Some major organizations are hailing farming within agro ecosystems as the way forward for mainstream agriculture. Current farming methods have resulted in over-stretched water resources, high levels of erosion and reduced soil fertility. According to a report by the International Water Management Institute and UNEP, there is not enough water to continue farming using current practices; therefore how we use critical water, land, and ecosystem resources to boost crop yields must be reconsidered. The report suggested that we need to assign value to ecosystems, recognize environmental and livelihood tradeoffs, and balance the rights of a variety of users and interests. We would also need to address inequities that result when such measures are adopted, such as the reallocation of water from poor to rich, the clearing of land to make way for more productive farmland, or the preservation of a wetland system that limits fishing rights.

Technological advancements can help provide farmers with tools and resources to make farming more sustainable. New technologies have given rise to innovations like conservation tillage, a farming process which helps prevent land loss to erosion, water pollution and enhances carbon sequestration.

**Marketing & Competition**

For enhancing production and productivity, as well as for reducing the cost of production, the induction of improved/new technology in the agricultural production system is inescapable. With this objective in view, demonstration of newly developed agricultural equipments including horticultural equipments at farmers’ fields has been included as a component of the restructured scheme of ‘Promotion and Strengthening of Agricultural Mechanization through Training Testing and Demonstration’ which continued during the Eleventh Plan by the Govt. of India. This scheme envisages conduct of demonstration of improved/newly developed agricultural/horticultural equipments identified by the State Governments/ Government Organizations at farmers’ fields, to acquaint them about their use and utility for production of different types of crops. This has still to reach the far flung rural areas like Khandwa.

Assistance in the form of subsidy @ 25-50% of the cost with permissible ceiling limits is made available to farmers for purchase of agricultural equipments including hand tools, bullock-drawn/power-driven implements, planting, reaping, harvesting and threshing equipments, tractors, power-tillers and other specialized agricultural machines under the centrally sponsored scheme of Macro Management of Agriculture, but most farmers are not aware of these schemes.

The Government of India had advised the State Governments in the year 1964, to set up State Agro Industries Corporations (SAICs) in the public sector to act as catalysts in providing access to industrial inputs for farmers for their use in agriculture. Thus, 17 SAICs were set up in the joint sector with equity participation of the Government of India and respective State Governments in the States of Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh, Tamil Nadu and West Bengal. Most farmers are not aware of these schemes, nor are the manufacturers benefitted in Khandwa.

The manufacturers of Agricultural implements in Khandwa require Better credit facilities, coal and power availability as well as exposure to the changing technology, raw materials, improved products and visibility for marketing outside of their own district. Online marketing through websites need to be encouraged, as well as participation in exhibitions/ Trade Fairs and government schemes.
Design Audit of A.I. Manufacturing Units at Khandwa

1. Name: Sona Agricultural machinery

   Owner: Mr. Mohannad Wasim

   Address: Kaelenganj, Khandwa

   Product: Tillers, Threshers

   Turnover: 22 Lakhs / Annum

**Design Audit:**

1. The unit mostly uses Quality metal for the products it produces. The Metal is collected from different sources and is of good quality, but expensive.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. The unit requires safety clothing

4. Coal procurement remains a major problem

5. Labor has to be trained at the units cost, the trained labor flux also needs to be controlled.

*Design Problems / Suggestions:

1. **Product Design** – For the Thresher machines for Collection of chaff at exit point needs to be designed for maximum efficiency; as also safety measures at the input point.
2. Anti rusting measures required to stop corrosion from destroying the metal, as threshers are used in very harsh farming conditions, were discussed. Raw material options as well as treatment options discussed with the manufacturers.

3. It is required that the unit diversify and expand range of products for better returns.

2. Name: Ditawat Agricultural Implements

Owner: Mr. Mohammad Iqbal

Address: Padam nagar, Indore Road

Product: Ploughs, Harvesters, Tillers

Turnover: 19 Lakhs / Annum

Design Audit:

1. The unit mostly uses scrap metal for it produces. The material is sourced from Indore, transportation costs are high.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better maintenance for machines are required

4. There is a flux of Trained Labor

5. Coal shortage is a constant problem

*Design Problems /Suggestions:

1. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and expense of the manufacturing process.
2. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

3. It is required that the unit diversify and expand range of products for better returns.

3. Name: Kudbu Agriculture

Owner: Mr. Shahbuddin

Address: Near Hero Honda showroom, Indore naka, Khandwa

Product: Tillers, Hoes, Ploughs, Subsoilers

Turnover: 17 Lakhs / Annum

Design Audit:

1. The unit mostly uses metal for the implements it produces. The metal is bought from different sources in Indore is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. The unit requires safety clothing for its labor

5. Buyers are required from outside of the District

*Design Problems /Suggestions:

1. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and expense of the manufacturing process.
2. Product Design of Smaller motorized versions of Tillers and ploughs need to be designed for faster and more efficient tilling of the fields, specially beneficial for the smaller farmers.

3. Better marketing is required and then Product Design of different versions of Tillers and ploughs need to be designed for faster and more efficient farming tools and implements.

4. It is required that the unit diversify and expand range of products for better returns.

4. Name: Samrat Krishi Yantra Udyog
Owner: Mr. Aji Nazamuddin
Address: Indore Road, Khandwa
Product: Thresher, Kadvi Machine, Arandi Machine, Plough, Cultivator
Turnover: 20 Lakhs / Annum

Design Audit:

1. The unit mostly uses Mild steel for the products it produces. The Metal is sourced from different sources, transportation adds to the costs.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. The unit requires safety clothing

5. Coal and Power are problem areas.

*Design Problems / Suggestions:

1. Suggestions were made to the larger manufacturing units to invest some time in research and development for improvement of the machines they are producing.
2. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

3. It is required that the unit diversify and expand range of products for better returns.

5. Name: Ajanta krishi Yantra

Owner: Mr. Zahur Samoti

Address: Pandhana Road, Khandwa

Product: Mini Ploughs, Subsoilers

Turnover: 17 Lakhs / Annum

Design Audit:

1. The unit mostly uses scrap metal for the it products. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Trained manpower is required

4. The unit workers require safety clothing

*Design Problems /Suggestions:

1. Safety clothing requirements for the labor were highlighted to the manufacturers, this will help them not only retain their trained labor, but also maintain better health conditions and attendance at their place of work.
2. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and expense of the manufacturing process.

3. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

4. It is required that the unit diversify and expand range of products for better returns.

6. Name: Khandwa Krishi udyog

   Owner: Mr. Mohammad Aminuddin

   Address: Purani Indore Line, Khandwa

   Product: Axe Heads, Hoes

   Turnover: 7 Lakhs / Annum

   Design Audit:

   1. The unit mostly uses ingot metal for the axe heads it produces, quality is inconsistent and expensive.

   2. Trained workers are required

   3. Research and development as well as better machines are required

   4. Safety clothing is required as also proper workstations.

   *Design Problems / Suggestions:

   1. Well Designed workstations as well as Safety clothing requirements for the labor were highlighted to the manufacturers, this will help them not only retain their trained labor, but also maintain better health conditions and attendance at their place of work.
2. **Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.**

3. **It is required that the unit diversify and expand range of products for better returns.**

7. **Name**: Wasim Krishi udyog  
   **Owner**: Mr. Wasim Lohar  
   **Address**: Behind Lady Butler hospital, Khandwa  
   **Product**: Tillers, Tractor accessories  
   **Turnover**: 10 Lakhs / Annum

**Design Audit**:

1. The unit mostly uses scrap metal for its produce. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. Coal and power is a problem.

5. The workers require Designed safety clothing.

* **Design Problems / Suggestions**:

1. **Safety clothing requirements for the labor were highlighted to the manufacturers, this will help them not only retain their trained labor, but also maintain better health conditions and attendance at their place of work.**

2. **Better Design of working spaces, residue and waste collection and disposals were discussed with the unit.**
3. **It is required that the unit diversify and expand range of products for better returns.**

8. Name: Lohar krishi works

Owner: Mr. Faruq Anwar

Address: Behind Lady Butler hospital, Khandwa

Product: Mini Ploughs, Other Ploughs

Turnover: 9 Lakhs / Annum

**Design Audit:**

1. The unit mostly uses mild steel for its produce. It is brought from Indore and adds to the expense.

2. Research and development as well as better machines are required

3. Buyer seller meets required for marketing as per discussions with the manufacturer.

4. The unit workers require Designed safety clothing

5. Coal and electricity are a problem.

*Design Problems /Suggestions:*

1. *Proper Design and maintenance Factory spaces requirements discussed and suggestions made.*

2. *Safety clothing requirements for the labor were highlighted to the manufacturers, this will help them not only retain their trained labor, but also maintain better health conditions and attendance at their place of work.*

3. **It is required that the unit diversify and expand range of products for better returns.**
9. Name: Nimar Agriculture

Owner: Mr. Gulab

Address: Cheepa colony, Khandwa

Product: Ploughs, Tillers

Turnover: 9 Lakhs / Annum

**Design Audit:**

1. The unit mostly uses scrap metal. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Better machines are required

4. Coal and electricity is required for the unit.

5. The unit requires Designed safety clothing

*Design Problems / Suggestions:

1. **Proper Design and maintenance of Factory spaces requirements discussed and suggestions made.**

2. **Safety clothing requirements for the labor were highlighted to the manufacturers, this will help them not only retain their trained labor, but also maintain better health conditions and attendance at their place of work.**

3. **It is required that the unit diversify and expand range of products for better returns.**

10. Name: Shakir Lohar

Owner: Mr. Shakir Lohar

Address: Cheepa colony, Khandwa
Product: Tillers

Turnover: 7 Lakhs / Annum

**Design Audit:**

1. The unit mostly uses scrap metal for it produces. The scrap is collected from different sources in Indore and is of inconsistent quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Need more orders

4. Space is not enough for manufacturing.

5. The unit requires Designed safety clothing

*Design Problems / Suggestions:*

1. Proper Design and maintenance Factory spaces requirements discussed and suggestions made.

2. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and expense of the manufacturing process.

3. It is required that the unit diversify and expand range of products for better returns.

11. Name: Abdul Rehman Krishi Udyog

Owner: Mr. Haji Abdul Rehman Lohar

Address: Cheepa colony, Khandwa
Product: Harvesters, Tillers, Tractor attachments

Turnover: 17 Lakhs / Annum

Design Audit:

1. The unit mostly uses scrap metal. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. More space is required

4. The unit requires Designed safety clothing

*Design Problems / Suggestions:

1. Proper Design and maintenance Factory spaces requirements discussed and suggestions made.

2. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients. This was suggested to the unit for better market and costs benefit of the produce.

3. The edges of the piece being formed as part of a tiller needs a Die designed for accuracy, this was also suggested to the unit, as the shape is mainly visually judged during production.

4. It is required that the unit diversify and expand range of products for better returns.

12. Name: Soroop Industries

Owner: Mr. Soroop

Address: Behind Lady Butler Hospital, Khandwa
Product: Cultivators, Ploughs, Subsoilers

Turnover: 15 Lakhs / Annum

**Design Audit:**

1. The unit mostly uses scrap metal for its produce. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. Coal and power shortage in the unit.

5. The unit requires Designed safety clothing

**Design Problems / Suggestions:**

1. **Proper Design and maintenance of Factory spaces requirements discussed and suggestions made.**

2. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

3. Design of Smaller motorized versions of Subsoilers and ploughs need to be designed for faster and more efficient and cost effective working of the fields.

4. It is required that the unit diversify and expand range of products for better returns.

**Name:** Kesari krishi

**Owner:** Mr. Kesari Lohar

**Address:** Jabaran colony
Need Assessment Study  
AGRICULTURAL IMPLEMENTS INDUSTRY KHANDWA  
NID/MSME Design Clinic Scheme

14. Name: Sampoorna Krishi  
   Owner: Yusuf bhai Baghiche wale  
   Address: Gulmohar colony, Khandwa  
   Product: Threshers, Tractor accessories, Tillers  
   Turnover: 14 Lakhs / Annum

Product: Hoes, axes  
Turnover: 7 Lakhs / Annum

**Design Audit:**
1. The unit mostly uses scrap metal for its produce. The scrap is collected from different sources and is inconsistent in nature and quality.
2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.
3. The unit requires Designed safety clothing
4. Coal and power shortages create problems
5. Marketing is required.

*Design Problems / Suggestions:
1. Proper Design and maintenance Factory spaces requirements discussed and suggestions made.
2. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and expense of the manufacturing process.
3. It is required that the unit diversify and expand range of products for better returns.
Design Audit:

1. The unit mostly uses scrap metal for its produce. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. Sales and marketing is required.

5. The unit requires Designed safety clothing.

*Design Problems / Suggestions:

1. Product Design – For the Thresher machines - Collection of chaff at exit point needs to be designed for maximum efficiency; as also safety measures at the input point.

2. Product Design of Smaller motorized versions of Tillers and ploughs need to be designed for faster and more efficient tilling of the fields, specially beneficial for the smaller fields.

3. Proper Design and maintenance of Factory spaces requirements discussed and suggestions made for workstations and space allocation.

4. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

5. It is required that the unit diversify and expand range of products for better returns.

15. Name: Safal Agricultor

Owner: Mr. Shakir

Address: Behind Lady Butler hospital, Khandwa

Product: Sub soiler, Cultivators
Need Assessment Study
AGRICULTURAL IMPLEMENTS INDUSTRY KHANDWA
NID /MSME Design Clinic Scheme

AMITA BHATNAGAR

Turnover : 17 Lakhs / Annum

Design Audit :

1. The unit mostly uses scrap metal for produces. The scrap is collected from different sources in Indore and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. Coal and Power shortage affects productivity.

5. The unit requires Designed safety clothing

*Design Problems / Suggestions :

1. It was suggested that specific spaces need to be allotted for Raw material, ongoing work and completed work for better quality product, efficiency and cost cutting of the manufacturing process.

2. Product Design of Smaller motorized versions of Tillers and ploughs need to be designed for faster and more efficient tilling of the fields, specially beneficial for the smaller fields.

3. Proper Design and maintenance of Factory spaces requirements discussed and suggestions made for workstations and space allocation.

4. It is required that the unit diversify and expand range of products for better returns.

16. Name : Santoshi maa Agriculture Udyog

Owner : Mr. Munna Bhai

Address : Gulmohar Colony

Product : Rotary Tillers

Turnover : 12 Lakhs / Annum
**Design Audit:**

1. The unit mostly uses scrap metal for it produces. The scrap is collected from different sources and is inconsistent in nature and quality.

2. Developing workable processes, space and sequential planning for maximum output, and proper storage etc. are some other areas for Design Intervention required by the Unit.

3. Research and development as well as better machines are required

4. Trained labor is required for better quality product.

5. The unit requires Designed safety clothing

6. Coal and Power shortage is harmful for productivity. No control on price of coal.

*Design Problems / Suggestions:*

1. Proper Design and maintenance of Factory spaces requirements discussed and suggestions made for workstations and space allocation.

2. Branding and Packaging of The Agricultural implements produced is required to be Designed and the advantages of the same need to be highlighted to the manufacturers, presently the agricultural implements produced by this cluster are not taking care of this aspect, as most of the larger items are made on orders for specific clients.

3. Research and designs for better agricultural implements required looking at ease of production, reduction in cost as well as newer technological solutions.

4. Design of better tools and accessories suggested for the rotor, which needs to be constantly freed of accumulated mud to move freely.

5. It is required that the unit diversify and expand range of products for better returns.
Suggestions for the Industry and Business growth

1. The Major areas for improvement are Machinery & Technology, Design, Quality Management systems, Human resources and Business Development Services. There is also scope for improving inter-firm linkages and inducing networks for common buying of Raw Materials and Consortia based exports. This will help in bringing down the rivalry level in the firms and enhancing their bargaining power in front of Raw Material suppliers as well as customers too.

2. Due to exposure to high heat, toxic substances and hazardous nature of the Industry proper Insurance coverage is required for the Labor in the form of subsidized Health cards.

3. Electric Power supply situation needs improvement

4. A Raw material Bank needs to be created for the Agricultural implements manufacturers.

5. Coal required for the open chimney furnaces is not easily available in Khandwa, creating problems for the manufacturers.

6. Credit facility should be made available to all the Manufacturers, on the same concept as the Kisan credit facility. Manufacturers should also be provided with credit cards for a limited amount, for buying Raw material or buying machines and equipment, giving them the advantage of picking up larger orders from the market.

7. A special SEZ should be created for the agricultural manufacturers of Khandwa for increasing their visibility for marketing purposes.

7. Business development Training; Machine operators training; Exposure to international manufacturing techniques; Automization of production for Agricultural implements, as well as Die making and Tools making training needs to be organized for the sector.

8. Regular Exhibitions and Buyer Seller Meets need to be organized for encouraging placement of orders.

9. Branding and Packaging need to be designed and developed, as it is non-existent in Khandwa, at the moment, its importance cannot be undermined by the manufacturers. As it will help them to get more visibility and therefore more Business.