Agriculture Management

The mini world:

This database stores all the information needed for sustainable, holistic, and fruitful cultivation of crops. Data at the micro level about all the important resources a farmer requires while cultivating his crops to the macro level of land use patterns and natural resource management is stored. To elaborate, we store details of land, crop, labour, water resources, machinery and its suppliers, government officials and, last but not the least, farmer.

Users of the database:

This database benefits Farmers, laborers, Government officials, and machinery suppliers (also known as contractors).

Purpose of the database:

India has the largest cultivatable landmass (1753694 km2) in the world and about 60 percent of the Indian population works in the agriculture sector. But are we producing optimally? Are we producing sustainably? Initial government contributions in agriculture sector were aimed towards making the nation self-sufficient in terms of food grains. We achieved selfsufficiency 30 years ago, and now overproduction is the new problem. Every year about 40 percent of food grains are lost due to lack of storage facilities. On the other hand, we import many agricultural products which can be grown locally. By recording demand for various crops in various locations, land usage patterns can be bettered. Sustainability can be ensured by managing usage of the resources by farmers.

Farmer is the heart of the agriculture sector, and to optimally perform their job, they require financial assistance, labour, machinery, fertilizers, pesticides, etc. Furthermore, all these requirements when fulfilled, also benefit those providing them (Eg: Laborers, Machine contractors, etc). This database has the capacity to connect the farmer and service providers, to ensure best possible cultivation. It also provides information regarding what farmers in a location frequently require in turn helping authorities devise necessary location centric schemes.

Entities and Attributes:

1. FARMER (Two key attributes)
    1. Name
    2. Father_name (Name +Father name = Composite key)
    3. Passbook_No. (Key)
    4. Sex
    5. Phone_No (Multi valued) 6. Address(comp):
        i. House_No.
        ii. Street_and_village_name
        iii. District_and_State
        iv. Pincode
    7. DOB(dd-mm-yyyy)

8. Age (Derived)
9. Inputs_to_land (multi valued) 10. Bank_details(comp):
    i. Bank_Name
    ii. Acc._No. iii. Bank_Branch
    iv. IFSC_code

2. DEPENDENT: (Weak entity)
    1. Name (partial key)
    2. Age
    3. Relation

3. CROP:
    1. Name (key)
    2. Category: (**Domain**: Food, Feed, Fibre, Oil, Ornamental, Industrial)
    3. Season: (**Domain**: Rabi, Kharif, Zaid, Whole Year, Seasonal*)
    4. Time (Expected time taken (in months) to reach the harvest stage)
    5. Grows_on(multi) (**Domain**: Red soil, Black soil, Alluvial soil, wet and dry lands)
    6. Cost_per_acre (In Rs.) (Seed cost per acre)
    7. Yield_per_acre (Quintals per acre)
    8. MSP (Minimum support price: As decided by the Govt.)
    9. Water_required_per_acre (In Cubic meters)
    10. Irrigation_method (**Domain**: Surface, Localized, Drip, Sprinkler, Central pivot irrigation)

4. GOVT. OFFICIAL (Agriculture officer)
    1. Name
    2. ID (key)

Note: A Govt. official is assumed to be in-charge of a location. Depending on the type of location (Village, Mandal, District) the position of the Govt. official can be differed. Though in this database Ranking is not considered.

5. LAND
    1. Type (**Domain**: Red soil, Black soil, Alluvial soil, wet and dry lands)
    2. Owner
    3. Survey_No. Range(key)
    4. Size (In acres)

6. LABOURER
    1. Name
    2. Father's_Name (Name + Father's name = composite key)
    3. Phone_No.

4. Skill_exist(**Domain**: Yes, No)
5. Type_of_wage (**Domain**: Daily, work-based wage)
6. Work_status (**Domain**: available, occupied)

Subclasses:
Based_on_wages:
    i. DAILY_WAGE:
        1. Wage ii.
    WORK_BASED:
        1. Cost_per_acre Based
on skill:
      i. SKILLED ii.
      UNSKILLED:
        1.Age

Based on leadership:

    i. LEADER:

      1.Group_size

7. WATER RESOURCE
1. Type (**Domain**: Lake, Canal, Pond, River, Underground)
2. Name(key)
3. Present_volume(in cubic meters)
4. Ideal_volume(in cubic meters)

8. MACHINERY (Weak entity)
1. Name (partial key)
2. Cost
3. Used_for (Multi)
4. Purchase_cost

9. SUPPLIER
1. Name
2. Father's_Name (Name + Father's name = composite key)
3. Ph._No.(key)

10. LOCATION
1. Name(key)
2. Total_area (in acres)

11. CROP_INPUT
1. Name (key)

2. Cost
   3. Type(organic/inorganic)

Relations:

Note: (Total Participation = T.P , Partial participation = P.P)

1. HIRES: FARMER hires LABOURER for work. (1: n) (Both have T.P)

2. SITUATED_IN: FARMER is situated in LOCATION. (n:1) (Farmer has T.P)

3. NEIGHBOUR_OF: FARMER is neighbour of another FARMER (m:n)(both have T.P)

4. RESIDES: LABOURER belongs to LOCATION. (n:1) (Labourer as T.P)

5. LEADS: A LEADER leads a group of LABOURERs. (n:1) (Leader has T.P)

6. OPERATES : A SKILLED labourer can operate MACHINE. (m:n) (Skilled has T.P)

7. OWNS: SUPPLER owns a MACHINE. (m:n) (Both have T.P)

8. OVERSEE: GOVT. OFFICIAL oversees the LOCATION. (1:1)(Both have T.P)

9. LOCATED IN: LAND is located in LOCATION. (n:1) (land have T.P)

10. DEMAND: Demand of a CROP in a LOCATION. (in quintals)   (m:n) (Both have P.P)

11. USED_ON: CROP_INPUT is used on LAND. (m:n)(Both have P.P)

12. REQUIRES: CROP requires CROP_INPUT to grow.   (m:n)(CROP_INPUT have T.P)

13. PROVIDES: SUPPLIER(0,n) provides FARMER(0,n) with MACHINE(0,n). It has attributes Rent_cost and Sell_cost.   (**TERNARY RELATION**)

14. CULTIVATES: FARMER(0,n) cultivates a CROP(0,n) on LAND(0,1) using WATER_RESOURCE(1,n). It has attributes Start_date, Expected_harvest_date.
   (**QUARTERNARY RELATION**)

Functions:

Selection:

1. Crop locations: Retrieves all the Survey numbers and farmers of the land where the given crop is being cultivated.
2. Suppliers of machine
3. Farmers in a location
4. Labourers with skill
5. Farmers using water resource
6. Farmers renting machine: Retrieves all the farmers who have rented a machine

Projection:

1. Crops by water usage greater than ___cost per acre greater than ___
2. Machines with rent cost greater than ___
3. Farmers with land greater than____
4. Water resources being overused
5. Labourers less than wage

Aggregate:

1. AVG yield per acre for a crop
2. Crop with MAX demand in a location
3. Total (SUM) production of crop in a location
4. Crop with MIN water required

Search:

1. Farmer/Labourer by name
2. water resource/crop/machine by name
3. Landowner by survey number

Analysis:

1. Number of farmers whose crops had below average yield
2. Resource (Machinery and crop inputs) with demand greater than half of the farmer population in a location
3. Farmers with access to multiple water resources and using an overused water resource
4. Crops being overproduced (overproduction is decided based on total demand)
5. Estimated harvest of crop in a location for a month

Modification:

1. Work status of labourer (update)
2. Crop cultivated on land (update)
3. Machine owned by supplier (insertion)

4. Landowner(update)
5. Delete farmer/labourer
6. Update start date
7. Update MSP